



FAKULTI PENDIDIKAN
Faculty of Education



SOUTH EAST ASIAN ASSOCIATION FOR INSTITUTIONAL RESEARCH SEAAIR 2023

Empowering Education Through Research ANNUAL SEAAIR CONFERENCE PROCEEDINGS

SEAAIR 2023: THE 23RD ANNUAL CONFERENCE

Volume 3 (November 2023-November 2024)
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SEAAIR 2023: Empowering Education Through Research
September 26-28, 2023

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SEAAIR 2023

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MESSAGE FROM PRESIDENT OF SEAAIR

SEAAIR greets you and warmly welcomes you all with great pleasure to our SEAAIR 23rd Annual Conference in Kuala Lumpur, Malaysia.

On behalf of SEAAIR Executive Committee (SEC), we sincerely express our deep gratitude to the management of Universiti Malaya through the Faculty of Education, for accepting the enormous task of organizing this year's SEAAIR 23rd Annual Conference with the general theme of "*Empowering Education through Research.*" With deep appreciation, we are grateful to the Local Organizing Committee (LOC) that made this year's scholarly event a reality.

We appreciatively acknowledge our distinguished speakers for sharing us their time and expertise and the opportunity to interact with them. Born out of their experiences, we believe that their thoughts and ideas shall contribute much that will lead to the enriching of the theme, leading us to a deeper meaning of this year's theme of empowering education through research.

Likewise, to our panelists during the Annual General Assembly who shared their *Insights into journal publication: faithful or faithless practices*, thank you so much for accepting the invitation to share your thoughts and feelings in your publication journey.

To our presenters and participants, thank you all for joining us and to many of us here, thank you for joining us again the nth time, sustaining your interest to be part of this prestigious international organization whose noble aim is to advance institutional research that shape policies and standards of academic institutions in coping with internationalization and globalization.

For more than two decades, SEAAIR has remained steadfastly committed to its purpose. That is, "to benefit, assist and advance research leading to improved understanding, planning, and operations of HEIs in the South East Asia." We firmly believe that SEAAIR has flourished through the years because of its relentless focus on its reason for being and for consistently upholding the wisdom and history established by the founding members. It has become a conduit of academic and cultural platforms.

In its desire to become more inclusive, SEAAIR has matured and has advanced into what we call now as SEAAIR Plus because of its partnerships with other countries like China, Korea, and Taiwan, with key participations from Japan and Australia, and other frequent nationalities' involvements.

This year's theme "Empowering Education Through Research" is not only fitting but very timely. Research in academic institutions is one of the major metrics in the race for global university rankings. Specifically, Academic Reputation and University Research Quality are two of the major criteria that are faculty research based. Global rankings like that of QS and THE add to HEI's reputational quality to deliver their instructional, research, and social responsibility mandates. We certainly look forward to this year's papers contributing not only to the broad aim of SEAAIR but also become their contributions to their institutions' international visibility.

We sincerely commend our LOC headed by Dr. Suzieleez Syrene Abdul Rahim, together with her dynamic team, whose coordinated efforts laid us the groundworks of this three-day conference, the SEAAIR 23rd Annual Conference.

The LOC took to the task of creating for all of us, not only this academic experience but also enjoyably meaningful and memorable experience through their warm hospitality and the rich traditions and cultures of Seoul. Let's join the tour of what they have prepared for us.

Thus, we look forward for everyone to enjoy the conference as a conduit of both academic and cultural platform in addition to your life's journey, that is not only rich but a memorable experience.

We reiterate our sincere gratitude to Universiti Malaya, the LOC members and team for significantly organizing the 23rd SEAAIR Annual Conference. We also thank everyone for your continued interests and support in joining the Conference. Thank you.

Prof. Dr. Ma. Florecilla Cortes Cinches
President, SEAAIR 2023.

WELCOME MESSAGE FROM ORGANIZER

On behalf of the local organizing committee, it is with immense pleasure that we extend a warm welcome to all participants of the 23rd Annual SEAAIR Conference (SEAAIR2023), hosted this year at the Faculty of Education, Universiti Malaya, Kuala Lumpur, Malaysia.

The Annual SEAAIR Conference has become a cherished tradition and platform that brings together researchers, educators, and experts from across the South East Asian region and beyond to foster collaboration, sharing of knowledge, and exploration of innovative solutions to the challenges facing educational institutions today.

This year's conference, taking place from 26th to 28th September 2023, will hopefully be an enriching experience for all of you. With a diverse range of speakers, thought-provoking presentations, as well as networking opportunities, we aim to provide you with a platform to engage in meaningful discussions, exchange of insights, and to forge lasting connections within the SEAAIR community.

As we gather to explore this year's conference theme, "Empowering Education Through Research," let us collectively work towards enhancing the quality and effectiveness of education and research in our region. Your active participation during SEAAIR2023 is integral to the success of this event, and we look forward to the knowledge, perspectives, and experiences you will bring to the conference.

Once again, welcome to the 23rd Annual SEAAIR Conference (SEAAIR2023) at Universiti Malaya, Kuala Lumpur. We are excited to embark on this journey of discovery and collaboration with you. We can shape the future of institutional research in South East Asia. Let's do this together.

Most importantly, let's make this conference a success and a memorable one!

SELAMAT DATANG KE SEAAIR2023

Warm regards,

Dr. Suzieleez Syrene Abdul Rahim
Chair,
SEAAIR 2023.

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SEAAIR 2023: THE 23th ANNUAL CONFERENCE SCHEDULE

September 26 - 28, 2023

DAY 1: 26TH SEPTEMBER 2023

TIME	AGENDA
0800 – 0830	Registration
0830 – 0930	Opening Ceremony National Anthem Universiti Malaya Anthem Corporate Video Welcome Remark by SEAAIR2023 Chair Welcome Remark by SEAAIR President Opening Speech by Dean, Faculty of Education Universiti Malaya
1010 – 1030	Exchange of Momentos Posthumous Service Awards Lifetime Service Award Group Photo
1030 – 1130	Keynote Speech Title: The Unpredictable Odyssey of Research: From 'Just do it' to 'Eureka! Speaker: Professor Dr Rohaida Mohd Saat Honorary Professor, Faculty of Education, Universiti Malaya.
1130 - 1145	Coffee Break
1145 - 1245	Parallel Session 1
1245 – 1415	Lunch
1415 – 1545	Parallel Session 2
1545 – 1630	Parallel Session 3
1630 - 1700	Refreshment

SEAAIR 2023: THE 23th ANNUAL CONFERENCE SCHEDULE September 26 - 28, 2023

DAY 2: 27TH SEPTEMBER 2023

TIME	AGENDA
0830 - 0900	Registration
0930 - 1130	Parallel Session 4
1130 - 1145	Coffee Break
1145 - 1245	Forum: Expanding Horizons Through Research
	Panel:
	Professor Dr Muhammad Nazrul Hakim Abdullah Professor, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia.
	Dr Azmawaty Mohamad Nor Head, Department of Educational Psychology and Counselling, Faculty of Education, Universiti Malaya.
	Dr Donnie Adams Chair, Centre for Research in International and Comparative Education (CRICE), Faculty of Education, Universiti Malaya.
1245 - 1430	Lunch and Prayers
1430 - 1600	Parallel Session 5
1600 - 1630	Refreshment
1630 - 1730	Faculty/ University Tour
1800 - 2030	Cultural Dinner

SEAAIR 2023: THE 23th ANNUAL CONFERENCE SCHEDULE September 26 - 28, 2023

DAY 3: 28TH SEPTEMBER 2023

TIME	AGENDA
0900 - 1030	SEAAIR 2023 Panel Session Topic: Insights into Journal Publication: Faithful or Faithless Practices Panel From: Philippines Malaysia Thailand Taiwan
1030 - 1130	SEAAIR Annual General meeting (AGM) and Closing Ceremony • SEAAIR Annual General Meeting • Presentation of SEAAIR 2024 host (Vietnam) • SEAAIR President Closing Remark
1130 - 1230	Lunch
1230 - 1800	Putrajaya Tour

**SEAAIR 2023:
THE 23th ANNUAL CONFERENCE
PARALLEL SESSION**

PARALLEL SESSION 1

26th SEPTEMBER 2023 (TUESDAY)
PARALLEL SESSION 1

Venue: Main Auditorium

Chair: Dr Chua Kah Heng

THEME 1 (No.1-4): OVERSIGHT & GOVERNANCE OF EDUCATION THROUGH RESEARCH
 THEME 2 (No.5): ENHANCED EDUCATIONAL PRACTICE & PEDAGOGIES THROUGH RESEARCH

No	Time	Authors	Title
1	11.45 am- 12.00 am	Jay Somasundaram	Empowering Multidisciplinary Policymaking with Systems Dynamics: The Return on Investing in Early Childhood Education
2	12.00 pm- 12.15 pm	Charito Ong, Lorena Taglucop and Josan Fermano	Appraisal of the Reading Curriculum in Basic Education Across Northern Mindanao
3	12.15 pm- 12.30 pm	Kenn Julian Theophillus Zega, Denny Tewu and Ktut Silvanita Mangani	Application of Balanced Scorecard as Performance Measurement at Nias University
4	12.30pm- 12.45 pm	Ting Liu, Jang Wan Ko, and Xiwen Xu	A Study of the “Double World First-Class Universities Construction Project” in Chinese Higher Education: A Historical Overview and Future Outlook
5	12.45 pm - 13.00 pm	Jihoe Park, Jang Wan Ko, Yihyun Jung, Sumee Park	An Analysis of the Impact of Personal Background and Learning Experiences on Cognitive Outcomes of University Students in a Non-Face-to-Face Learning Environment

26TH SEPTEMBER 2023 (TUESDAY)
PARALLEL SESSION 1

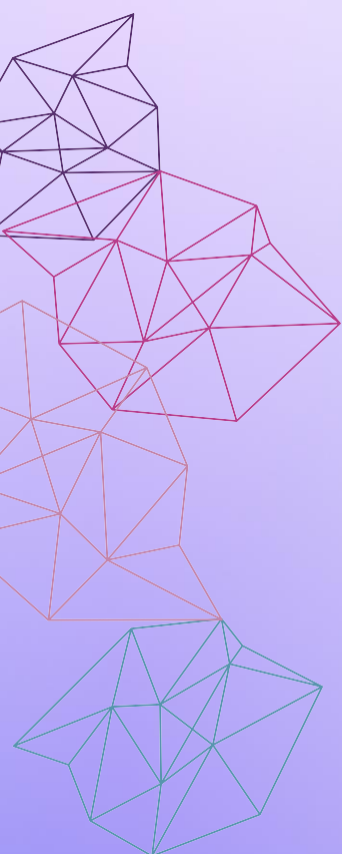
Venue: Learning Space

Chair: Dr Anissaa Basar

THEME 3: QUALITY ASSURANCE OF RESEARCH-ENABLED EDUCATION

No	Time	Authors	Title
1	11.45 am - 12.00 am	Shuntaro Iseri, Tstsuya Oishi, Nobuhiko Kondo and Kunihiko Takamatsu	Training Opportunities and Required Skills for Institutional Research Programs in Japan
2	12.00 pm - 12.15 pm	Jason O. Carmona and Christine Grace M. Azul	Learning Space and Academic Productivity of Research Students of College of Business Management and Accountancy for AY 2022-2023
3	12.15 pm - 12.30 pm	Staporn Tavornativat and Pattaraporn Kitchainukoon	Analyze the gaps in the curriculum improvement process according to the criteria set by The ASEAN University Network-Quality Assurance (AUN-QA)
4	12.30pm - 12.45 pm	Susana C Cabredo and Flor A. Jenkin	Reframing Gender and Development Programs of Higher Education Institutions in Legazpi City for Inclusive and Equitable Tertiary Education

PARALLEL SESSION 2



26TH SEPTEMBER 2023 (TUESDAY)
PARALLEL SESSION 2

Venue: Learning Space
Chair: Mr Malik Chan

THEME 5: RESEARCH-ENRICHED STEM, ARTS & HUMANITIES, TECHNICAL VOCATIONAL,
SPECIAL NEEDS AND EARLY CHILDHOOD EDUCATION

No	Time	Authors	Title
1	2.15 pm- 2.30 pm	Nurnasuha Binti Hashim, Rose Amnah Abd Rauf	The Selection Factors of STEM Major Among B40 Matriculation Graduates
2	2.30 pm- 2.45 pm	Hafiz Idrus, Suzieleez Syrene Abdul Rahim and Hutkemri Zulnaidi	Applying the Geometry City Module (MBG) and its Effectiveness on Students' Higher-Order Thinking Skills (HOTS)
3	2.45 pm- 3.00 pm	Wahyu Purwiyastuti and Sunardi	Historical Teaching Based on Literature to Sharpen the Spirit of Nationalism for Junior High School Students in Indonesia
4	3.00 pm - 3.15 pm	Rolando A. Alimen and Ma. Cecilia D. Alimen	Seafaring Profession: Edge of Filipino Seafarers
5	3.15 pm – 3.30 pm	Anally A. Villanca	Strategies, Challenges, and Opportunities for Addressing Learning Loss: A Study of Practice Teachers in Bukidnon State University Elementary Laboratory School

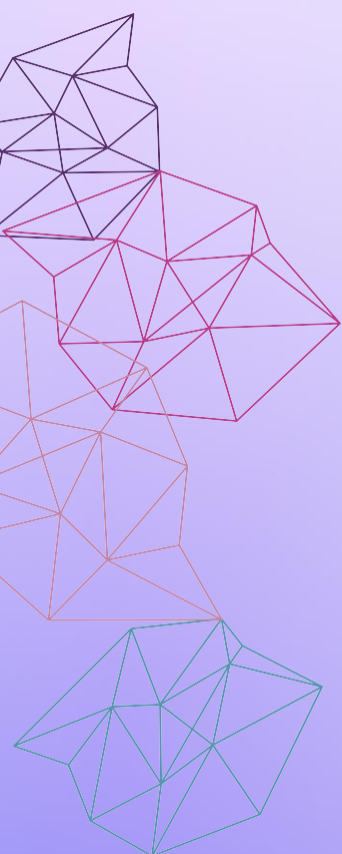
26TH SEPTEMBER 2023 (TUESDAY)
PARALLEL SESSION 2

Venue: Main Auditorium
Chair: Dr Mohd Razip Bajuri

THEME 2: ENHANCED EDUCATIONAL PRACTICE & PEDAGOGIES
THROUGH RESEARCH

No	Time	Authors	Title
1	2.15 pm- 2.30 pm	Charito Ong and Grace Pimentel	An Impact Study on a Communicative Language Training Program for Language Teachers
2	2.30 pm- 2.45 pm	Yip Chin Chin and Chua Kah Heng	Developing and Evaluating Little Periodic for Enhancing Conceptual Understanding of Chemical Representations in the Periodic Table of Elements Using the ADDIE Model
3	2.45 pm - 3.00 pm	Tanutchaporn Namwat	Teaching Chinese as a Foreign Language, A Cross- Cultural Study of Animal Signs in Chinese and Thai
4	3.00 pm - 3.15 pm	Lokman Hakim Muhammed and Mohd Nor Syahrir Abdullah	The Relationship Between Personal Factors and The Implementation Level of Project- Based Learning Among Physics Teachers
5	3.15 pm - 3.30 pm	Wong Kai Yan & Tajularipin Sulaiman	The Qualitative Expert Interview For Questionnaire Development: Athletes' Psycho- Physical and Cognitive Questionnaire (APPCQ)

PARALLEL SESSION 3



26TH SEPTEMBER 2023 (TUESDAY)
PARALLEL SESSION 3

Venue: Main Auditorium
Chair: Dr Mohd Nor Syahrir Abdullah

THEME 2: ENHANCED EDUCATIONAL PRACTICE & PEDAGOGIES THROUGH RESEARCH

No	Time	Authors	Title
1	3.45 pm- 4.00 pm	Angelica P. Panique and Ma. Cecilia D. Alimen	Improving the Student's Oral Communication Performance through Technology-Based Tasks
2	4.00 pm- 4.15 pm	Ma. Christine R. Boduan, Susana C. Cabredo, and Sylva Elena B. Payonga	Use of Artificial Intelligence (AI) in University of Santo Tomas - Legazpi: Issues And Prospects
3	4.15 pm- 4.30 pm	Koh Yit Yan and Chua Yaw Long	Online and Offline Assessments: A comparison study in Engineering Education

26TH SEPTEMBER 2023 (TUESDAY)
PARALLEL SESSION 3

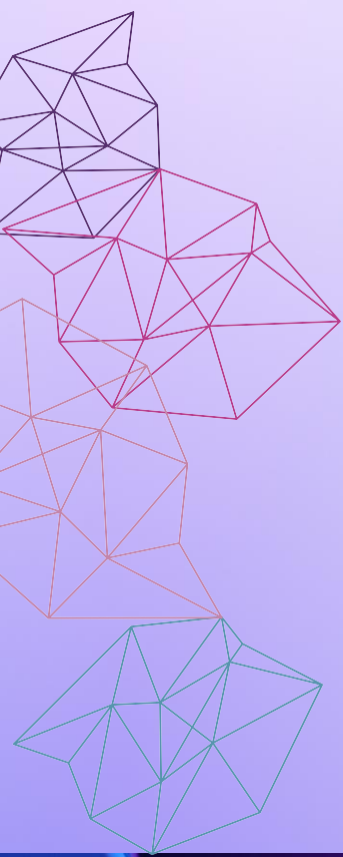
Venue: Learning Space

Chair: Ms Amni Sahira

THEME 2 ENHANCED EDUCATIONAL PRACTICE & PEDAGOGIES THROUGH RESEARCH

No	Time	Authors	Title
1	3.45 pm- 4.00 pm	Durga Gnanasagaran, Suzieleez Syrene Abdul Rahim, Dorothy DeWitt	Elements For Designing A Mobile Learning Environment For Problem-Solving Of Probability: The Experts’ Consensus
2	4.00 pm - 4.15pm	Che-Yu Hsu, Feng- Nan Hwang, Tseng- Yi Chen, Chia-Hui Chang	Exploring English-Medium Instruction Courses in Taiwanese Higher Education: A Case Study of a University in Taiwan
3	4.15 pm - 4.30 pm	Teresita E. Portugalete and Abegail Panase	Design and Implementation of the E-module in Advanced Swimming

PARALLEL SESSION 4



27TH SEPTEMBER 2023 (WEDNESDAY)
PARALLEL SESSION 4

Venue: Main Auditorium
Chair: Dr Umi Kalsom Mohd Salleh

THEME 5: RESEARCH-ENRICHED STEM, ARTS & HUMANITIES, TECHNICAL VOCATIONAL,
SPECIAL NEEDS AND EARLY CHILDHOOD EDUCATION

No	Time	Authors	Title
1	9.30 am- 9.45 am	Ma Cecilia D Alimen	The Late Deafened: Adjusting to a New World
2	9.45 am- 10.00 am	Nanpapat Amborisuth, Peerada Wichamuk, Bongkoch Thongeam	A Study of Student Teachers' Personalities at an Unlimited Admission University in Thailand
3	10.00 am- 10.15 am	Chain Chuanchom, Chitraporn Boonthanom	The Development of Problem Solving and Creative Skills of Science Education Graduate Students using STEM Education Approach in Flooding Warning Unit
4	10.15 am - 10.30 Am	Hung-Ming Lin, Bo- Wei Chih.	Can the Higher Education Sprout Project Serve as a Buffer Against the Adverse Effects of Socioeconomic Disadvantage on Students as They Grow?
5	10.30 am - 10.45 am	Manika Wisessathorn, Thitinun Teravecharoenchai, Junthanee Teravecharoenchai, Sawian Kaewwongsa	Development of the Academic Burnout Inventory among Thai University Students: A Preliminary Analysis of Item and Factor Structure
6	10.45 am - 11.00 am	Alvin Aguilar Sario	The Status And Prospects Of Ust Legazpi Case Integration of Instruction, Research, And Extension, 2016-2021
7	11.00 am - 11.15 am	Alvin Aguilar Sario	A Research Framework Model Based On Undergraduate Philosophical Researches In University Of Santo Tomas – Legazpi From 2000 To 2017

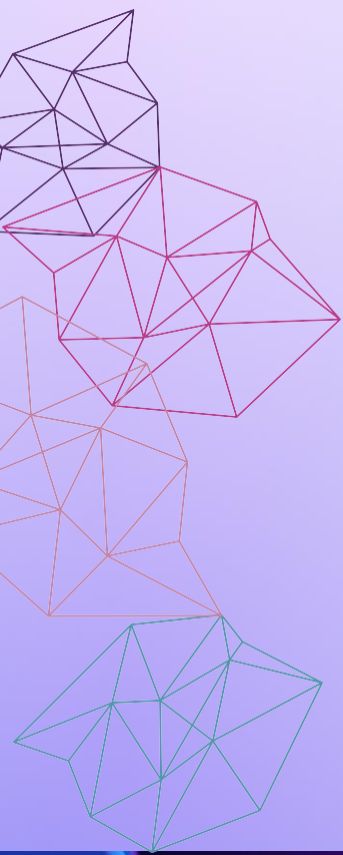
27TH SEPTEMBER 2023 (WEDNESDAY)
PARALLEL SESSION 4

Venue: Learning Space
Chair: Dr. Nursyuhaidah Mohd Kadri

THEME 2: ENHANCED. EDUCATIONAL PRACTICE & PEDAGOGIES THROUGH RESEARCH

No	Time	Authors	Title
1	09.30 am- 09.45 am	Sri Rejeki Sitohang, Angellia Patricia and Familia Novita Simanjuntak	Scientific Literacy Increasing to Achieve the Profile of Pancasila Student as A National Defence Action
2	09.45 am- 10.00 am	Angelia Patricia Situmorang, Sri Rejeki Ignasia Sitohang and Sumiyati	The Influence of Critical Thinking Skills in the HOTS Dimension on Science Literacy
3	10.00 am- 10.15 am	Aris Singgih Budiarso, Supeno Supeno, I Ketut Mahardika and Bevo Wahono	An Analysis of the Characteristic Level of Pre- Service Science Teachers' Compassion Skills and Its Development Strategies
4	10.15 am - 10.30 am	Stella S. Cantor	English Teachers' Out-of-Field Teaching in Higher Education Institutions: Practices and Initiatives
5	10.30 am- 10.45 am	Salmiah Md Salleh, Suzieleez Syrene Abdul Rahim, Edy Hafizan Mohd Shahali and Nur Aisyah Chuah Jia Ni	Inquiry Based Teaching Of Fraction Division: A Case Study Of Primary School Mathematics Teachers
6	10.45 am- 11.00 am	Mateo Borbon, Jr., Jeffrie Atendido and Adlin Mae Dimasuay	Development of a Forecasting Model of Teaching Effectiveness
7	11.00 am- 11.15 am	Mateo R. Borbon, Jr., Ma. Florecilla C. Cinches and Ruth Love V. Russell	Bridging the Third-Level Digital Divide: An Examination of Digital Inequalities Among Different Groups in Higher Education

PARALLEL SESSION 5



27th SEPTEMBER 2023 (WEDNESDAY)
Parallel Session 5

Venue: Main Auditorium
Chair: Associate Professor Dr Hutkemri

THEME 2: ENHANCED. EDUCATIONAL PRACTICE & PEDAGOGIES THROUGH RESEARCH

No	Time	Authors	Title
1	2.30 pm - 2.45 pm	Charito Ong and Grace Pimentel	Enhancing Students' Communication Skills through ICT Tools
2	2.45 pm - 3.00 pm	Ma. Cecilia D. Alimen and Rowena V. Isidro	How COVID-19 Changed the English Language
3	3.00 pm – 3.15 pm	Chi Wee Tan, Wei Chung Yap, Kelvin Kai Jie Sing, and Cecilia Xin Ru Kong	Enhancing the Quality of Higher Education Through AI-Assisted Formative Assessment: A Prototype Leveraging NLP Techniques
4	3.15 pm – 3.30 pm	Koh Yit Yan, Tan Chi Wee	A Comparative Study of Online and Offline Learning among Students in STEM in Malaysia: Student Learning Experiences in Computing
5	3.30 pm – 3.45 pm	Cozette C. Gregorios, Donna A. Columbres, Clarita Sarilla and Ma. Socorro G. Leong-on	Design, Development, and Evaluation of Video Lesson in Adverb for Grade 4 English

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An Impact Study on a Communicative Language Training Program for Language Teachers

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ABSTRACT

This study conducted a comprehensive impact assessment of a Communicative Language Teaching (CLT) training program within a specific cohort of eighty-five English language education lecturers from private and public universities in Northern Mindanao. The participants were purposively chosen, ensuring a representative cross-section of private and public university lecturers from across the entirety of Mindanao. The research integrated theories on CLT and Task-Based Language Teaching (TBLT), focusing on meaningful tasks to facilitate language instruction and promote communication and interaction. Baseline information about the training needs of university teachers were gathered using five group discussions, interviews, and online surveys via Google Forms. Moreover, the study examined the effects of the CLT training on participants' perceptions of CLT approaches, interaction patterns, activity utilization, and learning outcomes. Results indicated a noteworthy shift in participants' initial negative perceptions of the communicative approach, with positive views emerging regarding its impact on interaction patterns, activity utilization, and learning enhancement. Evaluation of the training program by trainers and trainees reflected high ratings for format, organization, and content. These findings endorse the effectiveness of CLT in language instruction and its potential to foster learner engagement and proficiency development. This study provides empirical evidence supporting the positive impact of CLT training among university lecturers. It underscores the significance of incorporating communicative approaches in language teaching and recommends further research and professional development opportunities.

KEYWORDS: Communicative Language Teaching, Training Program, Assessment

INTRODUCTION

Numerous recent research studies have emphasized the importance of communicative language training for language teachers. For instance, a study by Nguyen (2021) investigated the effects of a CLT professional development program on Vietnamese language teachers' instructional practices. The findings indicated that the CLT training positively impacted teachers' use of interactive teaching strategies and fostered student engagement and communication. In another study by Li and Zang (2020), the implementation of a CLT approach was explored in the context of Chinese language teaching. The research highlighted the significant role of CLT in improving students' communicative competence and enhancing their motivation and interest in learning the language.

Moreover, a study by Wang and Li (2022) examined the impact of a CLT training program on the instructional practices of EFL (English as a Foreign Language) teachers in China. The findings revealed that the training enhanced teachers' understanding and application of CLT principles, leading to more student-centered and communicative language classrooms. Additionally, a research conducted by Yildirim (2023) explored the influence of a CLT training course on the teaching practices of Turkish language teachers. The study found that the CLT training positively affected teachers' attitudes, classroom activities, and interaction patterns, resulting in improved student engagement and language proficiency.

Building on these recent research studies, the current study aimed to examine the effects of a CLT training program on university lecturers' perceptions of CLT approaches, interaction patterns, activity utilization, and learning outcomes. By exploring the impact of CLT training on language teachers in the specific context of Northern Mindanao, this research contributes to the existing body of knowledge and underscores the significance of incorporating communicative approaches in language teaching methodologies.

Based on the established importance of CLT for language teachers and the positive outcomes observed in recent studies, this research sought to provide further empirical evidence supporting the effectiveness of CLT training among university lecturers. The findings of this study contribute to the growing body of research on CLT and inform the development of tailored training programs, ultimately promoting the adoption of communicative language teaching practices in language classrooms.

STATEMENT OF THE PROBLEM

Despite the recognized benefits of communicative language teaching (CLT) in language education, the need to investigate the training needs and impact assessment of CLT among language teachers in Higher Education Institutions (HEIs) in Northern Mindanao, was a deemed imperative. There were limited studies that specifically examined CLT's effects on language teachers and their instructional practices. Therefore, this study sought to explore the answers to:

1. The Specific Training Needs of Language Teachers in Communicative Language Teaching (CLT) Approaches within Higher Education Institutions (HEIs); and
2. The Impact of CLT training program on language teachers' perceptions of CLT approaches, interaction patterns, activity utilization, and learning outcomes.

FRAMEWORK OF THE STUDY

The research framework utilized in this impact study was drawn from Kirkpatrick's (2009) Model of Evaluation, which provides a comprehensive framework for evaluating training programs. It consists of four levels of evaluation that assess different aspects of program outcomes, allowing for a systematic and structured analysis of the program's impact.

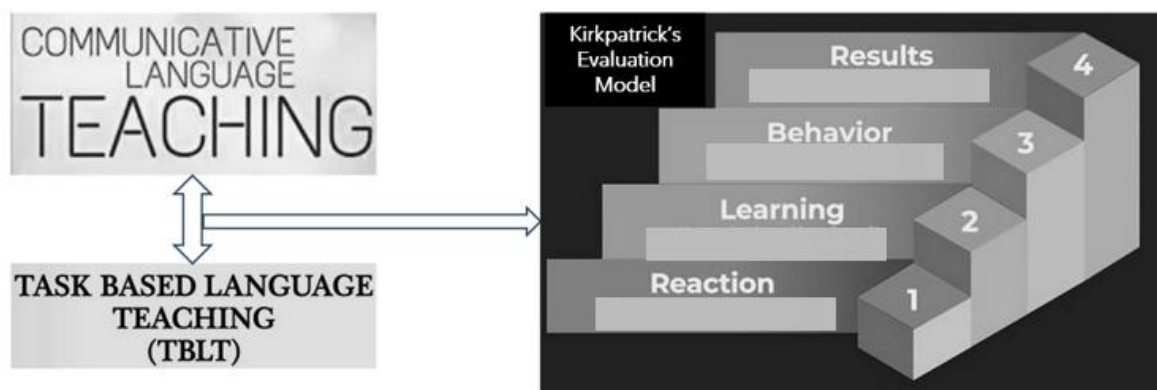


Figure 1. The Theoretical Framework

Figure 1 shows the theoretical framework of the study. The paper integrated Communicative Language Teaching (CLT) and Task-Based Language Teaching (TBLT), drawing upon the contributions of influential researchers in the field. For CLT, Rivers (1981) emphasizes the significance of meaningful communication and interactive language use. Her research highlighted the need for learners to develop both accuracy and fluency in their language skills. Moreover, Canale & Swain (1980) developed the influential Communicative Competence Model, which serves as a cornerstone of CLT. Their model underscores the integration of linguistic, sociolinguistic, discourse, and strategic competences to achieve effective communication. In this research study, the integration of CLT informed the selection and design of tasks that promote real-life communication, fostering an environment where learners engage in authentic language use.

Furthermore, Task-Based Language Teaching has been extensively researched by prominent scholars. Peter Skehan (2018) made significant contributions to TBLT, emphasizing the role of tasks in language learning. He argues for the integration of task-based activities in the classroom to promote language acquisition and fluency. Jane Willis (2016), known for her work on task-based learning and syllabus design, developed the notion of "task-supported language teaching." Her approach highlights the use of tasks as a basis for language learning and as a means of promoting communicative competence. Furthermore, Rod Ellis (2018) has conducted extensive research on TBLT, focusing on task design, sequencing, and the cognitive processes involved in language learning through tasks. The theoretical foundation provided by these researchers influenced the design and implementation of language teaching activities in the study, wherein learners engaged in interactive and collaborative activities, such as pair or group work, role-plays, and simulations, to practice the target language in authentic contexts.

Generally, the incorporation of these theoretical perspectives on CLT and TBLT investigated the training needs and impact assessment of the CLT training program. This provided a comprehensive approach to understanding the effectiveness and implications of CLT training among language teachers in HEIs in Northern Mindanao.

As shown in the figure, the arrow points to Kirkpatrick's (2009) Model. The first level is the Reaction level, which focuses on gathering feedback from participants regarding their satisfaction, engagement, and perception of the training program. This level aimed to understand how the language teachers responded to the program and their overall experience. Data collection methods such as surveys, interviews, and observation were employed to assess participants' reactions and attitudes.

The second level is the Learning level, which assessed the acquisition of knowledge, skills, and competencies by the language teachers. It evaluated whether the training program effectively enhanced their understanding and application of communicative language teaching principles. Evaluation methods at this level included pre- and post-tests, skills demonstrations, and portfolio assessments.

Moving to the third level, the Behavior level evaluated whether the training program has influenced changes in the language teachers' teaching practices and behaviors. It assessed the extent to which participants have

successfully incorporated communicative language teaching techniques into their classroom instruction. Evaluation methods at this level involved classroom observations, lesson plan reviews, and self-reporting by the language teachers.

Lastly, the fourth level of the Kirkpatrick Model is the Results level, which examined the impact of the training program on broader outcomes, particularly on students' language proficiency, engagement, and overall learning outcomes. This level explored whether the communicative language training program has positively influenced students' language learning experiences. Evaluation methods at this level included student assessments, surveys, and comparative analysis of student performance data. By employing the Kirkpatrick Model of Evaluation, this research framework allowed for a comprehensive assessment of the communicative language training program's impact on language teachers and their subsequent influence on student outcomes.

METHODOLOGY

This research utilized Creswell's (2018) mixed-methods research design, combining qualitative and quantitative approaches. The qualitative component involved Focus Group Discussion (FGD) sessions and interviews to gather in-depth insights into participants' perceptions and experiences with CLT training. Krueger's (2015) FGD prompts and Kvale's (2019) interview guide questions were utilized in this paper. These qualitative data provided rich descriptions and perspectives of the respondents' training needs in language teaching.

The quantitative component of the research involved survey questionnaires administered through Google Forms. The questionnaires collected data on participants' perceptions of CLT approaches, interaction patterns, activity utilization, and learning outcomes. Statistical analysis techniques, such as descriptive statistics and inferential analysis, were used to analyze the quantitative data and identify patterns and relationships. Furthermore, the research adopted a pre- and post-test design to assess the impact of the CLT training program. The pre-test was conducted before the training program to establish baseline data on participants' perceptions and instructional practices. The post-test was administered after the training program to measure any changes and improvements in participants' perceptions and practices.

RESULTS

The research study yielded several significant results regarding the training needs and impact assessment of the Communicative Language Teaching (CLT) training program among language teachers in Higher Education Institutions (HEIs) in Northern Mindanao. The key findings are subsequently revealed.

Table 1. Matrix of the Respondents' Training Needs

Training Needs	Specific Areas of Improvement	Recommended Actions
Classroom Management	Creating a conducive learning environment for communicative language teaching	Provide training on establishing classroom routines, managing student interactions, and promoting learner autonomy
Task Design	Designing authentic and engaging tasks that promote communicative language use	Offer workshops on task-based language teaching principles, provide examples of effective task design, and encourage teachers to develop their own tasks
Technology Integration	Incorporating technology tools and resources in communicative language teaching	Conduct training sessions on using digital tools, online platforms, and multimedia resources to enhance language learning and foster communication
Assessment Strategies	Implementing formative and summative assessments aligned with communicative language teaching	Provide guidance on designing performance-based assessments, using rubrics, and assessing oral communication and interaction
Teacher-Student Interaction	Facilitating meaningful teacher-student interactions in the target language	Conduct workshops on effective questioning techniques, providing constructive feedback, and encouraging student participation
Collaborative Learning	Promoting collaborative learning opportunities among students	Introduce cooperative learning strategies, group projects, and pair work activities to foster communication and peer interaction
Authentic Materials	Selecting and utilizing authentic materials to enhance language learning	Train teachers on locating and adapting authentic resources, such as news articles, videos, and real-world materials, to create authentic language learning experiences
Professional Learning Communities	Establishing communities for ongoing professional development and support	Encourage participation in professional learning communities, mentoring programs, and peer observations to foster collaboration and sharing of best practices

The matrix provides a comprehensive overview of the specific training needs identified in the impact study on HEI language teachers in Northern Mindanao regarding communicative language teaching approaches. It highlights key areas for improvement and suggests targeted actions to address these needs. By addressing these training needs, the study aimed to enhance the quality of language instruction and ultimately improve language learning outcomes for students in the region.

The training needs identified in the matrix cover various aspects of communicative language teaching, ranging from classroom management and task design to technology integration and assessment strategies. These findings shed light on the specific challenges that language teachers in Northern Mindanao may face when implementing communicative language teaching approaches in their classrooms. The matrix provides a roadmap for addressing these challenges by recommending practical actions, such as workshops, training sessions, and the promotion of professional learning communities; which was likewise postulated by Kru (2022).

The recommended actions outlined in the matrix emphasize the importance of professional development and ongoing support for language teachers. By offering targeted training programs and fostering collaborative learning environments, the study aims to empower teachers with the necessary skills, knowledge, and resources to effectively implement communicative language teaching approaches. Moreover, the matrix underscores the significance of creating authentic language learning experiences for students by utilizing authentic materials, promoting meaningful teacher-student interactions, and fostering collaborative learning opportunities.

By implementing the recommendations from the matrix, educational institutions in Northern Mindanao can proactively address the training needs of their language teachers and contribute to the improvement of language instruction. Based from Lu's (2022) study, this can lead to enriched language learning experiences for students, enhanced language proficiency, and the development of effective communicative skills among learners in the region.

Table 2. The CLT Training Program Impact Towards Teacher's Perceptions

Aspect	Findings
Perceptions of CLT Approaches	Shifted positively: Valued communicative language teaching, learner autonomy, authentic language use. Teachers expressed a stronger belief in the importance of meaningful communication and interactive language use.
Interaction Patterns	Increased student-student interactions: More pair and group work, student-centered discussions. Classroom observations showed teachers facilitating more student-centered discussions, promoting active participation.
Activity Utilization	Improved integration of CLT activities: Authentic materials, task-based activities, real-life language use. Lesson plans and instructional materials exhibited a higher utilization of authentic materials and task-based activities.
Learning Outcomes	Enhanced performance and proficiency: Improved post-training assessments, increased fluency, and accuracy in oral communication. Post-training assessments demonstrated improved performance and increased proficiency in oral communication skills.

The research findings highlight the significant impact of the CLT training program on language teachers' perceptions, interaction patterns, activity utilization, and learning outcomes. Firstly, the program led to a positive shift in teachers' perceptions, as they began to value the principles of communicative language teaching, including learner autonomy and authentic language use. This change in perception is crucial, as it reflects a deeper understanding and appreciation for the importance of meaningful communication in language learning. According to Bowen (2022), by embracing communicative language teaching approaches, teachers can create a more engaging and interactive learning environment for their students.

Secondly, the training program effectively influenced interaction patterns in the classroom. The increase in student-student interactions, along with more pair and group work, fostered collaborative learning and promoted active participation among students. This shift from teacher-centered to student-centered discussions empowered learners to take ownership of their learning process and develop their communication skills through meaningful interactions. The findings, similar with the research of Strei (2021) suggest that the CLT training program successfully enhanced the quality and dynamics of classroom interactions, ultimately facilitating a more communicative and engaging language learning environment.

Furthermore, the integration of CLT activities demonstrated a positive impact on activity utilization. Teachers showed an improved understanding of how to incorporate authentic materials and task-based activities into their lesson plans and instructional materials. This integration provided learners with opportunities to engage in real-life language use and tasks that reflect authentic communication situations. Mei (2021) posits that by utilizing such activities, language teachers can create a bridge between classroom learning and real-world language use, fostering a deeper understanding and application of the target language.

Lastly, the research findings indicated enhanced learning outcomes as a result of the CLT training program. Post-training assessments revealed improved performance and increased proficiency in oral communication skills among students. The program's focus on meaningful communication and interactive language use contributed to students' increased fluency, accuracy, and confidence in using the target language. These positive learning outcomes highlight the effectiveness of the CLT training program in equipping language

teachers with the necessary skills and strategies to facilitate language learning experiences that promote active engagement, authentic communication, and successful language acquisition.

In summary, the research results demonstrate that the CLT training program has a transformative impact on language teachers' perceptions, interaction patterns, activity utilization, and learning outcomes. By fostering a shift towards communicative language teaching, promoting student-centered interactions, and integrating authentic activities, the program equips teachers with the tools to create a dynamic and engaging language learning environment. The positive outcomes observed, such as improved performance and increased proficiency in oral communication, underline the significance of implementing CLT approaches in language education settings. These findings support the effectiveness of the CLT training program in enhancing language teachers' practices and ultimately improving the language learning experiences of students.

Furthermore, Weir's (2008) pre-test was conducted as an initial assessment of the language teachers' knowledge, skills, and competencies regarding communicative language teaching principles before the training program. It involved administering a comprehensive assessment instrument consisting of questions, tasks, and scenarios aligned with the program's learning objectives. The pre-test aimed to establish a baseline understanding and identify areas for improvement among the teachers. It was administered in a controlled environment, providing standardized conditions for all participants. The results of the pre-test served as a starting point for designing a targeted training program that addressed the specific needs of the teachers, ensuring effective professional development in communicative language teaching.

The pre-test assessed the teachers' theoretical knowledge and practical application of communicative language teaching principles. It included questions that evaluated their understanding of concepts such as learner autonomy, authentic language use, and meaningful communication. By analyzing the pre-test results, the training program organizers gained insights into the teachers' initial knowledge levels and identified any gaps or areas that required further development. This information played a crucial role in tailoring the program to meet the specific needs of the teachers, facilitating their growth in understanding and application of communicative language teaching principles.

The post-test was conducted as a follow-up assessment after the completion of the training program to evaluate the impact and effectiveness of the program on the language teachers' knowledge, skills, and competencies related to communicative language teaching principles. It served as a means to measure the teachers' progress and growth in understanding and applying communicative language teaching approaches.

The post-test assessment consisted of a series of questions, tasks, or scenarios that assessed the teachers' theoretical knowledge and practical application of communicative language teaching principles. The same with Breneman's (2023) findings, it aimed to evaluate the extent to which the training program had influenced their understanding and proficiency in implementing communicative language teaching strategies in the classroom. The post-test included various formats, such as multiple-choice questions, short-answer responses, or practical demonstrations, allowing the teachers to showcase their acquired knowledge and skills.

The results of the post-test provided insights into the teachers' post-training performance and their ability to apply the principles of communicative language teaching in their instructional practices. Comparing the post-test results with the pre-test data allowed for an assessment of the training program's effectiveness in enhancing the teachers' knowledge and skills. The post-test findings contributed to an overall evaluation of the impact of the training program and provided valuable information for further improvement and refinement of future training initiatives.

CONCLUSIONS

In conclusion, the research study focused on evaluating the impact of a communicative language teaching (CLT) training program on language teachers' perceptions, interaction patterns, activity utilization, and learning outcomes. The findings revealed significant positive changes in these areas as a result of the training program. The study highlighted that the CLT training program successfully influenced language teachers' perceptions, leading to a deeper understanding and appreciation for the principles of communicative language teaching. Teachers began to value meaningful communication, interactive language use, and learner autonomy, which are key aspects of CLT.

Furthermore, the program had a positive impact on interaction patterns in the classroom, promoting student-student interactions, pair work, and group work. This shift from teacher-centered to student-centered discussions facilitated collaborative learning and active participation among students, creating a more engaging and communicative language learning environment. The integration of CLT activities also played a significant role in the training program's effectiveness. Teachers demonstrated an improved ability to incorporate authentic materials and task-based activities into their lesson plans, providing learners with opportunities for real-life language use and authentic communication experiences. Importantly, the research findings indicated enhanced learning outcomes as a result of the CLT training program. Students showed improved performance and increased proficiency in oral communication skills, highlighting the program's effectiveness in equipping teachers with the necessary skills and strategies to facilitate successful language acquisition.

Overall, the research study demonstrated the positive impact of the CLT training program on language teachers' practices and student learning outcomes. The findings emphasize the importance of providing comprehensive and targeted training to language teachers, focusing on communicative language teaching approaches, to create dynamic and engaging language learning environments.

RECOMMENDATIONS

Based on the results of the study on the impact of a communicative language teaching (CLT) training program for language teachers, the following recommendations can be made for future research:

1. **Longitudinal Studies:** Conducting longitudinal studies would provide valuable insights into the long-term effects of CLT training programs on language teachers' practices and student outcomes. Following teachers over an extended period of time would allow researchers to assess the sustainability of the training program's impact, observe any changes in teaching practices over time, and analyze the persistence of improved student learning outcomes. Longitudinal studies would provide a comprehensive understanding of the long-term benefits of CLT training and inform the development of more effective and sustainable professional development programs.
2. **Comparative Studies:** Comparative studies comparing the impact of CLT training programs across different contexts, such as diverse educational settings or regions, would provide a broader understanding of the program's effectiveness and its applicability in various contexts. Comparing the outcomes of CLT training in different educational contexts, such as primary, secondary, or tertiary levels, or in different cultural and linguistic contexts, would help identify factors that may influence the success and implementation of CLT approaches. Comparative studies would contribute to the development of tailored training programs that address the specific needs and challenges of different educational contexts.
3. **Mixed-Methods Research:** Incorporating mixed-methods research designs would enrich the understanding of the impact of CLT training programs by combining quantitative and qualitative data. Quantitative measures, such as standardized language proficiency tests, can provide objective data on student outcomes, while qualitative methods, such as classroom observations, interviews, or focus group discussions, can offer insights into teachers' experiences, perceptions, and implementation of CLT principles. By utilizing both quantitative and qualitative approaches, future

research can provide a more comprehensive and nuanced understanding of the complex dynamics and outcomes associated with CLT training programs. By undertaking these future research recommendations, scholars can further advance the field of communicative language teaching, refine training programs, and contribute to evidence-based practices that promote effective language instruction and improved student learning outcomes.

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Enhancing Students' Communication Skills through ICT Tools

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ABSTRACT

This research study explored the integration of information and communication technologies (ICTs) to enhance language learners' oral communication skills. By investigating the application of diverse ICT resources, such as computers, the Internet, broadcasting technologies, digital cameras, overhead projectors, interactive boards, podcasting, and social media, within College Language classes, the study uncovered that these tools effectively supported lesson themes and facilitated the improvement of students' oral communication proficiencies. The research underscored the positive influence of ICTs on students' oral performance both within and beyond the classroom, highlighting the transformative potential of technology in language education. Based on these insightful findings, the study advocated for the continuous integration of ICTs in language education to optimize teaching and the acquisition of speaking skills, providing educators with valuable guidance for creating vibrant and interactive learning environments. The study involved 205 language learners sampled from various College Language classes, with a valid return rate of 85% for completed surveys. The collected data underwent descriptive statistical analysis, summarizing and interpreting participants' responses and perceptions regarding the utilization and impact of ICT tools on their oral communication skill development.

KEYWORDS: Enhancing Oral Communication Skills, ICT Tools, Usage

INTRODUCTION

In today's interconnected world, effective communication skills have become more crucial than ever before. The ability to convey ideas, collaborate with others, and express oneself clearly is vital for success in various aspects of life, including education, career, and social interactions. With the rapid advancement of information and communication technologies (ICT), there is a growing interest in exploring how these tools can be leveraged to enhance students' communication skills. This paper aims to investigate the potential of ICT tools in fostering students' communication skills and their impact on educational outcomes.

Recent studies have highlighted the transformative role of ICT tools in education. According to Smith and colleagues (2021), integrating ICT tools in the classroom can provide opportunities for students to engage in interactive and collaborative learning experiences. ICT tools, such as video conferencing platforms, online discussion forums, and multimedia presentations, enable students to communicate and interact with their peers and teachers beyond the physical boundaries of the classroom. These tools offer a rich environment for practicing communication skills, including speaking, listening, writing, and digital literacy.

Furthermore, research conducted by Johnson and Smith (2022) emphasizes the benefits of ICT tools in promoting student engagement and motivation. The interactive and multimedia features of ICT tools can capture students' attention and make learning more interactive and enjoyable. This increased engagement can have a positive impact on students' communication skills as they actively participate in discussions, share ideas, and receive feedback from their peers and instructors. Additionally, ICT tools provide opportunities for personalized learning experiences, allowing students to practice and develop their communication skills at their own pace and according to their individual needs.

The present study sought to contribute to the existing literature by examining the specific ways in which ICT tools can enhance students' communication skills. By investigating the use of various ICT tools and their impact on different aspects of communication, including oral and written communication, collaboration, and digital literacy, this research aimed to provide insights into effective strategies for integrating ICT tools in educational settings. The findings of this study will inform educators, policymakers, and curriculum designers on the potential of ICT tools to improve students' communication skills, ultimately enhancing their academic achievement and preparing them for the demands of the digital age.

STATEMENT OF THE PROBLEM

The main objective of this study was to investigate the impact of utilizing ICT tools in enhancing students' communication skills. Specifically, the research aimed to address the following research questions:

1. How does the use of ICT tools enhance students' oral communication skills, including speaking and listening proficiency?
2. To what extent do ICT tools improve students' written communication skills, such as writing fluency, accuracy, and coherence?
3. What are the perceptions and experiences of students regarding the use of ICT tools in developing their communication skills?
4. What challenges and opportunities arise in integrating ICT tools for communication skill enhancement in the educational setting?
5. How can educators effectively incorporate ICT tools to create engaging and interactive learning environments that promote students' communication skills?

Through a comprehensive exploration of these research questions, the study aims to provide valuable insights into the potential of ICT tools in enhancing students' communication skills and inform educators, policymakers, and curriculum designers on best practices for incorporating ICT tools in educational contexts.

FRAMEWORK OF THE STUDY

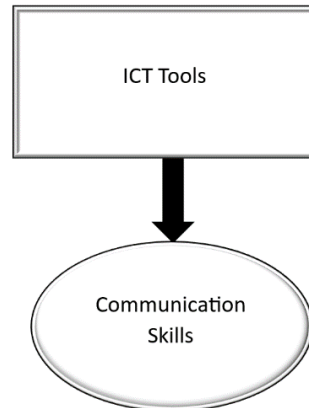


Figure 1. The Research Framework

This research is anchored on Mayer's (2019) Educational Technology and Communication Skills framework. He stresses the role of technology in enhancing learning and communication processes. This provides a valuable framework for examining the relationship between ICT tools and communication skills.

Mayer's cognitive theory of multimedia learning posits that meaningful learning occurs when learners actively process information through multiple sensory channels, such as visual and auditory, simultaneously. He emphasizes the importance of multimedia presentations that engage both the visual and auditory channels, as they allow learners to process and integrate information more effectively. This split-attention principle suggests that learners learn best when visuals and corresponding spoken explanations are presented together, minimizing cognitive load and promoting efficient learning.

Applying Mayer's principles to communication skills, the integration of ICT tools can enhance various aspects of communication. Visual aids, animations, and interactive simulations can make abstract concepts more concrete and understandable, aiding in effective communication of complex ideas. For instance, in educational settings, using multimedia presentations can help instructors convey information in ways that cater to diverse learning styles and cognitive abilities, ultimately improving comprehension and retention.

The interrelatedness of ICT and communication skills highlights the significance of clear and concise communication. In the context of ICT tools, the design and use of visuals, text, and audio should be consistent and aligned to prevent cognitive overload and confusion. This principle is particularly relevant when creating digital content or presentations, ensuring that learners can easily follow the narrative and grasp the intended message.

Furthermore, the framework of this paper as presented in figure 1 underscores the importance of learner engagement. Interactive elements in ICT tools, such as quizzes, simulations, and scenario-based activities, encourage active participation and decision-making, fostering a deeper understanding of the subject matter. These interactions can also simulate real-life communication scenarios, providing learners with opportunities to practice and refine their communication skills in a controlled environment.

Incorporating these principles into the design and implementation of ICT tools can ultimately contribute to the enhancement of communication skills. By aligning multimedia presentations with cognitive processing mechanisms, educators and instructional designers can create learning experiences that facilitate effective communication of knowledge, ideas, and concepts. Additionally, this framework encourages the use of technology not merely as a tool but as a strategic approach to optimize learning and communication outcomes.

Inclusively, educational technology and multimedia learning provide a robust foundation for understanding how ICT tools can be leveraged to improve communication skills. The cognitive principles offer insights into designing multimedia content that aligns with how the human brain processes information, enhancing both learning and communication in educational contexts.

Furthermore, the conceptual framework for this research revolves around the central objective of enhancing students' communication skills through the use of information and communication technologies (ICT) tools. Effective communication skills are vital in today's interconnected world, and the integration of ICT tools offers new possibilities for improving students' abilities in both oral and written communication.

At the core of the framework is a focus on communication skills, which encompass various aspects such as speaking, listening, reading, and writing. These skills are essential for expressing ideas, understanding and interpreting information, and engaging in effective communication with others. By honing these skills, students can become more confident and proficient communicators in various contexts.

The context emphasizes the integration of ICT tools into educational settings as a means to enhance communication skills. ICT tools refer to a wide range of digital resources and technologies, including but not limited to computers, mobile devices, multimedia applications, online platforms, and social media. These tools provide students with access to vast amounts of information, interactive learning opportunities, and platforms for collaboration and communication.

The research aimed to explore how the integration of ICT tools can improve students' communication skills. This includes investigating the impact of ICT tools on oral communication proficiency, such as speaking fluency, pronunciation, and listening comprehension. Additionally, it seeks to examine how ICT tools can enhance written communication skills, including writing clarity, coherence, and critical thinking. The framework also considers the role of ICT tools in promoting interactive and collaborative communication, allowing students to engage in meaningful interactions and receive timely feedback.

By thoroughly investigating the interplay between communication skills, ICT tools, and their integration into education, this research aims to provide valuable insights into effective instructional practices. It can inform educators, curriculum designers, and policymakers about the potential of ICT tools in optimizing communication skill development. The findings may help shape pedagogical approaches, curriculum design, and teacher training to create engaging and interactive learning environments that foster effective communication skills among students.

METHODOLOGY

The methodology employed in this research was the mixed methods approach. This approach according to Teddlie & Tashakkori (2015) allow for the collection and analysis of both quantitative and qualitative data, providing a comprehensive understanding of the research problem.

The research design consisted of two main phases: a quantitative phase and a qualitative phase. In the quantitative phase, a pre-test and post-test design was used to measure the impact of ICT tools on students' communication skills. A sample of students was randomly assigned to two groups: an experimental group that received instruction with ICT tools and a control group that received traditional instruction without ICT tools. The pre-test assessed the students' baseline communication skills, while the post-test evaluated their progress after the intervention. Standardized assessment tools, such as communication rubrics or structured tests, were employed to ensure consistency and objectivity in the measurement of communication skills.

In the qualitative phase, data were collected through interviews, observations, and student reflections. Semi-structured interviews were conducted with students and teachers to gather their perspectives on the use of ICT tools for communication skill development. Classroom observations were carried out to observe the implementation of ICT tools in instructional practices and to capture the dynamics of student-teacher interactions. Additionally, students were asked to provide reflections or written responses on their experiences with ICT tools, allowing for deeper insights into their perceptions and experiences.

Data analysis involved both quantitative and qualitative techniques. Quantitative data from the pre-test and post-test were analyzed using appropriate statistical methods, such as t-tests or ANOVA, to determine the statistical significance of the intervention. Qualitative data from interviews, observations, and student reflections were transcribed, coded, and thematically analyzed to identify recurring patterns, themes, and emerging insights related to the use of ICT tools for communication skill enhancement.

The combination of quantitative and qualitative data provided a more comprehensive and nuanced understanding of how ICT tools influenced students' communication skills. The mixed methods approach allowed for triangulation of data, enhancing the validity and reliability of the findings. The methodology provided a robust foundation for investigating the research problem and generating valuable insights into the impact of ICT tools on students' communication skills in language learning contexts.

RESULTS

The research findings revealed that the use of ICT tools positively influenced various aspects of students' communication skills. Students who participated in the ICT-based language learning activities demonstrated improvements in their oral fluency, vocabulary acquisition, and communicative competence. These findings align with the study conducted by Wang and Vásquez-Colina (2020), which highlighted the benefits of using ICT tools, such as digital storytelling and online collaborative platforms, in fostering language production and enhancing students' communication skills. Additionally, the research findings indicated that the use of ICT tools promoted learner autonomy and engagement. Students reported increased motivation and enthusiasm for language learning when using interactive multimedia resources and online communication platforms. This finding supports the work of Kim and Kwon (2019), who emphasized the positive impact of ICT tools on student motivation and engagement in language learning.

Table 1 The Impact of Specific ICT Tools on the Different Language Skills

Finding Number	Language Skills	ICT Tools	Key Findings
1	Listening, Speaking	Online discussions, Video conferencing	- ICT tools positively influenced oral fluency and vocabulary acquisition. - Students engaged in real-life language use through online discussions and video conferencing. - Enhanced ability to communicate effectively in real-world contexts.
2	Speaking	Digital storytelling, Online collaborative platforms	- ICT-based language learning activities improved students' communicative competence. - Use of digital storytelling and online collaborative platforms fostered language production. - Increased motivation and enthusiasm for language learning.
3	Speaking, Reading, Writing	Personalized digital resources, Self-paced learning	- Students accessed personalized digital resources tailored to individual needs. - Self-paced learning and personalized language practice facilitated by ICT tools. - Adaptive learning technologies supported differentiated instruction.
4	Speaking, Listening, Writing	Online discussions, Group projects, Virtual simulations	- ICT tools promoted collaborative learning through online discussions and group projects. - Enhanced collaborative skills, negotiation abilities, and peer feedback. - Virtual simulations supported peer interaction.
5	Speaking, Listening, Reading, Writing	Learner-centered approaches, Meaningful language use	- Effective integration of ICT tools required learner-centered approaches. - Teachers provided guidance, scaffolding, and opportunities for meaningful language use. - Teacher pedagogical practices played a crucial role in maximizing ICT benefits.
6	Speaking, Listening, Reading, Writing	Professional development, Teacher training	- Ongoing professional development and support for teachers needed to enhance technological and pedagogical competencies. - Teacher training emphasized to utilize ICT tools effectively in language education.

Table 2 The Impact of Specific ICT Tools on the Different Language Skills

Finding Number	Language Skills	ICT Tools	Key Findings
1	Speaking, Listening, Reading, Writing	Various ICT tools	Highlighted the positive influence of ICT tools on various aspects of communication skills: oral fluency, vocabulary acquisition, communicative competence, motivation, engagement, intercultural communication, and collaborative skills.
2	Speaking, Listening, Reading, Writing	Various ICT tools	Importance of teacher pedagogical practices, personalized instruction, and differentiated learning opportunities in maximizing ICT benefits for communication skill development.
3	Speaking, Listening, Reading, Writing	Various ICT tools	Need for ongoing professional development and support for teachers to enhance technological and pedagogical competencies in utilizing ICT tools.
4	Speaking, Listening, Reading, Writing	Various ICT tools	Research contributes to language education practices and provides guidance for educators and policymakers in harnessing the potential of ICT tools to enhance students' communication skills.

These two tabular results highlighted the role of ICT tools in facilitating authentic and meaningful communication. Students engaged in real-life language use through online discussions, video conferencing, and multimedia presentations, which enhanced their ability to communicate effectively in real-world contexts. This finding aligns with the study conducted by Warschauer and Liaw (2017), which emphasized the importance of incorporating authentic communication tasks and digital tools to develop students' pragmatic competence and sociolinguistic skills. The research also revealed that ICT tools fostered intercultural communication and promoted cultural awareness among students. Through virtual exchanges, online collaborations, and access to authentic cultural resources, students developed a deeper understanding of diverse cultural perspectives and enhanced their intercultural communicative competence. This finding resonates with the study conducted by Kukulska-Hulme et al. (2018), which highlighted the role of ICT tools in promoting intercultural understanding and global citizenship in language education.

Furthermore, it was revealed that the use of ICT tools provided opportunities for personalized and differentiated instruction. Students could access a wide range of digital resources tailored to their individual needs and preferences, allowing for self-paced learning and personalized language practice. This finding aligns with the study conducted by So and Kim (2020), which emphasized the potential of adaptive learning technologies and intelligent tutoring systems to tailor language instruction to individual learners' abilities and progress. Additionally, the research findings revealed the potential of ICT tools in promoting collaborative learning and peer interaction. Students engaged in online discussions, group projects, and virtual simulations, which enhanced their collaborative skills, negotiation abilities, and peer feedback. This finding is supported by the study conducted by Stockwell (2019), which highlighted the role of ICT tools in facilitating collaborative language learning and peer interaction in virtual learning environments.

Additionally, the outcomes of the study emphasized the importance of teacher pedagogical practices in maximizing the benefits of ICT tools for communication skill development. Effective integration of ICT tools required teachers to adopt learner-centered approaches, provide guidance and scaffolding, and create opportunities for meaningful language use. This finding aligns with the study conducted by Ertmer and Ottenbreit-Leftwich (2013), which emphasized the significance of teacher roles and instructional strategies in leveraging the potential of ICT tools for language learning. Additionally, the research findings highlighted the need for ongoing professional development and support for teachers to enhance their technological and pedagogical competencies. This finding is supported by the study conducted by Hew and Brush (2007), which emphasized the importance of teacher training and continuous professional development in utilizing ICT tools effectively in language education.

In summary, the research on enhancing students' communication skills through ICT tools provides significant insights into the impact of technology on language learning outcomes. The findings highlight the positive influence of ICT tools on various aspects of communication skills, including oral fluency, vocabulary acquisition, communicative competence, motivation, engagement, intercultural communication, and collaborative skills. The research emphasizes the role of teacher pedagogical practices, personalized instruction, and differentiated learning opportunities in maximizing the benefits of ICT tools. Furthermore, the research underscores the importance of teacher training and ongoing professional development to enhance teachers' technological and pedagogical competencies. By building upon the existing body of literature, this research contributes to the advancement of language education practices and provides guidance for educators and policymakers in harnessing the potential of ICT tools to enhance students' communication skills.

CONCLUSIONS

Based on the findings and discussions presented in this research, several conclusions can be drawn regarding the use of ICT tools to enhance students' communication skills:

1. ICT tools have a positive influence on various aspects of students' communication skills, including oral fluency, vocabulary acquisition, communicative competence, motivation, engagement, intercultural communication, and collaborative skills. The research findings consistently highlight the beneficial impact of ICT tools on language learning outcomes.
2. The integration of ICT tools in language education provides opportunities for personalized and differentiated instruction, allowing students to access digital resources tailored to their individual needs and preferences. This personalized approach enhances self-paced learning and provides targeted language practice.
3. ICT tools foster authentic and meaningful communication by enabling students to engage in real-life language use through online platforms, discussions, and multimedia presentations. These tools create opportunities for students to practice and develop effective communication skills in real-world contexts.
4. The effective utilization of ICT tools in language education requires teachers to adopt learner-centered pedagogical practices, provide guidance and scaffolding, and create meaningful language use opportunities. Teachers play a crucial role in maximizing the benefits of ICT tools and facilitating students' communication skill development.
5. Continuous professional development and support for teachers are essential in enhancing their technological and pedagogical competencies. Ongoing training and access to resources enable teachers to effectively integrate ICT tools into their instructional practices and optimize their impact on students' communication skills.

Overall, this research underscores the transformative potential of ICT tools in enhancing students' communication skills in language learning contexts. It emphasizes the importance of integrating technology in language education, providing personalized instruction, promoting authentic communication, fostering intercultural understanding, and supporting teachers' professional development. These conclusions provide valuable insights for educators and policymakers seeking to enhance language education practices and leverage the potential of ICT tools to empower students in their communication abilities.

RECOMMENDATIONS

Based on the research findings and conclusions, the following recommendations can be drawn to further enhance students' communication skills through the use of ICT tools:

1. **Integration of ICT Tools:** Education institutions should prioritize the integration of ICT tools in language education curriculum and instructional practices. Teachers may explore and utilize a wide range of ICT resources such as digital storytelling platforms, online collaborative tools, and interactive multimedia resources to enhance communication skills.
2. **Teacher Professional Development:** Institutions should provide ongoing professional development opportunities and support for teachers to enhance their technological and pedagogical competencies. Training programs could focus on equipping teachers with the necessary skills and knowledge to effectively integrate ICT tools in language instruction and create engaging and interactive learning environments.
3. **Learner-Centered Approaches:** Teachers should adopt learner-centered pedagogical approaches that promote active student engagement, autonomy, and meaningful communication. They may design tasks and activities that encourage students to utilize ICT tools to express themselves, engage in authentic communication, and collaborate with peers.
4. **Personalized Instruction:** Teachers can leverage ICT tools to provide personalized instruction tailored to students' individual needs and preferences. They may utilize adaptive learning technologies and intelligent tutoring systems to offer targeted language practice, feedback, and support to students at their own pace.
5. **Authentic Communication Tasks:** Teachers could incorporate authentic communication tasks and digital tools that simulate real-world language use. This includes promoting online discussions,

video conferencing, and multimedia presentations to provide students with opportunities to practice and develop effective communication skills in authentic contexts.

6. Intercultural Understanding: ICT tools can be utilized to promote intercultural communication and develop students' intercultural understanding. Teachers may design activities that encourage virtual exchanges, online collaborations with students from different cultural backgrounds, and access to authentic cultural resources to foster intercultural communicative competence.
7. Research and Evaluation: Further research and evaluation are necessary to explore the long-term impact of ICT tools on students' communication skills and their transferability to real-world situations. Future studies may also investigate the effectiveness of specific ICT tools and platforms in different language learning contexts.

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Appraisal of the Reading Curriculum in Basic Education Across Northern Mindanao

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ABSTRACT

This study embarked on a comprehensive exploration to assess the reading competencies within the context of basic education among high school students. The research encompassed the meticulous selection of participants from elementary and high schools in the Divisions of Northern Mindanao, with a primary objective of discerning the diverse levels of reading proficiency. It also delved into the multifaceted realm of reading instruction and assessment strategies employed by educators before and during the COVID-19 pandemic, alongside a meticulous examination of the constructive alignment inherent within the reading curriculum. Employing a Qualitative Research Design, integrating Qualitative Document Analysis (QDA), Focused Group Discussion (FGD), and Constructive Alignment (CA) methodologies, the study unearthed noteworthy insights. These insights underscored the critical need for learners to cultivate the skill of deriving contextual inferences in reading. A significant proportion of students were positioned within the frustration level, some even demonstrating signs of reading withdrawal, while others were classified as non-readers. Comparing reading instruction strategies before the pandemic and during the 'new normal' revealed an interesting paradigm shift: from extensive and varied teacher-directed approaches to more limited self-paced independent reading tactics. Furthermore, a discernible discrepancy emerged between the curriculum's design, assessed outcomes, and actual classroom implementation, emphasizing the need for enhanced monitoring and evaluation of assessment tools and pedagogical activities in alignment with the K to 12 curriculum guides. Addressing these recommendations would empower educators to refine reading pedagogy and provide the essential support for students to enhance their reading skills within the framework of basic education.

KEYWORDS: Reading curriculum, Constructive alignment, Assessment

INTRODUCTION

The significance of reading across academic and personal realms was acknowledged within the Philippine educational system. The imperative of a literate population for the country's social and economic advancement was recognized within the global context. Thus, a concerted effort was made to enhance students' reading comprehension skills for the betterment of the quality of life for Filipinos. This perspective was echoed by Ness (2019), who emphasized the crucial role of reading comprehension instruction, especially in relation to informational texts encountered across different content area classes.

Reading education held a pivotal position within Philippine schools, particularly within the public education sector overseen by the Department of Education. Various reading initiatives were implemented across educational levels to ensure universal literacy among Filipino children. Teachers were encouraged to employ contextually relevant reading interventions, commencing as early as K2. Despite these endeavors, the reading competence and literacy rates among students continued to decline, as evidenced by assessments such as the Program for International Student Assessment (PISA, 2018). These findings underscored the vulnerability of Filipino learners in other subject domains due to their subpar reading literacy.

Consequently, the juncture warranted a comprehensive evaluation of the reading curriculum to scrutinize the alignment among the written, implemented, and assessed curricula. This study concurrently sought to appraise the designated reading comprehension skills prescribed by the K to 12 curricula and gauge students' reading proficiency levels within the realm of basic education, as gauged through reading assessment outcomes.

Moreover, this research accentuated the pivotal role of reading comprehension, marking the culmination of the process of meaning construction. Successful comprehension ensued when readers employed cognitive and metacognitive reading strategies, leveraging linguistic and contextual knowledge to engage with textual material. A study by Duke et al. (2021) showcased the affirmative impact of comprehension strategy instruction on reading proficiency. Similarly, Dew et al. (2021) established that fortified reading strategies significantly contributed to the advancement of text comprehension. Recognizing the pivotal nature of reading instruction in nurturing reading comprehension skills, this study aimed to pinpoint target reading proficiencies across diverse educational tiers in basic education and ascertain students' reading aptitudes via assessment results. Furthermore, the study aimed to uncover the methodologies of reading instruction and evaluation utilized by educators both prior to and amid the COVID-19 pandemic.

By addressing these research aims, this study aimed to enrich reading instruction and curriculum development within the Philippine education framework, with the overarching objective of heightening students' reading comprehension competencies and fostering heightened literacy rates.

FRAMEWORK OF THE STUDY

The theoretical framework for this research on the assessment of the basic education reading curriculum in Northern Mindanao draws upon Constructivist Learning Theory and the Backward Design Model. Constructivist Learning Theory posits that learners actively construct knowledge and meaning through their interactions with the environment and the texts they engage with (Piaget, 1973; Vygotsky, 1978). According to Piaget, learners actively assimilate new information into their existing mental structures, while Vygotsky emphasizes the social and cultural aspects of learning, highlighting the role of language and social interaction in knowledge construction. In the context of reading comprehension, this theory highlights the importance of learners' active engagement with texts, critical thinking, and the application of metacognitive strategies (Dole et al., 2016). By understanding how students construct meaning, educators can design instructional strategies that promote deep understanding, critical analysis, and interpretation of texts (Vacca et al., 2017). This theory will guide the research in examining how the reading curriculum and instructional

practices in Northern Mindanao facilitate the construction of meaning and the development of students' reading comprehension skills.

The Backward Design Model, developed by Wiggins and McTighe (2005), provides a systematic approach to curriculum development, instruction, and assessment. It emphasizes the alignment between the intended learning outcomes, the instructional strategies employed, and the methods of assessment used to measure students' achievement of those outcomes. In the context of this research, the Backward Design Model will serve as a guide to assess the alignment between the written curriculum, the instructional practices, and the assessment methods in Northern Mindanao. By examining the coherence and alignment between these three key components, the study aims to identify areas of strengths and weaknesses in the reading curriculum and make recommendations for improvement. This model has been widely used in educational settings to promote effective curriculum design and instructional practices (Wiggins, 2007).

The combination of Constructivist Learning Theory and the Backward Design Model provides a comprehensive framework for understanding and evaluating the reading curriculum in Northern Mindanao. This framework acknowledges the active role of students in constructing meaning and the importance of aligning the curriculum, instruction, and assessment practices to achieve desired learning outcomes. By applying these theoretical perspectives, the research aims to shed light on the effectiveness of the reading curriculum and provide recommendations for enhancing instructional practices and assessment methods to foster the development of students' reading comprehension skills.

This research holds vital implications for higher education institutions as they prepare students for advanced academic pursuits. By acknowledging the identified misalignments and challenges within the reading curriculum, higher education institutions can better anticipate the reading proficiency levels of incoming students. This awareness can guide the development of tailored reading programs and interventions aimed at addressing specific deficiencies in foundational reading skills.

The emphasis on critical reading competencies and metacognitive reading skills carries relevance beyond basic education, extending to higher education environments where complex textual analysis and critical thinking are essential. Higher education institutions can integrate targeted interventions and coursework to further cultivate these skills, ensuring students' preparedness for advanced academic demands.

METHODOLOGY

The methodology employed in this study is detailed as follows.

This research embraced a mixed methods approach, blending qualitative document analysis, focused group discussions (FGDs), and constructive alignment (CA) with basic statistical analysis. By combining these methods, a comprehensive examination of the research question was facilitated, enabling the triangulation of data from diverse sources.

Data collection involved employing a set of carefully prepared prompts for focus group discussions. These prompts acted as guides during the FGDs, engaging elementary and high school teachers as well as reading coordinators from the Department of Education Region X. Simultaneously, the research conducted a qualitative document analysis of curriculum guides, modules, and textbooks. A constructive alignment checklist was employed to gauge the alignment between intended, implemented, and assessed curriculum components. The validation of results obtained from the Philippine Informal Reading Inventory (PHILIRI) and Early Grade Reading Assessment (EGRA) occurred through FGDs and qualitative documentary analysis.

The study's participants were randomly selected from elementary and high school teachers, along with reading coordinators representing the Department of Education Region X. This sampling included the Divisions of Cagayan De Oro, El Salvador, Misamis Oriental, and Gingoog. Given the ongoing pandemic,

interactions with respondents were established through diverse communication avenues, encompassing Google Meet, text messages, phone calls, and electronic mails.

Ahead of data collection, a formal request for study permission was sent via email to the Department of Education Superintendent through the Curriculum and Learning Management Division. Following approval, data was collected from teacher-respondents via focused group discussions that centered on reading instruction strategies and assessment practices. Additionally, relevant materials such as the Curriculum Guide, PHILIRI and EGRA test outcomes, Daily Lesson Guide, and Learner's Guide were procured. The constructive alignment checklist, initially formulated by Ghaith (2018) for Reading Comprehension Instruction, was customized and utilized to evaluate the alignment between instructional approaches and the intended curriculum. Ethical considerations, including informed consent and confidentiality maintenance, were observed during the data gathering process.

Employing a mixed methods approach facilitated an exhaustive exploration of the research question, capturing both qualitative insights and quantitative data. This amalgamation offered a deeper comprehension of matters associated with reading instruction and curriculum coherence.

RESULTS

The results of the study are subsequently presented.

Table 1. Reading Competencies of the Respondents

Category	Frequency
Searching for and selecting relevant text	High
Acquiring a representation of the literal meaning of a text	High
Inferring implicit ideas, themes, or viewpoints	Moderate
Evaluating a text	Moderate
Analyzing the structure and organization of a text	Low
Interpreting text and applying it to new contexts	Moderate
Recognizing the social and cultural features of a text	Low
Distinguishing between main ideas and supporting details	High
Recognizing literary devices and figurative language	Moderate
Reflecting on and evaluating one's own reading	Low
Understanding the role of context in meaning-making	High
Recognizing textual coherence and cohesion	Moderate

Table 1 provides an overview of the reading competencies of the respondents categorized across twelve distinct areas. "Searching for and selecting relevant text" emerges as the most frequently noted competency, emphasizing the significance of students' capability to navigate and comprehend a diverse array of reading materials. The second-ranking category, "Acquiring a representation of the literal meaning of a text," underscores the pivotal role of vocabulary knowledge in reading comprehension. This finding resonates with Baumann's (2014) insights and is further corroborated by research conducted by Toquero (2020) and Hennessey (2021). The outcomes of this study suggest a robust interconnection between vocabulary mastery and comprehension, with vocabulary knowledge playing a direct role in text comprehension. Notably, the analysis indicates a relatively limited emphasis on emergent literacy within the curricula, particularly evident in grades 7, 8, and 10. This observation underscores the necessity for intensified focus on nurturing learners' capacity to predict reading events and establish predictable routines.

Table 2. Reading Proficiency Across Grade Levels

Grade Level	Proportion of Instructional Readers	Proportion of Independent Readers	Proportion of Non-Readers
Grade 9	Higher	Lower	Low
Grade 10	Higher	Lower	Low
Grade 11	Higher	Lower	Considerable
Grade 12	Higher	Lower	Considerable

Table 2 presents an overview of the reading proficiency outcomes across four high school grade levels in the region. The data signifies a notable presence of instructional readers in comparison to independent readers, suggesting the requirement for enhanced emphasis on fostering independent reading habits. Although the disparity is not substantial, it prompts the need for further enhancement of reading instruction across all grade levels. Additionally, a substantial proportion of students in grades 11 and 12 were identified as non-readers, grappling with fundamental skills such as letter-sound recognition and decoding. This emphasizes the necessity for the Department of Education to critically evaluate the efficacy of its "Every Filipino Child a Reader" program and implement systematic monitoring to ensure the effectiveness of its initiatives and endeavors.

Moreover, the data reveals that the relatively larger proportion of instructional readers compared to independent readers across multiple grade levels might be attributed to diverse factors. Anderson et al.'s (2018) research suggests that limited exposure to diverse reading materials and inadequate opportunities for independent reading practice could hinder students' transition from instructional to independent reading. This underscores the significance of educators and policymakers prioritizing the cultivation of independent reading practices and furnishing students with a rich array of reading materials to stimulate their reading autonomy and fluency. Implementing strategies like sustained silent reading periods, classroom libraries, and nurturing a culture of reading can contribute to bridging the gap between instructional and independent readers (Krashen, 2011).

Furthermore, the substantial number of non-readers in the elementary grades raises apprehensions about the efficacy of the "Every Filipino Child a Reader" program enacted by the Department of Education. This finding aligns with Sison's (2020) study, which underscored the necessity for targeted interventions and early literacy support to tackle the challenges encountered by non-readers. Regular monitoring and evaluation of the program's execution, coupled with rigorous assessment of students' reading proficiencies, can offer invaluable insights into the efficiency of existing strategies and aid in identifying avenues for enhancement. Collaborative efforts among teachers, parents, and the community are pivotal in executing evidence-based reading interventions and furnishing tailored assistance to non-readers (Lipka et al., 2019).

In summary, the data analysis unveils a higher proportion of instructional readers in comparison to independent readers across multiple high school grade levels, signifying the demand for amplified focus on independent reading practices. Furthermore, the substantial number of non-readers among elementary grades accentuates the importance of reevaluating the efficacy of the "Every Filipino Child a Reader" program and instituting continuous monitoring and targeted interventions. By addressing these concerns and implementing strategies grounded in evidence, policymakers and educators can endeavor to elevate literacy levels and cultivate a culture of reading among Filipino students, securing their scholastic accomplishments and lifelong learning journey.

Table 3. Shift in Reading Instruction Approaches and Assessment Methods Due to the COVID-19 Pandemic

Pre-COVID-19 Approaches	Shift During COVID-19 Pandemic
Diverse and extensive approaches	Limited approaches
Varied methods	Focus on self-paced independent reading
Teacher-directed practices	Utilization of printed modules and limited digital resources
Emphasis on class and group dynamics	Adapted assessment methods
	Alternative performance-based assessments
	Exploration of mobile and video-based assessment

Table 3 provides a clear comparison of the changes in reading instruction approaches and assessment methods that occurred due to the COVID-19 pandemic. Prior to the pandemic, reading instruction involved diverse and extensive approaches, encompassing various methods and primarily directed by teachers. The emphasis was on class and group dynamics. However, the pandemic led to a shift in these approaches. The focus shifted towards self-paced independent reading, often using printed modules and a restricted range of digital resources. Alongside, there was an adaptation in assessment methods, incorporating alternative performance-based assessments and exploring novel methods like mobile and video-based assessment. This adaptation aimed to cater to students engaged in remote learning settings.

The change in reading instruction and assessment methods during the pandemic underscores the challenges posed by remote learning. Chen et al.'s (2021) study emphasized the rapid transition to online teaching, resulting in modifications in instructional strategies and the integration of technology for delivering reading materials and evaluating students' reading abilities. This shift highlights the need for educators to explore innovative strategies to ensure effective reading instruction and assessment in the context of online learning. The findings suggest that combining synchronous and asynchronous strategies and incorporating digital resources can enhance student engagement and facilitate meaningful reading experiences in remote learning environments.

Table 4. Alignment Assessment of Reading Curriculum Components

Findings	Description
Lack of Alignment	The curriculum assessment reveals a lack of alignment between the written, assessed, and delivered curriculum in the domain of reading. Certain learning outcomes outlined in the K-12 curriculum guide were not adequately addressed and assessed by teachers.
Misalignment with CCA Model	This misalignment contradicts the principles of the Curriculum, Content, and Assessment (CCA) model advocated by Capin et al. (2021), which underscores the importance of coherence among curriculum, content, and assessment.
Ineffective Assessment of Learning Outcomes	Examination of tests demonstrated that not all reading competencies specified in the written curriculum guide were effectively assessed.
Inconsistencies in Teaching and Learning	Inconsistencies were identified in the teaching and learning activities within the delivered curriculum, which did not align with the specific reading skills being assessed.
Importance of Alignment	These findings emphasize the critical need for alignment between the intended curriculum, implemented curriculum, and assessed curriculum to ensure effective teaching and learning outcomes in the domain of reading.

The findings from the assessment of the curriculum underscore a significant lack of alignment among the written, assessed, and executed curriculum within the realm of reading. Evidently, specific learning objectives outlined in the K-12 curriculum guide were insufficiently addressed and evaluated by educators. This misalignment distinctly contravenes the tenets of the Curriculum, Content, and Assessment (CCA) model, as articulated by Capin et al. (2021), which emphasizes the pivotal necessity for seamless integration across these three crucial components.

Moreover, upon scrutinizing the assessments, it became apparent that not all the prescribed reading proficiencies delineated in the written curriculum guide were effectively gauged. Further inconsistencies came to light in the instructional methods and learning activities executed within the enacted curriculum, deviating from the specific reading competencies under evaluation. These revelations accentuate the paramount importance of fostering harmonious alignment between the envisaged curriculum, the executed curriculum, and the assessed curriculum, all working in tandem to cultivate proficient teaching and learning outcomes in the domain of reading.

CONCLUSIONS AND RECOMMENDATIONS

The incorporation of alternative performance-based assessment methods, as recommended by this study, can foster a culture of comprehensive evaluation in higher education. By adopting these practices, institutions can move beyond conventional testing approaches and assess students' holistic understanding and application of reading skills. This shift aligns with the overarching goals of higher education – to nurture well-rounded learners capable of analytical thinking and effective communication.

In essence, the insights provided by this research offer higher education institutions a foundation for informed decision-making, curriculum development, and instructional planning. By proactively addressing the identified reading proficiency challenges, institutions can contribute to the overall academic readiness

and success of their students in both foundational and advanced educational settings.

The enhancement of critical reading competencies and metacognitive reading skills is imperative across all grade levels, necessitating diversified reading activities that effectively engage learners and cultivate sustained focus. This should be prioritized to fortify students' foundational reading abilities.

The assessment of the "Every Filipino Child a Reader" program underscores the urgency for its reevaluation. The prevalence of frustration-level readers among respondents signifies a substantial hurdle in achieving reading proficiency. Moreover, the notable presence of non-readers accentuates the immediate need for targeted interventions to address reading challenges and provide tailored support.

Misalignments within the delivered curriculum are evident, particularly regarding prescribed reading activities and the comprehensive assessment of specified reading competencies. To bridge these gaps, it is recommended to devise structured and adaptable home-based reading activities and methodologies. This approach will ensure the acquisition of essential reading skills suited for the new normal learning landscape.

Augmenting traditional multiple-choice assessments with alternative performance-based evaluation methods is advised. This inclusive approach will offer a more comprehensive measurement of students' reading proficiencies. Additionally, DepEd Region X should reinforce its oversight of assessment tools and instructional practices in reading to harmonize the learning objectives, pedagogical approaches, and assessment strategies as outlined in the K to 12 curriculum guides. Collectively, these recommendations are geared toward refining the synergy between curriculum, instruction, and assessment within the realm of reading. The ultimate aim is to elevate students' reading prowess and foster tangible learning achievements.

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Application of Balanced Scorecard as Performance Measurement at Nias University

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ABSTRACT

To improve quality human resources, universities need to have performance measurements that can be used as guidelines in carrying out university activities. These measurements can be used to assess the success of the University. Universities need a tool that can be used to measure financial and non-financial performance using the balanced scorecard through four perspectives namely financial perspective, customer perspective, internal process perspective, and learning and development process perspective. With the existence of the performance measurement tools Balanced Scorecard, it is hoped that the university can measure its performance well, and produce strategic plans that are comprehensive, coherent, balanced, and measurable. In knowing these four aspects using qualitative methods consisting of interviews, observation, and documentation. The existence of continuity between leaders and lecturers and students makes the vision, mission, and strategy work well. Communication is an important role in progress. from the four perspectives that are interrelated with quality improvement objectives, good service, transparent finance, an innovation that continues to grow, fulfillment of student rights and satisfaction, providing work motivation, improving HR skills with training and character building, and using an integrated and easy system applied. The implication is how the leadership's desire can turn bad management into good and transparent management so that university governance can be implemented. BSC as a management system used can include financial and non-financial matters consisting of finances, customers, internal processes, and learning and growth from leaders, students, and lecturers.

KEYWORDS: Balanced Scorecard, Performance, Quality, Strategy, University.

INTRODUCTION

The improvement and productivity of human resources, which are expected to be competitive, innovative, and productive, can make Indonesia a country that is ready to face demographic bonuses and technological disruption. President Joko Widodo's administration has encouraged reform in the education sector and prepared a budget for the education of Rp. 608.3 Trillion in the 2023 State Budget Bill speech.

This large budget allocation is expected to be able to improve the quality of human resources which is emphasized on five things, namely increasing access to education at all levels, improving the quality of infrastructure for educational activities, especially in the 3T areas, namely outermost, disadvantaged and foremost, strengthening connections and compatibility with the labor market, equalizing the quality of education, and improving the quality of Early Childhood Education services.

In addition, President Joko Widodo's administration is committed to strengthening investment in the education sector, by supporting the expansion of scholarship programs, promoting culture, strengthening world universities, and developing research and innovation. That way, the commitment of 20% of the state budget for education is maintained and has been regulated in Law Number 20 of 2003 Article 49 paragraph 1 concerning the allocation of education funds. The seriousness of the current government in education reform and realizing the ideals of competitive human resources can provide benefits to the community and become a success during President Joko Widodo's two-term administration.

To improve quality human resources, universities need to have performance measurements that can serve as guidelines for carrying out university activities. These measurements can be used to assess the success of the University. So far, performance measurement has only been seen from a financial perspective. Meanwhile, a non-financial perspective also measures the success of the University's performance.

The existence of this balance makes the University's performance successful and run well. In this regard, the University needs a tool that can be used to measure financial and non-financial performance using four perspectives, namely financial perspective, customer perspective, internal process perspective, and learning and development perspective. The tool that can be used to measure these four perspectives is the balanced scorecard method. A balanced scorecard is a tool used to measure performance from four perspectives both financially and non-financially.

In improving the quality of higher education, Nias University (UNIAS) has several aspects and guidelines so that the university can run well, namely:

1. Vision, mission, goals, and strategy
Nias University has a concise, short, and clear vision. The vision provides what the university wants to achieve. To realize its vision, the university's mission states what it intends to do in concrete terms. Nias University also has clear, specific, and relevant objectives and strategies for its vision and mission.
2. Academic Executive
This standard is a factor of excellence in the quality of human resources and ensures the quality of study program organizers, through academic programs that are in line with the vision, mission, goals, and strategies.

With the balanced scorecard performance measurement tool, it is expected that the university can measure its performance well, producing a comprehensive, coherent, balanced, and measurable strategic plan.

STATEMENT OF THE PROBLEM

Based on the background that has been described, the problems that will be discussed in this study are as follows:

How is the application of the balanced scorecard as performance measurement in the four perspectives of finance, customers, internal processes, learning, and development at Nias University to improve quality human resources?

FRAMEWORK OF THE STUDY

The application of the Balanced Scorecard to measure performance at Nias University can be seen in the following figure:

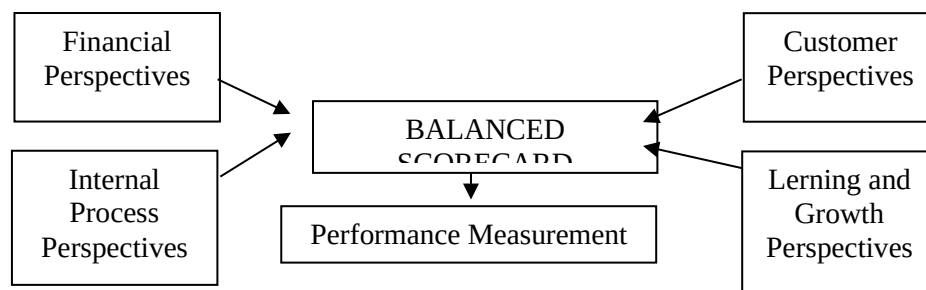


Figure 1: Framework of the study.

METHODOLOGY

A. Type of Research

This research on "APPLICATION OF BALANCED SCORECARD AS PERFORMANCE MEASUREMENT AT NIAS UNIVERSITY" uses qualitative research methods. Qualitative research is research that is oriented toward natural phenomena or symptoms. Qualitative research is a research procedure that produces descriptive data in the form of written or spoken words from people and observable behavior. Data validity in qualitative research is the degree of accuracy between the data that occurs on the object of research with the power that researchers can report. Data in qualitative research is considered reliable if the researcher is in the field conditions in accordance with the reality that occurs. Qualitative research is subjective and reflective because the researcher acts as an instrument. The level of reliability in the qualitative approach is individual or not the same between researchers with one another, because each research relies on the researcher himself. In qualitative research no standard instrument is used but the researcher acts as an instrument. Data collected verbally is enriched and deepened by the results of observations, listening, perceptions, meaning / appreciation of researchers. However, even though the researcher involves subjectivity, he must be disciplined and honest with himself because qualitative research must have objectivity as well. Objectivity here means that the data found is analyzed carefully and thoroughly, arranged, categorized systematically, and interpreted based on the experience, frame of mind, perception of the researcher without prejudice and certain tendencies.

B. Object of Research

The object of research is the thing that is the focus of research. In this research, the focus of research is the balanced scorecard in the four perspectives to measure performance at Nias University.

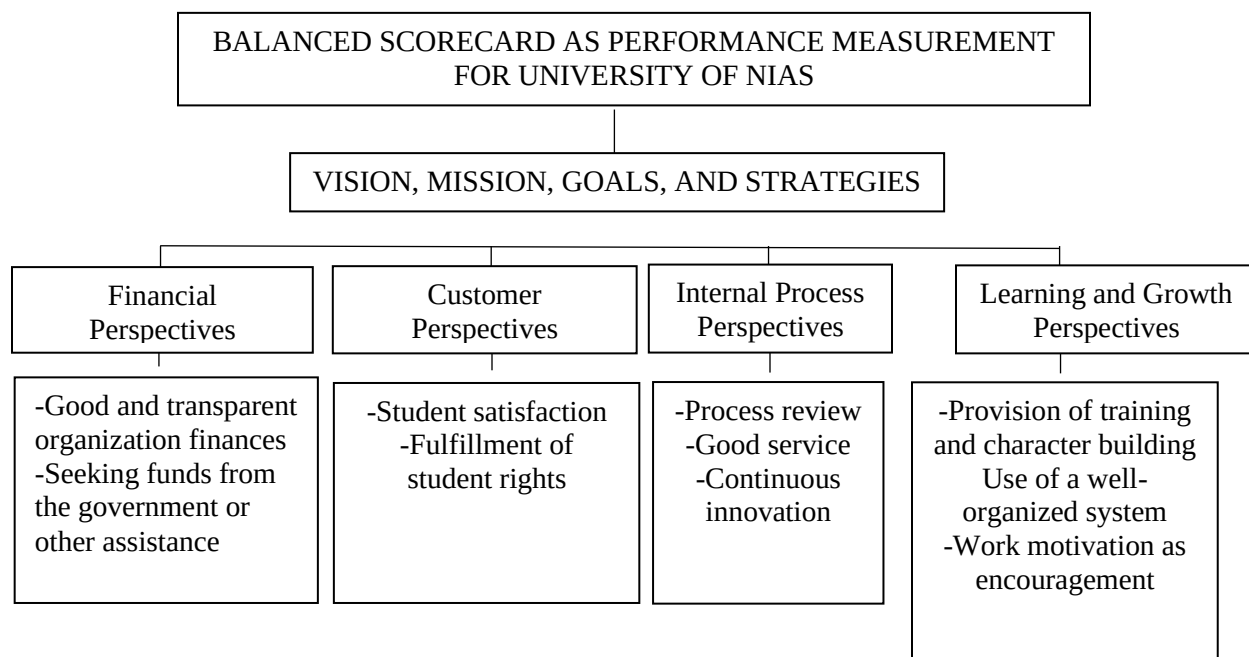


Figure 2: Object of research in the balanced scorecard.

The chart explains that the application of the balanced scorecard as a performance measurement of Nias University can be seen from the university's vision, university mission, university goals, and university strategies which are divided into financial and non-financial perspectives which are divided into four perspectives, namely financial perspectives, stakeholder perspectives, internal process perspectives, and learning and development perspectives.

From the financial perspective, it can be seen that finance is an important role in managing a university which must be managed properly and transparently so that the university has a strategy for what it wants to build in the future. Likewise, in terms of seeking funds from the government and other grant funds through the network that is owned, the university can improve its human resources and good infrastructure.

From the customer's perspective, students are also one of the important things in the development of a university. Students who excel and are competent are the pride of the university itself. So, the university must also fulfill the rights of students and the satisfaction of the students themselves both when they become students and after graduating later.

From an internal perspective, the process is also important for the university. How the university wants to evaluate the results of its performance by looking at the processes that have been carried out so far so that there is an increase in good service and the university continues to transform to become better by making continuous innovations.

From the perspective of learning and development, universities need to improve the human resources of lecturers and employees by providing training and character building, using a good system, and being given motivation or awards as encouragement for lecturers and employees to work.

C. Place and Time of Research

1. Place of Research

This research was conducted at Nias University. Address: Jalan Yos Sudarso Ujung No.118/E-S, Ombolata Ulu, Kecamatan Gunungsitoli, Gunungsitoli City, North Sumatra 22812. Email: admin@unias.ac.id.

2. Research Time

This research was conducted from November to December 2022.

D. Social situation

The social situation in this research is the leadership of Nias University, lecturers, and also students of Nias University,

E. Data collection

This method is done in three ways, namely: The first step is the interview method by conducting face-to-face and direct questions and answers between researchers and sources. The second step is observation by looking at the surrounding situation. And the third step is the document study method, documents regarding university statutes, academic guidelines, and several documents and documentation that are needed.

RESULTS

The balanced scorecard is how management can evaluate its performance not only on the financial part, but there are other things such as customers, internal processes, and learning and growth which are non-financial aspects that are sometimes not considered. implementing this, the driving force in implementing balanced scorecard at Nias University is due to the willingness of the leadership to improve as a whole. So that researchers welcome this good thing. After conducting research at Nias University from November 21, 2022, to December 30, 2022. There is some data that researchers get with the interview, observation, and documentation methods which will be explained below:

Interviews were conducted with 8 resource persons to obtain information about the four perspectives in the balanced scorecard. The Resource Persons consisted of three students in each faculty for the customer perspective, three lecturers in each faculty for the learning and development perspective, one Faculty Leader for the internal process perspective, and one University Leader for the financial perspective.

The interviews were conducted to answer the research question, namely how is the implementation of a balanced scorecard method performance measurement in the four perspectives of finance, internal process customers, learning, and development at Nias University? and then describe the findings.

When viewed from the interview above, the balanced scorecard which consists of four perspectives can be made in the strategic map as below:

Table 1: BSC STRATEGY MAP

BSC STRATEGY MAP	
FINANCIAL PERSPECTIVE	Expanding revenue opportunities, Use of Revenue, Strategy to increase the number of incoming students,
CUSTOMER PERSPECTIVE	Student satisfaction, employment opportunities, student rights, participation in activities,
INTERNAL PROCESS PERSPECTIVE	Teaching excellence, learning excellence, updated curriculum, good service, increased accreditation.
LEARNING AND GROWTH PERSPECTIVE	Training, asset development, attendance, communication, employee appreciation, motivation, and reference materials. Provision of further education scholarships. cooperation with various parties.

Financial Perspective

Finance at Nias University shows a positive trend in its development, along with the large number of new students who enrolled when the first enrollment opened with the university designation. On the other hand, in financial arrangements that use an organized system that can be monitored through bank statements, transparency is immediately applied from the start so that the university can run well and with integrity.

The most income is still from the payment of student tuition fees which shows good results, especially in the number of new students who enter. Grant funding from both the government and other sources is still limited. For example, the Nias Regency Government has only provided grants in the form of scholarships to residents with Nias Regency ID cards. There is no grant from an institution to improve the university. There is also a lot to be done in terms of expenditure because the university has just been established. Starting from the construction of new buildings, adding facilities and infrastructure, operational costs, scholarships for outstanding students, and providing training to lecturers and employees. Even like that, the university still sees its financial balance.

Customer Perspective

Customers, in this case, students who use services and facilities from the university, feel that since the formation of UNIAS, they are quite happy because there is a real form of implementation such as the construction of new buildings, and the addition of ac units and projectors. The services provided have also become better and more responsive to students. So that what you want to take care of such as administration, finance, complaints, and suggestions can be responded to properly.

In terms of teaching, they have also used technology such as presentations using laptops, and active discussions between lecturers and students. According to students, there is still no forum provided by the university in providing job connections after graduation. Regarding tuition fees, most students at UNIAS come from the region and are economically disadvantaged. The high tuition fees make payments sometimes late, which burdens students because they have to live in boarding houses and the cost of living is high compared to the area so parents' income cannot cover this. Even so, there is a scholarship program provided for the faculty of science and technology only.

The disadvantage felt by students is the lack of socialization of policies and rules to students so there is a misunderstanding of information. In this transition period, there are still many perceived shortcomings such as a lack of parking lots, some classrooms that lack air conditioning and are too crowded, and small and less clean bathrooms. For sports facilities, spirituality and student organizations still do not exist. The existing activities are dance studios, UNIAS Voice, seminars, English lessons, computer lessons, and student organizations activities.

Internal Process Perspective

Leaders in the University have a way to take care of their internal, teaching, and learning excellence, lecturers must first plan the syllabus and Semester Learning Plan in lectures which are conducted 16 times including midterm exam and end semester exam. Lectures use laptops for assignments and presentations, and there are even teaching and assignments made in YouTube videos. In terms of innovation, lecturers direct students to make crafts both in the form of handicrafts and food that have an impact on society and sell them so that they are included in the entrepreneurship course. Lecturers also conduct industrial visits in factories to see firsthand the process of making products. The academic innovation carried out is the design of Merdeka Belajar Kampus Merdeka (MBKM) for the new curriculum because until now it is still using the Kerangka Kualifikasi Nasional Indonesia (KKNI) curriculum in which student practice is included, internships within 3 months, where in their activities students look for companies to be occupied and then the university gives internship request letters to companies both local, state-owned enterprise, accounting service offices. Furthermore, the increase of Associate's degree of accounting to bachelor of accounting is being attempted.

In terms of services provided, it is also done well and according to responsibility. Services are also open in study programs, faculties, and universities. Students are directed to choose courses using an online system and are integrated including grades and attendance. The real thing that is done if there is unsatisfactory service is evaluated by calling and reprimanding so that the service can be done better. Unfortunately, training for employees has not been carried out so that a lack of broad insight.

The university's assessment of its lecturers to assess their performance is seen from the attendance list, and employee work objectives assessment once a year, lecturers also make minutes of lecture meetings so that the university knows what lecturers do in the lecture.

In reviewing the process, some policies are decided quickly because they are still in transition. Some rules, regulations, development master plan, and strategic plan, guidelines for making scientific papers have been made well.

The form of obstacles experienced in this internal process is still the existence of lecturers who cannot master technology. Some cannot use laptops, while the university wants to teach in the form of presentations. Furthermore, some students do not have laptops due to weak family economics, which hampers the teaching and learning process, assignments, and presentations carried out. Another thing that must be improved is the problem of network and electricity because it is located on the islands, the network is sometimes unstable and also sometimes the lights go out. The university's solution to these blackouts to procure generators as a form of good service, while the internet network must be resolved immediately with the addition of a strong wifi network.

The formation of the university is also an internal advantage in the process because the greater the opportunity to be able to get the number of new students who register, the cooperation with several parties such as state-owned enterprise, North Sumatera Bank (Bank Sumut), State Treasury Service Office (KPPN), and cooperation with National Bank of Indonesia (BNI) in terms of student cards combined with atm cards so that they can make transactions and be used in library access. That is how internal universities improve their services, evaluate processes, and continuous innovation.

Learning and Development Perspective

Communication between lecturers and lecturers, lecturers and study program leaders, lecturers and faculty leaders, and lecturers and university leaders run well and intensely, there is no rigidity in conveying matters related to the university such as discussion of materials and activities that can be conveyed through lecturer groups and input for university development. The existence of differences of opinion is a natural thing in the process which increases the thinking and learning of fellow lecturers. Problems that occur are immediately handled first by the new study program leader to the faculty leader, if it is still not finished, then to the university leader. In their activities, lecturers also have lessons on how to minimize failure in lectures, namely obeying existing regulations, evaluating themselves to correct mistakes made previously, preparing teaching materials according to Semester Learning Plan, providing motivation to students, holding lectures 16 times a semester, giving student assignments, and keeping a journal. There is still no training aimed at each individual, only training such as general seminars and workshops for the development of learning methods and human resources.

In terms of attendance, it also affects the performance of lecturers. Lecturers who are not present during lectures mean that there is no responsibility for their work. Attendance has also been implemented online so that it can be seen immediately. To motivate lecturers in the form of awards is still not applied because it is still in the transition period but in the future planning will be done so that lecturers will be more enthusiastic in doing their work because lecturers and employees are university assets. For learning is also still lacking with the lack of reference books in the library, internet network access is not good, and parking is still not organized. Hopefully, everything can be resolved and realized so that campus accreditation

increases. Infrastructure facilities are also in improving the skills of lecturers such as laboratories, sports facilities are also expected to be held soon.

Nias University also cooperates with Universitas Sumatera Utara and Universitas Negeri Medan in providing scholarships for lecturers in improving their quality with doctoral programs. Nias University also conducts MoUs with outside parties and several public and private universities in realizing the tridarma of higher education which is useful for improving the quality of Nias University. From the results of the interviews conducted, it can be made in the form of a scorecard:

Table 2: Nias University Scorecard

	Objective	Goals	Indicators	Initiative
Financial Perspective	Increasing Income	University Welfare	Financial Statements	University promotion, seeking grant assistance, and appropriate use of funds
Customer Perspective	Increase in the number of students	Qualified Students	Student Satisfaction and Rights	Good service and teaching, Provision of employment opportunities, Provision of campus activities
Internal Process Perspective	Service Improvement and Accreditation, Strategy Planning, Guidelines, Rules, and Regulations	Learning Excellence, curriculum, innovation, and effectiveness.	Cooperation, Hospitality, Accreditation.	ATM-based student cards, Use of the new curriculum, and creating future strategies with development master plan and strategic plan. employee work objectives assessment.
Learning and Growth Perspective	Human resource Improvement and Facility Development	Development of Study Programs, Faculties, and Universities, Use of systems and technology, Training of human resources, and providing motivation.	Training, Awards, and Construction of Facilities and Infrastructure.	Construction of a new building, Addition of ac and projector facilities, Provision of Doctoral Program Scholarships, Awarding.

The table is divided into four different perspectives with given objectives, goals, indicators, and initiatives.

CONCLUSION AND RECOMMENDATIONS

From the results of the research conducted, Nias University can utilize it as one of the ways how the balanced scorecard at the university can be applied with the aim of evaluating performance. It can also be an input for the university for proposed improvements from various aspects to improve the quality of the university itself. And the results of this study can be used as a reference for similar research in the future.

Especially in the application of the balanced scorecard for performance measurement at the university.

Measurement of university performance using the balanced scorecard method in this study was carried out on ten aspects, namely: aspects of good and transparent organizational finance, aspects of seeking funds from the government or other assistance, aspects of student satisfaction, aspects of fulfilling student rights, aspects of process review, aspects of good service, aspects of continuous innovation, aspects of training and character building, aspects of using a good system, and aspects of work motivation as encouragement. Of these ten aspects, some have been running well, some are in the planning process and some have not been held at all.

The existence of continuity between leaders with lecturers and students makes the vision, mission, and strategy can be done well. Communication is an important role in progress. of the four existing perspectives are interrelated to improve quality, good service, transparent finance, growing innovation, fulfilling student rights and satisfaction, providing work motivation, increasing HR skills with training and character building, and using an integrated and easy-to-implement system.

Based on what the researcher felt in this study was due to the new formation of the college which at the time of the study had only been operating for 9 months, of course, there were still not many activities and there were still many experiments being carried out so that nothing was routinely done. Furthermore, the research time is short so it does not cover the entire college.

This research implies that the leadership's desire can change bad management into good and transparent management so that higher education governance can be implemented. BSC as a management system used can cover financial and non-financial matters consisting of finance, customers, internal processes, and learning and growth from leaders, students, and lecturers.

The recommendations given to the Nias University and other universities are:

1. Needs to accelerate the use of systems and technology from all existing activities because it can make it easier to monitor and evaluate results directly.
2. Needs to plan a campus area that is close together so that distance, communication, activities, and management can be done quickly.
3. Immediately applies the balanced scorecard as a method in the management system and performance measurement at the university.
4. Immediately cooperates with various parties to obtain sufficient funds for development, construction, research, innovation, and scholarships to accelerate the quality of students, lecturers, and employee services within the university.

RESEARCH LIMITATIONS AND FUTURE STUDY

The limitations of my research are as follows:

1. At the time of conducting the research, the university of Nias had not yet reached the age of one year so it was still in the adjustment stage in the implementation and completeness of teaching
2. The resource persons were determined from representatives of the rectorate consisting of students from each faculty who are also administrators of student organizations, then lecturers from each faculty, faculty leaders, and representatives of the rectorate itself.

Future research after the normal running of the university in the next few years can be improved by looking at the performance every year, whether the balanced scorecard has been applied.

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Historical Learning Based on Literature to Sharpen the Spirit of Nationalism for Junior High School Students in Indonesia

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ABSTRACT

Roman *Buiten het Gareel* which was written and published in 1930 is the story about struggling of Suwarsih, Sudarmo and their friends. The dynamics of life framed in everyday life are represented through works on nationalistic education themes. A few years later (1975) the novel was translated by Suwarsih into Indonesian with the title *Manusia Bebas*. Why does literature-based social studies learning important to sharpen the spirit of nationalism and relevant to measure the knowledge and practice of nationalism. The research used a historical method and also kognitif historical excursion as methodology. Document such as pictures of student's imagination are used to objectify the research. Historical novels are relevant for social studies in Indonesia because it bring more cognitive imagination from another state oriented perspective. This kind of learning pattern reduces of the historical learning style by rote memorization. The philosophy of history methodology is argued to be the needs of students when the logic of historical events is based on literary works.

KEYWORDS: historical learning, Indonesian nationalism, historical novel

INTRODUCTION

Since Indonesia independence, education system has been constructed in various scenarios. 1975 was an important period for education system in Indonesia. The curriculum center institution of Indonesian Republic produced a new document that was endorsed at that time for Junior High School. Innovative thinking began to be developed through 1975 curriculum. A significant change that occurred in curriculum was the implementation of a broad-fields organization that combined subjects. Earth science, economics, and history are united into the field of Social Sciences abbreviated as IPS, stand for *Ilmu Pengetahuan Sosial*. (Hasan, *Kurikulum SMP dari Masa Hindia Belanda hingga kini*, 2020; Martono, 1987) Said Hamid Hasan explained in his book that social science is the study of a group behavior of human beings. (Calhoun, 1971 in Hasan, 1996) History is argued as a field of science that is identical to events and historiographic narratives.

In 2023, Indonesia is implementing learning using the Merdeka Curriculum. Merdeka curriculum is a concept of a feature is differentiated learning. Class activities are designed to be interesting and adapting to the talents of students' interests. The differentiated model in social studies learning is idealized as a solution to students' habit of memorizing historical material.

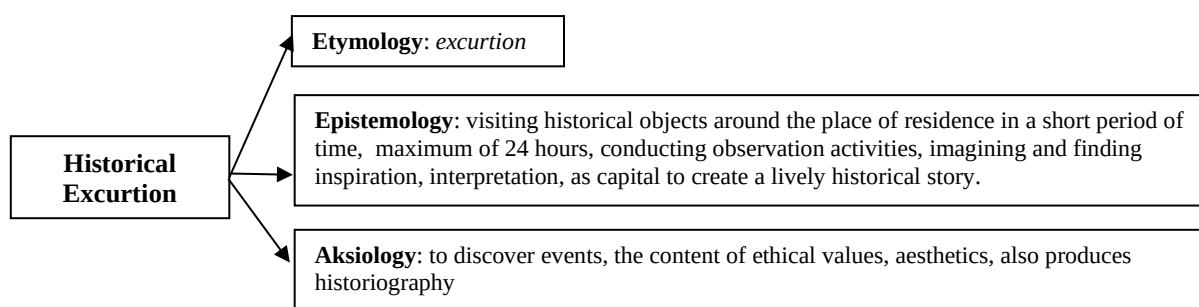
Teacher has been managed the class in a way for student to study independently or in a group. In 2022, social studies teachers at Satya Wacana Laboratory accepted collaboration with a researcher team from the History Education department in Satya Wacana Christian University. One of the research activities was to observe how students understand national history material. The problem that arises is that teachers and students have not utilized learning resources in the form of literary works (historical novels) to enrich the nationalistic imagination. The title of historical novel is *Manusia Bebas*. This novel is a translation of roman *Buiten het Gareel* which was written and published in 1930. A few years later (1975) the novel was translated by Suwarsih into Indonesian with the title *Manusia Bebas*. Term of *Manusia Bebas* could be define as a human being independently of thought, speaking, arguing, doing, etc. Indonesian people used to had opinion that *Bebas* or freedom similar with a respons of free from kolonialization. This novel was presented the story about struggling of Suwarsih, Sudarmo and their friends. They were teachers who did devote all of their life for Indonesian education. The dynamics of life framed in everyday life are represented through works on nationalistic education themes.

Why does literature-based social-historical studies important to sharpen the spirit of nationalism among junior high school students? The answer to this question is obtained by identifying the learning process of junior high school students in Salatiga city and what students understand about nationalism. Why does *Manusia Bebas* relevant to measure the knowledge and practice of nationalism?

The research method used to this study is the historical method. (Kartodirdjo, 1992) The research methodology was using the concept of historical excursion by Nugroho Notosusanto. Data were obtained from six students of Satya Wacana Christian Laboratory Junior High School grades VII and VIII who were selected as research subjects. In October 2022, six students of SMP Laboratorium Satya Wacana were recruited as young excursion cadres. At that time, students were asked to imagine Indonesia and then pour their imagination into sheets of paper in the form of picture symbols and narratives. Students performed the task without receiving instructions from the research team. This activity was deliberate so that there was no ideological intimidation from the researcher's side. The assumption is that students have had recordings of historical events obtained from various parties before. Contributors who feed the imagination can be obtained from the family environment, teachers, or relational at school. The activity of scratching imagination into paper media is carried out to measure the spirit of Indonesian nationalism. (Purwiyastuti, 2023) Kuntowijoyo describes that the knowledge system is a part of culture that can be associated with symbols and social systems in the sociology of knowledge approach. (Kuntowijoyo, 1994).

After the first activity, students were asked to do the second stage to read a literary work (*Manusia Bebas*). This literacy method is carried out to gain inspirational knowledge from the role of characters in the novel. The setting and characterization of Suwarsih Djojopuspito's novel are assumed to spark students' imagination. At this stage, the researcher practiced the participant observation method (Mertler, 2011). This is important to sharpen the identification of literacy practices. The researcher observed the subject, but also participated with the students. The role of the researcher in the observation arena is equal and active. This is important so that the researcher can learn directly how students' participation acts, observe patterns of behavior, participate in discovering unexpected events in the group, and motivate students to actively participate in expressing their arguments.(Daryanto, 2011)

The conceptual framework used to analyze students imagination uses the thoughts of Indonesian historian, Nugroho Notosusanto. He was an Indonesian minister of education and cultural who died in 1985. Nugroho Notosusanto had also argued as a New Order keyperson. In 1975, Nugroho Notosusanto had been placed the concept of historical excursions as an important element that junior high school students in Indonesia should undertake. The concept and its philosophical basis are illustrated below:



Figur 1: Philosophical Basis of the Historical Excursion Concept
Sources: Notosusanto, 1985 dan Purwiyastuti, 2022

Excursion studies as argued by Nugroho Notosusanto in the past were constructed according to the zeitgeist. In today's digital era, excursions need to be adaptive. So, researchers practiced the excursion concept at Satya Wacana Laboratory Junior High School with a cognitive-imaginative approach. Students do not visit the historical object area directly, but their imagination moves into the setting of the novel *Manusia Bebas*. The practice of imagination analyzed through the social studies-history learning process is inspired by a scientific article by Sydney C. Li (Li, 2015). In that article, Sydney presents the idea of novel-based history teaching. The author explores the use of new historicism to enrich social studies, strengthen multiculturalism in secondary schools and strengthen interdisciplinarity. Sydney also analyzes textbooks to illustrate the lack of multiculturalism in history or social studies education in high schools in the United States. After reviewing the article, the assumption emerged that history teaching should ideally be used to shape the human person. It is important to do so that history subjects are not only memorized or called *memorie-vak*. (Ali, 1963) The state has an interest in positioning history teaching as a medium to strengthen the spirit of nationalism or nationality. Social studies textbooks are one of the infrastructures to place nationalistic interests in Indonesia.(Mukminam, 2017)

Historical Learning and Imagination of Indonesia

Satya Wacana Junior High School is a laboratory for the development of education and an internship site for students of the Faculty of Teacher Training and Education. Satya Wacana Laboratory Junior High School was established on July 15, 1985 in Salatiga.(Paaneah, 2020) The students come from various ethnic groups in Indonesia. Social studies learning at Satya Wacana Laboratory Junior High School is conducted for 160 minutes a week. Teachers deliver material with a variety of learning media that are argued to increase student focus and attention. National history is given to grade VIII students with the theme of

changes in Indonesian society during the colonial period and the growth of the national spirit.(Mukminam, 2017) In this material, nationalism is argued as the spirit of resistance to colonialism and imperialism.

Students need to have historical awareness and try to draw lessons from past experiences. History of Indonesian nation is a source of knowledge to find the strength, to face challenges, and overcome obstacles.(Hardi, 1988) Teachers are responsible for teaching nationalism as a form of popular resistance in certain areas so that heroic figures emerge, such as Teuku Umar, Cut Nyak Dien, Cut Meutia, Sisingamangaraja, and so on.(Mukminam, 2017) Nationalism concept that students understanding is identical to ceremonies, respecting the flag, the obligation to sing the national anthem, and respect for heroes. Nationalism is also learned through outbursts of major events such as the Sumpah Pemuda, Indonesian independence commemoration ceremonies, or national anthems. In fact, social fact shows that nationalism is the spirit of the Indonesian nation that can be found in daily activities.

In 2022, Satya Wacana researchers designed an activity for Junior High School students. They were asked to define nationalism. At that time, researchers did not provide historical material and gave students the freedom to express their ideas. On average, students still understand nationalism as an action with a state-oriented perspective. They presented conceptions derived from historical materials obtained from their social studies teacher. Samuel and Lita stated that they also understand nationalism in cultural arts subjects.(Lita, 2023)

Students argued that nationalism is a sense of love for the country, willing to sacrifice, togetherness as a country and not oriented towards regionalism, pride in the country. A sense of pride in the country needs to be realized by protecting it from various challenges. Nationalism can also be interpreted as a way of life to maintain the unity of the whole community. Students recounted the practice of nationalism in their school. For example, children learn with a serious attitude when attending lessons on the history of the nation's struggle. Students also respect the heroes, sing a song *Indonesia Raya*, every two weeks students follow the ceremonial procession. In their school, teachers make it a habit for students to sing local and national songs. "When I sing *Halo-halo Bandung*, I remember how Indonesian heroes fought against the invaders," Asha said.(Asha, 2023) Student's opinion based on their stated oriented nationalism is represent in figure 2.

Figure 2 is a realization of junior high school students' thoughts on the conception of nationality or Indonesianness. At this stage students firmly reflected nationalism in many symbols from the stated oriented path. From pictures below, we can pay attention to how students were imagined nationalism. A flag, Indonesian archipelago, Bhinneka Tunggal Ika or unity in diversity, traditional houses, religious architectural symbols, and even narratives of heroic spirit are very clearly described from reading textbooks. The results of this thinking become a reference for the next stage when researchers were explored literary-based nationalism. Almost all of student had thought that nationalism terminology relate with officially symbols. Student said that they were not focus on daily activity symbolic to define nationalism.

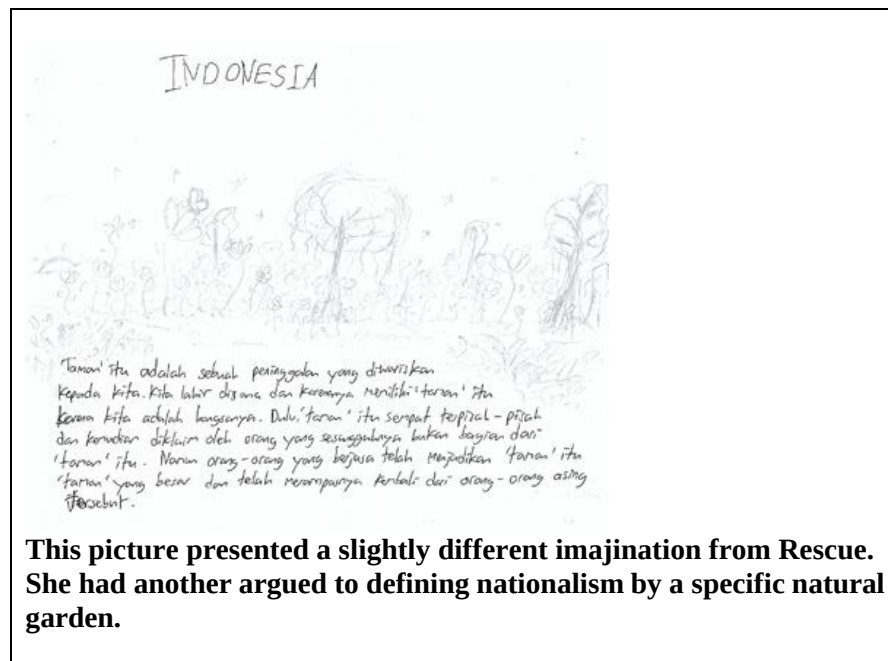


Figure 4: Nationalism from another perspective based on institutional textbook

Six months later, in May 2023, the second phase of the activity was conducted at the school. The researcher distributed the historical novel *Manusia Bebas* to five students, because one student named Johan could not attend the class. Each student received a book to read. They were free to choose the theme of a particular chapter according to their interests. The researcher gave three hours of class time for the students to read, understand, and then discuss the contents of the novel. The researcher applied participatory observation so that during the discussion the flow of ideas was guided in order to achieve the targeted goals. The activity of reading the *Manusia Bebas* novel was proven to provide different views on the cognitive of junior high school students. (Figure 5)



Figure 5: Students tried to understand the story and have been expressed by draw their nationalistic imagination

Students acknowledge that after reading the literary work there are new insights into the practice of nationalism from the non-state-oriented side. The behavior of the main character in the novel is very relevant to the students' need to understand nationalism from daily practice. While discussing later, students explored examples of nationalism practices found through social studies (especially in historical teaching) history lessons. The indicator of the success of the practice of nationalism, according to students, lies in the teaching method. The way teachers teach determines the emergence of national awareness for students. Rescue argued that students also play a strategic role in responding to the historical material delivered by the teacher. This is important so that the output of nationalism is useful for sharpening the spirit of nationalism. (Rescue, 2023)

At school, students build relationships with friends from different ethnic groups. They claim not to be constrained in terms of culture. Students respect each other. If friends succeed in winning academic competitions, students do not act jealous. Samuel stated that he was actually proud if his friend succeeded in the competition, especially since the success was a promotion to make Satya Wacana Junior High School more famous. Ernest argues that this attitude is a form of nationalism because a person respects his nation. In the school environment, Ernest studies science seriously. (Ernest, 2023) This is done as a nationalistic attitude towards the Indonesian nation and state. Lita argues that nationalism is also learned through cultural arts. At her school, students in the eighth grade have the opportunity to practice traditional Javanese dance and music. These activities are related to the subject matter, especially social studies history. The practice of art is important so that students do not just learn theory, but directly experience the cultural symbols of Indonesian society. (Lita, 2023)

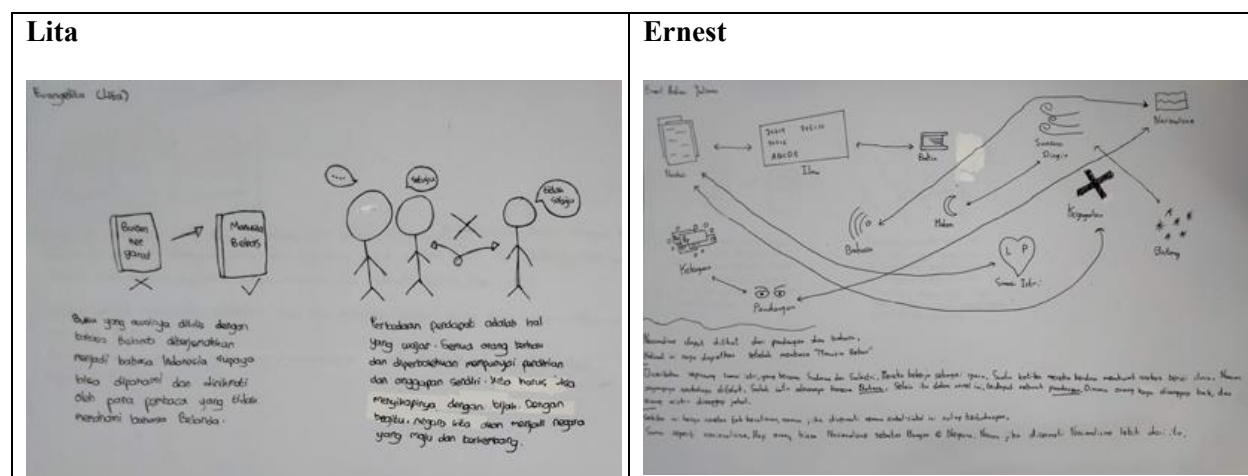


Figure 6: Lita and Ernest had been capturing their imagination after reading a historical novel *Manusia Bebas*

Rescue had another opinion to discovered the characteristics of nationalism through a group activities. He realized that the practice of nationalism was not easy to implement. She admitted found a little depressed when read novel *Manusia Bebas*. She also got a difficulties to share her nationalistic imajination by paper based. This picture below showing us how Rescue finally succed to blow up her nationalistic argumentation.

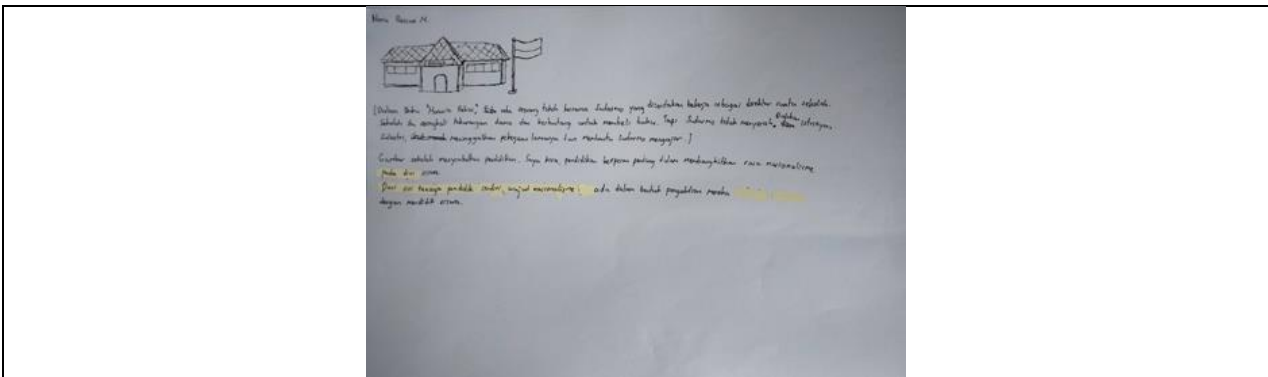


Figure 7: Rescue had drew a school building and flag. Both are symbols of a place where Sudarmo worked as a director. The school building look likes majestic but in fact they lack funds and even get into debt to buy books for the students. Sudarmo never gave up and his wife, Sulastri, did too. Rescue argues that education is very important to sharpen the spirit of nationalism. Teachers are important agents in learning nationalism.

Rescue interpreted that self-awareness is an important element in the practice of nationalism. She had her statement after imagining how Sudarmo and Sulastri did. So, unity is the key to socializing among students. Group work is faced with the problem of differences of opinion but Rescue has a deliberative solution. When students encounter problems, they are able to find a way out. In such cases, the role of a mediator is important in order to lead their friends to create unity of ideas.

What about Samuel and Asha. The following picture is the result after they did imagined nationalisme:

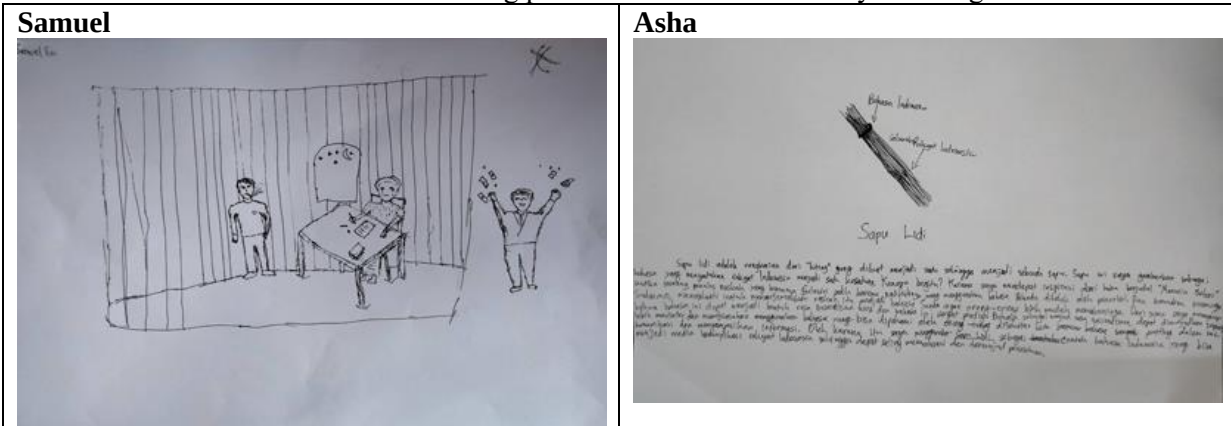


Figure 8: Samuel an Asha had a different nationalistic perspective. But, they argued that novel very significant for constructing historical imagination. After they read *Manusia Bebas* at chapter 1 and 2, students could be sharpening their experiences additional knowledge.

IS HISTORICAL NOVELS SHARPEN THE SPIRIT OF NATIONALISM?

The activity of reading the novel *Manusia Bebas* has sparked the open-mindedness of junior high school students in Salatiga city. The narrative in the introduction of the book by Suwarsih Djojopuspito became a medium for cognitive-imaginative excursions. One of the main topics of interest to junior high school students is the story of the struggle of Suwarsih, Sudarmo and their friends when they stirred up the nationalistic spirit. The dynamics of life in the frame of everyday life are represented in an educational perspective. Suwarsih Djojopuspito's work was first published in 1930 under the title *Buiten het Gareel*. Later, in 1975, Suwarsih translated her novel into Indonesian. After the title was changed to *Manusia Bebas*, the literary work could be read by people in Indonesia as a historical, nationalistic romance in accordance

with the spirit of the times. expressed her excitement over the planned translation of her work, originally titled *Buiten het Gareel*.

Cleaning the school building, creating a "feel good" atmosphere, creating a friendly impression by telling stories to each other on the school terrace are concrete examples of the life experiences of Sudarmo and Sulastrri, the main characters in the novel *Manusia Bebas*. Such positive attitudes, behaviors and beliefs are conceptualized by Marcel Theodorus Aloysius (2001) as nationalistic attitude. Marcel adopted the concept of attitudes from the writings of I. Ajzen and Fisbein (1975 & 1980). The school and its environment are imagined in the context of the country. There, Sudarmo, Sulastrri, Rustri, Jusuf, and their friends have the freedom to design and generate collective spirit within the scope of their unique locality. (Djojopuspito, 2000, second edition)

"Di sekolah itu pula, Sudarmo dan kawan-kawan memperbincangkan usahanya untuk membangkitkan otaktivitas rakyat agar dapat tumbuh menjadi gerakan rakyat yang prinsipil". (Djojopuspito, 2000, second edition)

For Suwarsih, producing literary works was not just disseminating her thoughts in a narrow sphere; on the contrary, the essence of language, which at that time was a political discourse, could be interpreted as ammunition for her national struggle. When in 1975 Suwarsih received news from G. Termorshuizen that her book *Buiten het Gareel* would be translated into Indonesian, she was overjoyed. It was a symbolic gesture that should be read as an expression of openness, freedom, independence, and perhaps even idealism that ignited the nationalistic spirit of novel readers in the Dutch East Indies. (Djojopuspito, 2000, second edition)

Manusia Bebas is presented in a very straightforward, simple language style, set in a location that is easily accessible, even in the terms of E. Du Perron, Suwarsih's style of speech is trivial and *cethek* (ini Javanese: shallow). When examined, at page 292 the work contains several notes, as if separated into thematic points of the narrative, including: the choice of diction and simple grammar, the target audience of the novel is correlated with the language of instruction used, the political agenda is implicitly the context of the national struggle even though it is local in scope. The domestic life of the Sulastrri-Sudarmo couple in a particular city influences the nationalistic narrative it constructs. (Djojopuspito, *Manusia Bebas*, 2000, second edition)

The teacher is a symbol of an intellectual figure in education, but in this novel Sudarmo packs a multi-role character. Sudarmo's teachers also have competence as writers, political actors, motivators, school engineers, and even statesmen. Sudarmo and Sulastrri can be categorized as nationalists. Their sincerity was often unstoppable, especially when interacting with school affairs. Sudarmo's attitude is very different from his colleague. In chapter seven of *Manusia Bebas*, it is described that after returning from school, Sudarmo's friends abandoned their memories of school. Sudarmo, on the other hand, clung to the responsibility of his work or teaching profession until he returned home, even affecting the comfort of his night's rest. Sudarmo has feelings and empathy to find a way out because the school's income has declined. Teachers in the school where Sudarmo worked had to be willing to make sacrifices when there were not enough learning tools, to act when parents could not afford to buy school equipment, and many other issues.

Sartono Kartodirdjo recommended that the daily lives of nationalists (such as Sudarmo) should be the focus of exploring the movement. Not only the reality of the nationalists' lives at the macro level, but the micro activities must still be observed. The aim is to examine the dilemmas and romantics of their lives, especially in the context of the subsistence of Indonesian national actors. The spirit that lives in nationalist instincts and intuition is the prospective direction of the current generation in responding to the stretching of the spirit of the times. (Kartodirdjo, 2001)

In *Indonesian Historiography*, Sartono Kartodirdjo describes the fragmentation of Sulastrri and Sudarmo's

activities, starting from the dynamics of running married life to the pragmatic ideological behavior of nationalism. The romance of Sulastri and Sudarmo's life reminds readers of the concept of nationalism initiated by Eric J. Hobsbawm and Ernest Gellner. Eric stated that he agreed with Gellner in interpreting the concept of nationalism. Hobsbawm states that:

"In short, for the purpose of analysis nationalism comes before nations. Nations do not make states and nationalism but other way round". (Hobsbawm, 1990)

The term nationalism is dynamic enough to be explored. Benedict Anderson argues that the term nationalism in scientific terms is difficult to explain unless the practice is real. Ben mentions that nationalism is a special kind of cultural artifact (parallel to archaeological objects). So it needs to be explained why it "exists" in history. So after referring to Aira's thoughts, Ben concluded that nationalism is a spontaneous distillation of the intersection of various historical forces. Analogously, once created, the artifacts of nationalism become modular, able to be embedded, with varying degrees of self-awareness, into a wide range of social expanses, to fuse and dissolve with a wide range of political and ideological systems. Ben explains why these cultural artifacts evoke such deep attachments.

In the perspective of Sulastri and Sudarmo, the concept of nationalism is pragmatic rather than theoretical. Both characters do not conceptualize it structurally in an imaginative political space, but in a pragmatic realm. Sartono Kartodirdjo, when re-narrating the substance and academic essence of the novel *Buiten het Gareel*, suggests the relevance and consistency of the concept of pragmatic nationalism played by Sulastri and Sudarmo with the situation of society today. Sartono argues that the behavior of the two characters shows the ideal nationalist life practiced during the Dutch colonial period. The idealism is realized through the struggle against power, finding solutions to systems and institutions. Sulastri and Sudarmo are portraits of the success of the Indonesian spirit and symbols of the power of national understanding. Sudarmo and Sulastri's speech acts, mindset, and life decisions were clearly not born in the context of their subjectivity or egoism. They have tied their intellectual network with the wider community. Sudarmo's attitude of considering intellectual recommendations from Sulastri's brother in law, establishing a local mass media (newspaper), and being involved in the party are examples of pragmatic actions in the context of his nationality.

Suwarsih's efforts to narrate the character and nationalistic spirit of the Free Man characters were highly appreciated by Satya Wacana Laboratory Junior High School students. One of the important elements of the novel is how the author struggles to raise the theme of local genius. Sundanese at that time was used as the language of instruction. But eventually, the novel was published in Dutch and reached an international audience. In the context of that time, Suwarsih became the main character who passionately fanned the spirit of nationalism. She managed to reach the peak of idealism with an attitude of unlimited struggle. The historical events portrayed by Suwarsih and Sudarmo were said to be inspiring. Junior high school students claimed to have gained insight into the meaning of Indonesia from their daily lives. The story of *Manusia Bebas* is considered to have an important point of study to be considered, namely language as a unifying medium for the nation. A student named Asha argued that she chose the symbol of a broomstick to reflect language as a very strategic unifying medium. The image of a broomstick in figure 3 is also equipped with a rope. Asha stated that the unifying tool is a strategic element needed to sharpen the nation's nationalism. (Asha, 2023)

CONCLUSION DAN RECOMMENDATION

Nationalism needs to be practiced in schools. Media such as novels, paintings, songs, comics, and others are very relevant to sharpen the spirit of Indonesian nationalism. It needs the right methods and procedures when practicing it. An alternative solution that teachers can work on with students is to introduce a research culture through social studies-history lessons. History is positioned as a medium to hone the ability of logic

and philosophy of knowledge. Suwarsih and Soedarmo's attitude of positioning language as a medium for unifying the nation needs to be referred to in re-conceptualizing Indonesian nationalism.

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Applying the Geometry City Module (MBG) and its Effectiveness on Students' Higher-Order Thinking Skills (HOTS)

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ABSTRACT

It is important to have a module as a learning innovation that creates an engaging learning environment and increases student enthusiasm in learning mathematics. Geometry instruction in elementary school, particularly for three-dimensional material, necessitates instructional materials that facilitate concept understanding. The study's objective is to evaluate the Geometry City Module's (MBG) effectiveness in geometry measurement. The purpose of this study is to demonstrate that performance assessment improves higher order thinking skills (HOTS) in learning activities through a quasi-experimental design that uses a pretest posttest non equivalent group research methodology. This study included 72 students from a public school in Pahang, Malaysia, consisting in age from 11 among fifth grade. The study's instrument was the five-item HOTS test on measurement and geometry, which was adapted from previous instruments. Pre- and post-test reliability were both 0.94. In order to analyse the data, a one-way analysis of covariance (ANCOVA) was performed after controlling for pretest scores (covariate), there was a significant difference between the posttest scores of the two sample groups on the MBG. In addition, partial eta squared =.073 suggested a substantial and moderate association between the pretest and posttest scores on the MBG. In conclusion, teaching and learning of geometry measurement topics through the module's integration is superior to conventional instruction. The results of this study showed that this alternative teaching method is effective at fostering and empowering students' higher order thinking skills in geometry measurement.

KEYWORDS: Geometry City Module, Higher Order Thinking Skills, Geometry Measurement

INTRODUCTION

Mathematics education plays a crucial role in adapting elementary students to problem-solving in their daily lives. Mathematical instruction has a vital role in acclimating elementary school kids to problem-solving in their daily lives (Chukwuyenum, 2013; Julie, 2017). Nonetheless, the mathematical principles taught in elementary education are frequently abstract (Malaty, 1994). In this situation, elementary pupils must have a strong conceptual grasp, including the ability to analyze, reason, and think, in order to solve difficulties. In the interest of helping students in acquiring these skills, it is essential to include literacy activities into the mathematical learning process. The effectiveness of literacy in mathematics education can have an effect on the mathematical performance of elementary and secondary school pupils. The significance of mathematical literacy in the context of problem-solving, namely that students are expected to be able to create, analyze, and solve mathematical issues in a variety of settings. In order to prepare primary pupils for tackling challenges they encounter in daily activities, maths instruction is crucial.

The purpose of education in Malaysia is to cultivate individual potential via the provision of a generation with the capacity for critical thought (Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, 2012). Educating a generation with critical thinking skills improves the quality of education (Ibrahim et al., 2019; Wahyuni et al., 2022). The Malaysian Ministry of Education (KPM) continually reviews its curricula to ensure that the implementation of the curriculum in schools equips students with the information, skills, and values necessary to meet present and future problems. The redesigned and reformed Standard Curriculum Primary School (KSSR) for Mathematics. The reorganization takes into mind the following level's continued viability. As it provides mathematical knowledge and skills, the revision is suitable for students with a wide range of capacities and experiences. With the offered information and abilities, individuals are able to explore knowledge, adapt, modify, and innovate in order to face and overcome future changes and obstacles (Education, 2012). The objective of KSSR for Mathematics Education is to develop students' understanding of number concepts, computer principles, and clearly realistically attainable mathematical concepts, as well as their ability to use mathematical knowledge and skills effectively and responsibly in daily life.

PROBLEM STATEMENT

Studies conducted by Beal & Cohen (2012) and Sassons et al., (2018), found that conventional teaching practices that are commonly used in classrooms provide students with a low level of thinking skills by teachers and do not lead to active learning. A teacher serves as an essential component in the introduction of new discipline concepts by providing professional explanations, motivating and defining new concepts, and emphasizing the connections between the newly defined concepts and previously taught concepts (Dietrich & Evans, 2022). The application of high-level thinking skills among students will face problems if the teacher lacks knowledge and teaching only depends on textbooks (Nur Hawa Hanis Abdullah & Ghazali Darusalam, 2018). This is due to teachers preparing students to face public examinations where the questions are usually procedural (Zulnaidi & Zakaria, 2012). Meanwhile, Siraj et al., (2016) explained that this situation is similar to the situation in the classrooms of schools in Malaysia. Teachers still emphasize conventional approaches such as lecturing to provide information and teacher-centered (Othman, 2017). This constraint continues until it interferes with the application of Higher Order Thinking Skills (HOTS) in the classroom (Othman et al., 2017). However, studies on the implementation of high-level thinking have not been taken intensively. Therefore, there is a need to develop a new instructional design to enable students to think at a higher cognitive level.

This problem continues until they tend to memorize the steps of measuring the space of mathematical problem solving without understanding the concept (Cahyono et al., 2018; Mason, 1998). Pupils need conceptual understanding that should be built through the visual senses and the operation of concrete materials (Andini et al., 2018; Sudihartinih & Wahyudin, 2020). This causes anxiety in mathematics

subjects which will lead to low mathematics achievement (Syed Azman & Siti Mistima, 2017). Poor conceptual knowledge in geometric space topics involving basic 3-Dimensional (3D) shapes is still low (Cahyono et al., 2018). Their difficulty is due to the proof of a formula that is difficult to understand (Van Hiele-Geldof & van Hiele, 1984). Students need concrete manipulative tools because they cannot describe basic 2D and 3D shapes in real life (Alex & Mammen, 2018; Mohd Norakmar Omar & Siti Noor Ismail, 2021; Mugot, 2018)

In addition, students are weak in understanding the topic of Space especially in the skills of measuring perimeter, area and volume of solids (Naidoo, 2018). The topic of geometry and spatial measurement offers a method to interpret and describe the physical environment and can be an important tool in solving problems (Stiff, 2000). However, students are unable to arrange units to become spatial composites because they cannot coordinate spatial information correctly physically (Fujita et al., 2017). This is due to the arrangement of their mental model being insufficient to accommodate all the arrangement units (Lowrie et al., 2021). Helping students to make accurate drawings is a key component of geometric construction learning, teaching, and implementation (Tisdell & Olmedo, 2022). For the concept of wide measurement, students cannot perform mental actions to divide 2-Dimensional space (2-D) into 2-D units and organize areas with other 2-D units (Gunhan, 2014). Pupils do not understand the broad concept that does not have gaps or overlaps and have problems involving squares and triangles to cover the same area (McDonough et al., 2013). Furthermore, students do not develop the concept of volume for solids through sufficient and accurate unit coordination for the process of forming the entire volume in order (Yuberta, 2018). As a result, the process of understanding the concept of area, perimeter and volume used in daily life becomes difficult for students to understand and the objective criteria of T&L will not be met.

However, a challenge arises when the percentage of HOTS questions in public examination papers will continue to increase from time to time and is expected to increase by another 10% in 2021 as reported by KPM (Kementerian Pendidikan Malaysai, 2019). Furthermore, according to the Malaysian Examinations Board Report (2020) it has shown that student performance in the *Sijil Pelajaran Malaysia* (SPM) through the mathematics subject among students for the year 2019 has decreased compared to the previous year (LPM, 2020). Referring to the circular letter issued by KPM dated 07 July 2021 (KPM.100-1/3/2 Vol. 3 (84), the *Ujian Pencapaian Sekolah Rendah* (UPSR) has been abolished starting in 2021. However, if you look at the performance of UPSR in 2019, as many as 74 367 (16.87%) students have still not reached the minimum mastery level which is in Grade E (Kementerian Pendidikan Malaysia, 2019). Therefore, this study focuses on the evaluation of the effectiveness of the Geometric City Module (MBG) in understanding the concepts of perimeter, area and volume in the topic of shape and space effectively towards HOTS. MBG can help teachers to deliver learning content standards without worrying about the use of a long time in the development of a learning module. MBG integrates social constructivist, cognitive theory and Anderson and Krathwohl's taxonomic model.

OBJECTIVE

The objective of this study was to investigate the effect of a HOTS-based module on the performance of fifth-grade students in mathematics. To accomplish this goal, two research objectives were developed:

1. Determining the level of higher order thinking skills (HOTS) of students exposed to MBG versus conventional teaching techniques in the subject of Space.
2. Comparing the effectiveness of MBG with conventional instructional techniques towards higher order thinking skills (HOTS) in the fifth grade in geometry measurement

METHODOLOGY

There are numerous experimental circumstances in education where researchers must use intact groups. Field experiments, i.e. experiments conducted outside of a laboratory, are constructed of quasi-experiments

(Cohen et al., 2018). Using the current class of year five students, this study employed a quasi-experimental research design, designating one group as the experimental group and the other as the control group. Randomly allocating students to both groups will interfere with learning in the classroom (Sekaran, 2012). This study is quantitative in nature. The pretest-posttest non equivalent group design is used in the research. The research design model employed in this study is depicted in table 1.

Table 1. Quasi-Experimental Design : The Pre-Tests Post-Test Non Equivalent Group

Groups	Pre Test	Treatment	Post Test
Intervention (K-MBG)	O_1	X	O_2
Control (K-PK)	O_1		O_2

The study involved 72 national school pupils from a district in the state of Pahang. The research was conducted on a national school, with total demographics presented in table 2 below.

Table 2. Demographic Factor

Groups	Frequencies	Percentage
Intervention (K-MBG)	37	51.4
Control (K-PK)	35	48.6

According to table 2, 37 (51.4%) students were in the intervention group (K-MBG) and 35 (48.6%) students were in the control group (K-PK). The intervention group is known as K-MBG (Group that utilises MBG intervention), whereas the control group is known as K-PK (Group that uses conventional teaching). This school has an average academic performance (Band 3). The samples were chosen using a basic random sampling strategy for picking the schools, two classes from school, and experimental groups from each class since it is simple and provides an accurate representative of a wider population. Two numbers representing classes were taken from the school, and the numbered class was then chosen to define intervention and control groups. Year five students are considered as practical and manageable within financial and time limits because they do not participate in major public examinations.

DATA COLLECTION METHOD

The objective of this research was to look at the effect of using the MBG module strategy on student performance. As a result, it was essential to use the current class of year 5 students, designating one as the experimental group and the other as the control group. A pre-test was given to both groups to see if the variance of the two groups is homogen. On the same topics, the experimental group used the MBG module strategy, while the control group used the conventional approach. Following the administration of the MBG, a post-test was given to the students to assess their performance at the end of three weeks. There were five questions on the geometry measurement involving perimeter, area and volume test.

The test questions have been developed to meet the requirements of the *Kurikulum Standard Sekolah Rendah* (KSSR) towards HOTS. Eight professionals assessed the questions, including six senior lecturers from the *Institut Pendidikan Guru* (IPG) and a mathematics excellent teacher. Following content evaluation by professional experts, they were modified and placed within the Malaysian context as intended. The researcher then used the ANATES4 software to obtain the discriminating index and difficulty index values for the higher order thinking skills test instrument (HOTS) as table 3 mentioned below.

Table 3. Discrimination Index (Disc.I) and Difficulty Index (Diff.I) for the HOTS test

No. Question	T	Disc.I (%)	Interpretation Disc. I	Diff. I (%)	Interpretation Diff.I	Correlation	Cronbach Alpha
1	29.00	72.50	Very Good	63.75	Moderate	0.942	0.94
2	12.68	82.50	Very Good	46.25	Moderate	0.920	
3	6.73	57.50	Very Good	48.75	Moderate	0.838	
4	12.43	72.50	Very Good	51.24	Moderate	0.933	
5	12.99	75.00	Very Good	47.50	Moderate	0.924	

The discriminating index and difficulty index of the HOTS exam for the composite perimeter, area, and volume are seen to be at a moderate level, as indicated in table 3. Hence, the difficulty level of each question is appropriately balanced and satisfactory. The range of discrimination index values for the HOTS test is between 72.50% and 82.50%. This observation indicates that the discrimination index for each item is highly satisfactory. Subsequently, the difficulty index value associated with each item is situated at a moderate level. The difficulty index values for all items range from 46.25% to 63.75%. The HOTS test questions are characterised by modest discriminating index values, rendering them appropriate and acceptable for utilisation.

DATA ANALYSIS

Data analysis is arranged into three stages: preliminary analysis, descriptive statistics, and inferential analysis. As an early data analysis technique, descriptive statistics are being used. According to Pallant (2016), the descriptive phase of data analysis may begin once it was determined that there were no errors in the given data set. The data in this study was described using mean, standard deviation, and frequency. To describe the distribution of subjects according to treatment and control groups, descriptive statistics were used. To address the study questions, however, inferential statistics such as ANCOVA will be used.

FINDINGS

Descriptive analysis was utilised to compare the levels before and after the application of MBG based on Higher Order Thinking Skills (HOTS). The mean and standard deviation of pre-test and post-test HOTS scores for both groups are provided in table 4.

Table 4. Mean and Standard Deviation Pre and Post Test for Both Group

Groups	N	Pre Test		Post Test	
		Mean	Standard Deviation	Mean	Standard Deviation
Intervention (K-MBG)	37	23.891	14.188	74.108	10.810
Control (K-PK)	35	23.942	15.495	65.571	9.684

Based on table 4 above, the mean score and standard deviation of the HOTS pre-test and post-test are shown. The pre-test mean score for the intervention group (K-MBG) was 23.891 with a standard deviation of 14.188, while the post-test mean score was 74.108 with a standard deviation of 10.810. The mean score of the control group (K-PK) is 23.942 with a standard deviation of 15.495, whereas the post test score is 65.571 with a standard deviation of 9.684. This clearly reveals that the K-MBG group surpasses the K-PK group in terms of HOTS. The mean score is significantly different, and the score difference is Figure 1 shows the mean value difference between the pre-test and post-test for both groups.

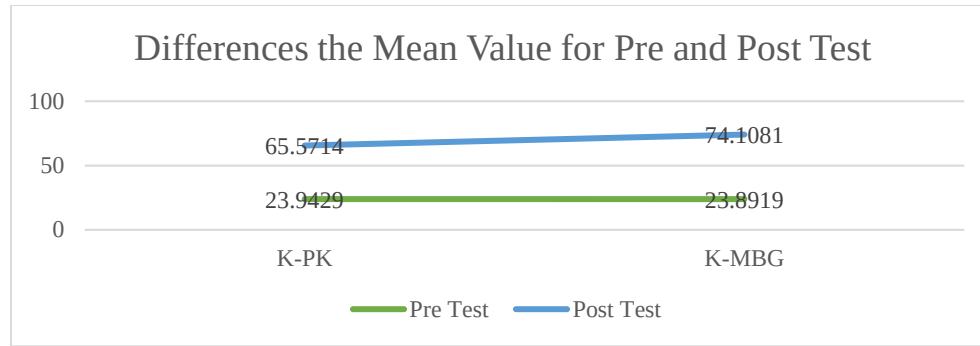


Figure 1. Differences the Mean Value for Pre and Post Test for K-MBG and K-PK

The findings in this section were determined by the specific study hypotheses. Following three weeks of intervention, the post-test results were subjected to a one-way between group analysis of covariance (ANCOVA) to evaluate the effectiveness of the two different types of mathematics teaching methodologies. In this study, the covariant was the pre-test scores. The descriptive data (means and standard deviations) of the post-test scores of the HOTS-based module and conventional techniques are shown in Table 5 below.

Table 5. Mean and Standard Deviation Post Test

Groups	N	Mean	Standard Deviation
Intervention (K-MBG)	37	74.108	10.810
Control (K-PK)	35	65.571	9.684

Table 5 shows the mean and standard deviation mean post-test scores for both groups. In terms of post-test scores, the treatment group ($M = 74.108$, $SD = 10.810$) had higher mean values than the control group ($M = 65.571$, $SD = 9.684$).

Table 6. Levene's Test of Equality of Error Variances of Post-test Score

f	df1	df2	Sig.
.173	1	70	.679

Test the null hypothesis that the error variance of the dependant variable is equal across groups.

a. Design: Intercept + Pre Test HOTS + Group

Based on table 6, the results of Levene's Test of Equality of Error Variance are [$F(1,70) = .679$, ($p > .05$)], indicating that the value of variance in each group of study respondents is not different (homogenous), which is the assumption that all enablers the change equals the variance (equal variance) and does not violate the assumption. The ANCOVA test procedures were met by the study data. After controlling for mean Pre-Test scores, Table 6 below showed a significant difference in post-test performance test scores between the treatment and control groups [$F = 5.441$, sig = .023 ($p < .05$)]. As a result, hypothesis is rejected. Research demonstrated that students exposed to both approaches differed in their post-test performance at school.

Table 7. Tests of Between-Subject Effects of Post-test Scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial ETA Squared
Corrected Model	935.639 ^a	2	467.820	4.604	.013	.118
Intercept	89474.479	1	89474.479	880.471	.000	.927

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial ETA Squared
Pre Test	384.278	1	384.278	3.781	.056	.052
Group	552.963	1	552.963	5.441	.023	.073
Error	7011.861	69	101.621			
Total	375172.000	72				
Corrected Total	7947.500	71				

R Squared = .118 (Corrected at R Squared = .092)

Table 8 below shows the mean of post-HOTS test for both group. Based on the mean, the post-HOTS test of intervention group students (K-MBG) is greater than the post-HOTS test of control group students (K-PK).

Table 8. Mean Post-HOTS Based on Group of Dependent Variables: Post-HOTS Test

Groups	Mean	Std. Error	95 % Confidence Interval	
			Low Boundary	Higher Boundary
Intervention (K-MBG)	74.112 ^a	1.657	70.806	77.418
Control (K-PK)	68.567 ^a	1.704	65.168	71.967

DISCUSSION

The purpose of this research was to investigate the effectiveness of HOTS on primary school students' mathematics performance. This study also assessed HOTS module (MBG) and conventional teaching methodologies in teaching and learning year five mathematics. The findings revealed a significant difference in higher order thinking skills in geometry measurement among school children. This study strengthens the results of Ibrahim et al., (2019), who discovered a change in HOTS scores when utilising the T&L module. This is consistent with the study's findings, which show that pupils exposed to MBG have a higher mean score between the pre-test and the post-test. MBG's method is consistent with the subject's content. DSKP Mathematics was used to develop MBG. As a result, a HOTS-based module (MBG) can be used as one of the alternative learning methodologies for incorporating HOTS in mathematics. For example, in high-level thinking at the application level, students successfully execute procedures using MBG activity implementation. MBG has been outfitted with instructions and practises that are acceptable and straightforward for the cognitive development level of primary school pupils. Students can utilise the technique to create a building based on the layout provided, and they can use the MBG strategy to assist students in building a multiplication model through a conceptual grasp of space measurement.

Furthermore, students are successful in breaking down material or concepts into smaller components. This is the level of analysis in HOTS (Fauziah & Shahrudin, 2020; Othman et al., 2017; Pratama & Retnawati, 2018). Students can compare and contrast the three spatial measuring skills in geometry involving perimeter, area, and volume. When they can break down the concept of space measurement into little components, they can examine the features based on those skills (Andini et al., 2018; Cahyono et al., 2018; Mason, 1998; Sudihartini & Wahyudin, 2020). But, high-level thinking is not limited to numeracy skills; it also includes how to apply mathematics in everyday life to solve an issue and how to explain it so that the student's mathematical thinking process can be observed (Pratama & Retnawati, 2018). Students should be taught to build their understanding autonomously, according to Milinia & Amir (2022), through a series of exercises that might support them in building developed models and understanding the perimeter and area of plane measurements. This issue is consistent with the module product, MBG, because it applies the context of the students' real life.

CONCLUSION

Based on the findings and discussions, it is possible to conclude that a MBG can be used as an alternate learning strategy for incorporating HOTS into mathematical material. Given the importance of HOTS in producing a generation capable of thinking, the findings of this study contribute to the body of knowledge in assessing kids' HOTS in mathematics learning using empirical evidence. Despite the fact that the findings for students who were exposed to MBG in both institutions were substantial, students should be given adequate time to adapt to a new way to studying mathematics. In addition to teachers, the application of HOTS in mathematics teaching necessitates familiarity with and a paradigm shift in order to fulfil national education goals. Modifications must be implemented with prudence so that students have the chance and assistance they need to become proficient in mathematics at a young age.

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Development of the Academic Burnout Inventory among Thai University Students: A Preliminary Analysis of Item and Factor Structure

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ABSTRACT

Academic burnout is one of the issues that negatively affects academic performance and the psychological wellbeing of university students. Early detection is the most crucial screening strategy since it can minimize and prevent more serious problems that could be caused by this condition. Thus, the study aimed to develop the *Academic Burnout Inventory-Thai Edition (ABI-T)* with the intention of elevating the scale to a standardized measurement. The preliminary process began with an analysis of the items and the factor structure of the scale. A total of 293 Thai university students participated, and the adequacy of the sample size was proven by KMO and Bartlett's test of sphericity. Linear regression analysis was used to analyze the item analysis, and exploratory factor analysis (EFA) with the Promax rotation approach was used to evaluate the ABI-T factor structure. The result revealed that the ABI-T consisted of 31 items with a response format of a 7-point Likert scale. Linear regression analysis demonstrated that all 31 items with high standardized coefficients significantly predicted the summative score of academic burnouts; hence, all items were retained for further factor structure analysis. Meanwhile, EFA found that the ABI-T was extracted as four factors, accounting for 72.858% of total variation. The four factors were emotional instability, decreased cognitive function, lack of motivation, and exhaustion. The ABI-T could benefit university counseling units or educational psychologists by offering an alternative tool for early diagnosis of indicators of academic burnout and planning to mitigate its impact in the future.

KEYWORDS: Academic Burnout, Item Analysis, Factor Structure Analysis, Exploratory Factor Analysis (EFA), Thai University Students

INTRODUCTION

The term "*burnout*" was first introduced by Freudenberger in 1974 to describe the state of emotional exhaustion, fatigue, and frustration that was experienced by volunteer employees in a care center as a result of failing to perform their job responsibilities as expected (Freudenberger, 1974). Following that, the concept of burnout was expanded upon. Maslach and Jackson (1981) generated the concept of a multidimensional model of burnout. They provided the operational definition of burnout as a psychological state characterized by a three-component set of symptoms: (1) Emotional exhaustion refers to the sense of being exhausted as a result of the efforts made at work. (2) Depersonalization or cynicism refers to a pessimistic attitude toward the job at hand, manifested in negative or improper attitudes and behaviors toward their work and relations with others. (3) Diminished individual accomplishment refers to a decrease in one's perception of work productivity and potential, as well as having low professional self-evaluation and self-efficacy (Maslach and Jackson, 1981; Edú-Valsania et al, 2022). According to the job demands-resources model by Demerouti et al (2001), burnout is commonly triggered by two types of work situations: job demands and expectations, and job resources. To date, the World Health Organization (WHO) has included the burnout condition as an occupational problem in the 11th Revision of the International Classification of Diseases (ICD-11) due to its negative impact on personal functioning and well-being, including physical and mental health issues, interpersonal relationships, and professional productivity (World Health Organization, 2019).

Although burnout has traditionally been studied in professions, particularly among medical personnel, the concept has also been applied in educational contexts because routine educational activities can be recognized as "work" (Salmela-Aro et al., 2008), and it is known as "*Academic burnout*." The term was first proposed by Neumann et al (1990). According to their study, academic burnout is defined by several characteristics that are similar to Maslach and Jackson's (1981) concept of burnout, namely: academic fatigue - a sense of exhaustion caused by academic demands and requirements; academic apathy - a sense of pessimism and lack of interest in academic tasks; and academic inefficiency - inadequate personal development in academic and educational matters (Neumann et al, 1990; Bikar et al, 2018).

To date, there are several burnout studies that extend beyond professions to university students and higher education. In the systematic review study, the prevalence of burnout syndrome in university students was estimated to be 55.4% for mental exhaustion, 31.6% for depersonalization, and 30.9% for academic efficacy (Rosales-Ricardo et al, 2021). Similar to the meta-analysis study with medical students, the prevalence was estimated to be 40.8% for emotional exhaustion, 35.1% for depersonalization, and 27.4% for academic efficacy (Frajerman et al, 2019). Academic burnout is a psychological condition caused by chronic stressor exposure that can make students feel unable to complete their duties, lose interest in their studies, and feel frustrated about their capacity to reach academic goals (Aguayo et al., 2019). A meta-analysis of 29 studies involving over 100,000 students found that burnout had a significant negative relationship with academic achievement (Madigan and Curran, 2021). Based on the student's motivation, academic burnout profiles can be divided into four categories: distressed (completely burnout), laissez-faire (not actively participating in their studies and not achieving), struggling (burnout but trying hard to achieve), and well-functioning (not burnout). Distressed and well-functioning groups were distinguished by attitude, internal motivation, and identified regulations. Internal and external regulation differentiated between groups that were laissez-faire and those that were struggling (Lee et al., 2020).

To measure academic burnout, research on student burnout often uses the Maslach Burnout Inventory-Student Survey (MBI-SS) to assess the severity of burnout symptoms: emotional exhaustion, depersonalization, and academic efficacy. The scale has 15 items that are scored on a Likert-type scale ranging from 0 (never) to 6 (every day) (Schaufeli et al, 2002). Several studies have translated the MBI-SS and assessed its psychometric qualities across various languages (Portoghese et al, 2018; Wickramasinghe et al, 2018; Pérez-Mármol, and Brown, 2019; Pérez Fuentes et al, 2020; AlShahrani et al, 2022). Aside

from the MBI-SS, at least two updated instruments are used to assess academic burnout among university students: the Student Version of Burnout Assessment Tool (S-BAT) and the Oldenburg Burnout Inventory–Student Survey (OLBI–S). The S-BAT has 23 items that assess the four core burnout symptoms (S-BAT–C, 23 items; includes feelings of exhaustion, mental distancing, cognitive impairment, and emotional impairment) as well as two secondary burnout symptoms (S-BAT–S, 10 items; includes psychosomatic complaints and psychological distress). Both components are scored on a five-point Likert scale, with 1 being "never" and 5 being "always" (Schaufeli et al, 2020; Popescu et al, 2023). The OLBI–SS, on the other hand, consists of 16 items and is divided into two dimensions: (physical, affective, and cognitive) exhaustion and disengagement, with a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree) (Reis et al, 2015)

In Thailand, there have been a few studies on academic burnout among Thai university students. The majority of them employed the Maslach Burnout Inventory to assess the severity of burnout, and the majority of the participants were medical students, pediatric residents, or family medicine residents (Puranitee, et al, 2019a; Puranitee, et al, 2019b; Charoentanyarak et al, 2020). Meanwhile, academic burnout was shown to be rather prevalent among Thai medical students, particularly in terms of emotional exhaustion and depersonalization (Taikerd et al, 2019; Charoentanyarak et al, 2020).

Thus, it is crucial to have a standardized screening tool for recognizing probable indications and symptoms of academic burnout in the Thai context. Screening is an essential aspect of prevention, with the intent to identify people at high risk early enough to provide treatment and avoid or reduce symptoms and other consequences. The goal is early detection, lifestyle modification, or surveillance to reduce the risk or detect it early enough to treat it most effectively. Although the screening tests are not diagnostic, they are designed to identify those who are at high risk and should undergo additional testing to determine the presence of symptoms. Another advantage of screening tools is that they have the potential to improve intervention cost-effectiveness (Iragorri and Spackman, 2018).

In light of these reasons, the purpose of this study was to develop the *Academic Burnout Inventory-Thai Edition (ABI-T)* with the intention of elevating the scale to a standardized measurement. The preliminary process began with an item and factor structure analysis so that the scale could be tested for its psychometric properties in the following stage. The implementation of the ABI-T might benefit university counseling units or educational psychologists by providing an alternate instrument for early detection of signs of academic burnout and planning to prevent its impact further on.

METHODS

Participants and data collection procedure:

The study employed a cross-sectional research design, with 293 Thai university students with bachelor's degrees (101 males, 183 females, and 9 unidentified) participating from various universities around the country. The sample size, sampling method considerations, and data collection procedures were as follows:

Sample size consideration:

The consideration of sample size is vital for reaching the statistical requirement and for the potentiality of generalizing the findings to the general population. According to factor analysis, the sample size's adequacy is evaluated using KMO and Bartlett's sphericity test. The KMO being greater than .80 and a statistically significant result of Bartlett's test, demonstrating that the correlation matrix is not an identity matrix, are the basis assumptions of the EFA. It implies that the sample size was sufficient to continue the EFA. (Hair et al, 2019). For this study, the KMO was .965 and the Bartlett's test of sphericity demonstrated the chi-square = 9148.682 (df = 465); p-value < .001, representing the adequacy of the sample size for EFA analysis.

Sampling method consideration:

To recruit participants for the study, nonprobability sampling using the purposive sampling method was employed. The inclusion criteria were established in order to select homogenous data in a manner that was objective, consistent, trustworthy, and uniform. As a result, the inclusion criteria for this study were as follows: (1) participants were enrolled in a university degree program (any subject, major, or university); (2) they were above the age of 18; and (3) they were willing to complete an online questionnaire. Since the inclusion criteria were sufficient to recruit homogeneity in the data collection, no exclusion criteria were required.

Data collection procedure and research ethics:

Data was gathered via online questionnaires from January to March 2023, which took an average of 10-15 minutes to complete. The collection procedure was carried out in accordance with research ethics. The participants were informed about the aim of the study, the time required to complete the questionnaire, and the importance of anonymity and confidentiality. Participants could able to cancel their involvement at any time during the processing (if necessary) and would not be affected in any manner. Once the study was completed, all the information was discarded.

Following that, the demographic characteristics of the participants were summarized as shown in **Table 1**. The majority of the participants were female. Most of them were in their first year of study at the Faculty of Education, with an average age of 23.29 (SD=5.58) years and a GPA of 2.81 (SD=0.53).

Table 1: The demographic characteristics of participants

Demographic characteristics		n (%)
Gender	Males	101 (34.5%)
	Females	183 (62.5%)
	Unidentified	9 (3.1%)
Age (year); Mean, SD		23.29 (SD=5.58); min=18, max=49
GPA; Mean, SD		2.81 (SD=0.53); min=1.52, max=4.00
Education years	First-year	92 (31.4%)
	Second-year	62 (21.2%)
	Third-year	35 (11.9%)
	Fourth-year	30 (10.2%)
	Higher than fourth-year	74 (25.3%)
Major	Education	210 (71.7%)
	Engineering / Sciences	56 (19.1%)
	Business administration / Accounting	12 (4.1%)
	Others (e.g., public health, law, geography, humanity)	15 (5.1%)

Measurements:

The study employed two measurements: a demographic questionnaire and the Academic Burnout Inventory-Thai Edition (ABI-T).

1) *The demographic questionnaire* inquired about the participant's gender, age, grade point average (GPA) which ranged from 0.00 (no points) to 4.00 (maximum points), education years, and major subject matter.

2) *The Academic Burnout Inventory-Thai Edition (ABI-T)*

The ABI-T was a new self-report inventory that was designed to assess the extent of academic burnout among university students. All of the items have been developed in Thai to be commonly used in

the country. The procedure for ABI-T development followed the guidelines for developing the standardized psychological test, as shown in **Figure 1** (Morgado et al, 2017; Fenn, et al, 2020). However, this study focused exclusively on the preliminary examination of the ABI-T, only steps 1 and 2 were performed.

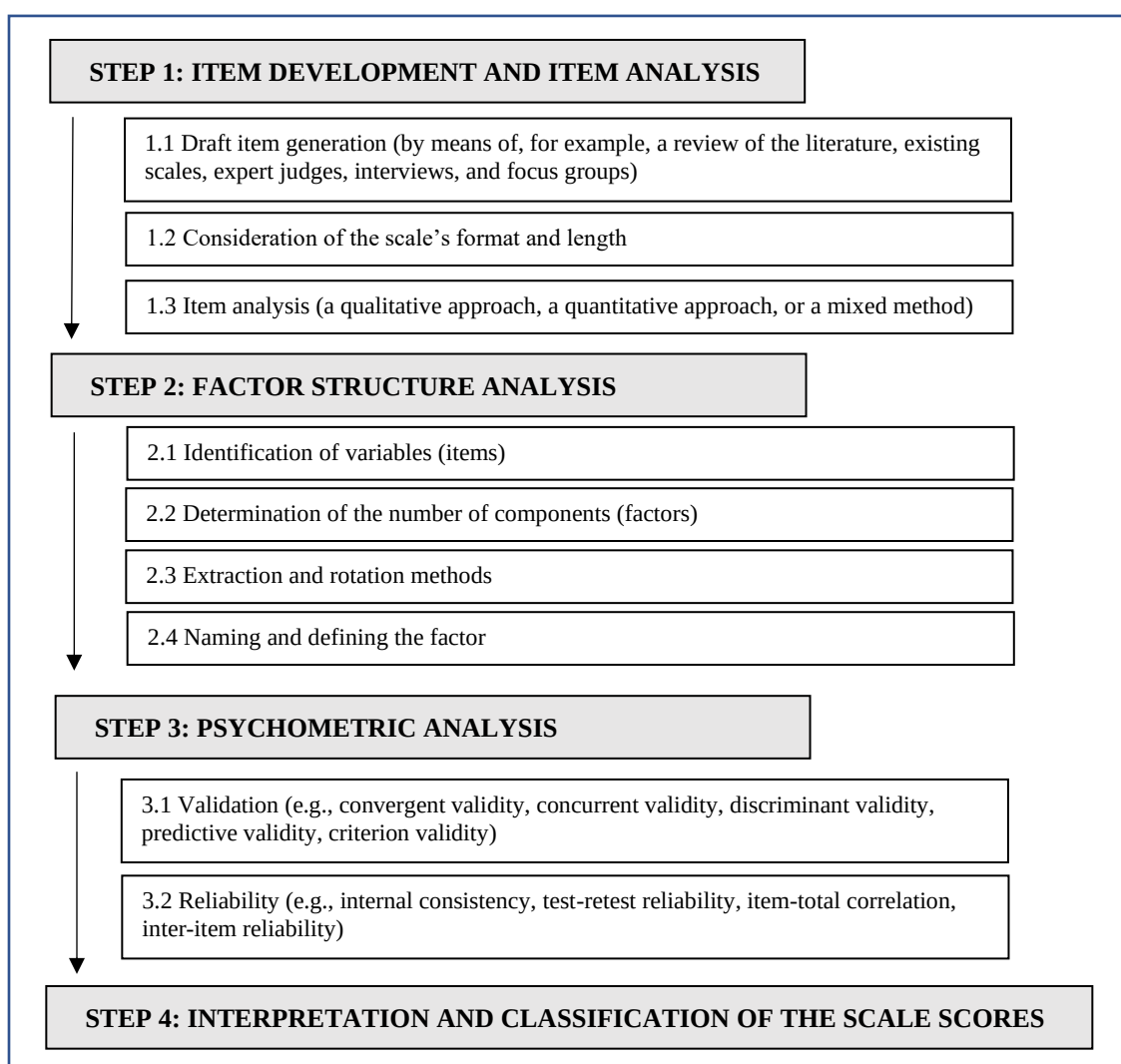


Figure 1: The procedure for developing a standardized psychological test

NOTED: This study focused on the preliminary examination of the ABI-T; thus, only steps 1 (item development and item analysis) and 2 (factor structure analysis) were performed.

Data analysis:

The following statistical methods were employed for data analysis: (1) the adequateness of the sample size was tested using KMO and Bartlett's test of sphericity. (2) The item analysis was tested using linear regression analysis to determine whether each item had the potential to predict the summative score of academic burnouts. Finally, the EFA was employed to test the ABI-T factor structure.

RESULTS

The findings were divided into two sections: (1) the item development and item analysis of the ABI-T, and (2) the factor structure of the ABI-T as follows;

PART 1: item development and item analysis of the ABI-T

According to the guidelines for developing a standardized psychological test, as indicated in **Figure 1**, the findings on item development for the ABI-T were presented in terms of (1) the procedure for generating the draft item, (2) the scale's format and length, and (3) the item analysis, as follows:

STEP 1: Procedure for generating the draft item

The ABI-T items were developed following a review of previous studies, theoretical concepts, and existing burnout and academic burnout measurements. According to the literature, the ABI-T items were constructed using the multidimensional model of burnout (Maslach and Jackson, 1981; Edú-Valsania et al, 2022) and the demand-resource model approach (Demerouti et al, 2001; Jagodics and Szabó, 2022). Existing scale suggestions were also taken into account, including the Maslach Burnout Inventory-Student Survey (MBI-SS) (Schaufeli et al, 2002), the Student Version of Burnout Assessment Tool (S-BAT) (Schaufeli et al, 2020; Popescu et al, 2023), and the Oldenburg Burnout Inventory-Student Survey (OLBI-S) (Reis et al, 2015). Finally, after synthesizing all of the material, the ABI-T has reached 31 draft items at this stage.

STEP 2: The scale's format and length

The ABI-T was designed as a self-report assessment using a forced-choice response format with a 7-point Likert scale. This format requires respondents to express their level of agreement or frequency of occurrence by selecting one of seven numbers ranging from 0 to 6 (where 0 represents strongly disagreed and 6 represents strongly agreed), with the midpoint (3) being a neutral view. A seven-point Likert scale provides a more accurate measure of a participant's true evaluation and is more appropriate for electronically-distributed and otherwise unsupervised surveys (Finstad, 2010). Because of these considerations, the ABI-T response structure applied a 7-point Likert scale. Meanwhile, the ABI-T required around 8-10 minutes to complete, which was not excessive until attention was lost.

STEP 3: Item analysis

The item on the ABI-T has been examined through both quantitative and qualitative methods. The qualitative method examined the wording, typing, and order of the ABI-T items. The items were adjusted to be more suitable for the target population by removing double-barreled items, biased wording, ambiguous wording with broad or abstract meaning, and items requiring effort and recall memory (Fenn et al, 2020).

Following that, the quantitative technique was employed to determine whether each of the ABI-T item had the potential to predict the summative score of academic burnouts using linear regression analysis. The regression results demonstrated that all of the ABI-T items were able to significantly predict the summative score of academic burnouts (p -value < .001), with standardized coefficients (β) ranging from .603 (item 4) to .843 (item 26). In a regression model, the variance in the summative score of academic burnouts explained by each of the ABI-T items varied from 36.4% (item 4) to 71% (item 26), indicating a moderate to fairly high prediction. As a result, all 31 items were retained for further evaluation of their factor structures as shown in **Table 2**.

Table 2: the item analysis using linear regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value	R Square Change
		B	Std. Error	Beta			
Item 1	(Constant)	13.215	2.391		5.527	< .001	.645
	Burnout_1	19.727	.858	.803	22.989	< .001	
Item 2	(Constant)	16.544	2.453		6.744	< .001	.604

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	R Square Change
	B	Std. Error	Beta			
Item 3	Burnout_2	18.949	.899	.777	21.070	< .001
	(Constant)	19.883	2.341		8.492	< .001
	Burnout_3	18.255	.870	.776	20.972	< .001
Item 4	(Constant)	14.423	3.815		3.781	< .001
	Burnout_4	14.384	1.115	.603	12.904	< .001
Item 5	(Constant)	19.675	2.436		8.077	< .001
	Burnout_5	18.022	.898	.762	20.065	< .001
Item 6	(Constant)	24.210	2.482		9.755	< .001
	Burnout_6	16.384	.915	.724	17.908	< .001
Item 7	(Constant)	25.759	2.936		8.773	< .001
	Burnout_7	13.546	.978	.630	13.847	< .001
Item 8	(Constant)	22.483	2.038		11.030	< .001
	Burnout_8	18.708	.791	.811	23.659	< .001
Item 9	(Constant)	31.153	2.091		14.895	< .001
	Burnout_9	18.717	.966	.751	19.373	< .001
Item 10	(Constant)	32.244	2.316		13.925	< .001
	Burnout_10	16.471	1.005	.693	16.392	< .001
Item 11	(Constant)	29.024	2.003		14.494	< .001
	Burnout_11	21.636	1.010	.782	21.424	< .001
Item 12	(Constant)	27.336	2.455		11.136	< .001
	Burnout_12	18.626	1.098	.705	16.967	< .001
Item 13	(Constant)	14.074	2.663		5.285	< .001
	Burnout_13	17.179	.860	.760	19.976	< .001
Item 14	(Constant)	18.135	2.165		8.376	< .001
	Burnout_14	19.899	.838	.812	23.752	< .001
Item 15	(Constant)	18.838	1.946		9.679	< .001
	Burnout_15	20.550	.773	.842	26.580	< .001
Item 16	(Constant)	19.199	2.318		8.283	< .001
	Burnout_16	18.563	.863	.783	21.498	< .001
Item 17	(Constant)	30.811	2.031		15.170	< .001
	Burnout_17	20.022	.986	.766	20.296	< .001
Item 18	(Constant)	17.736	2.128		8.333	< .001
	Burnout_18	19.094	.783	.820	24.397	< .001
Item 19	(Constant)	19.903	2.096		9.496	< .001
	Burnout_19	19.715	.824	.814	23.939	< .001
Item 20	(Constant)	16.528	2.155		7.671	< .001
	Burnout_20	19.173	.781	.821	24.544	< .001
Item 21	(Constant)	20.569	1.975		10.415	< .001
	Burnout_21	20.443	.805	.830	25.393	< .001
Item 22	(Constant)	22.109	2.142		10.323	< .001
	Burnout_22	18.231	.813	.796	22.432	< .001
Item 23	(Constant)	26.090	1.853		14.083	< .001
	Burnout_23	20.818	.835	.825	24.929	< .001
Item 24	(Constant)	18.028	2.266		7.955	< .001
	Burnout_24	18.794	.834	.797	22.547	< .001
Item 25	(Constant)	25.784	2.094		12.315	< .001
	Burnout_25	18.265	.848	.784	21.545	< .001
Item 26	(Constant)	24.525	1.790		13.701	< .001
	Burnout_26	19.523	.732	.843	26.686	< .001
Item 27	(Constant)	28.204	2.026		13.921	< .001
	Burnout_27	17.109	.798	.783	21.443	< .001
Item 28	(Constant)	27.657	2.126		13.008	< .001
	Burnout_28	17.841	.876	.767	20.366	< .001
Item 29	(Constant)	27.170	2.038		13.334	< .001
	Burnout_29	17.551	.808	.786	21.714	< .001
Item 30	(Constant)	30.964	1.806		17.149	< .001
	Burnout_30	21.807	.924	.810	23.603	< .001

Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value	R Square Change
	B	Std. Error	Beta			
Item 31	(Constant)	33.100	2.265	14.614	< .001	.486
	Burnout_31	17.641	1.064	.697	< .001	

PART 2: Factor structure of the ABI-T

The ABI-T factor structure was evaluated using the EFA analysis. The following were the processes involved in performing EFA: identification of variables (items), determination of the number of factors, extraction and rotation methods, and, finally, naming and defining the factor.

STEP 4: Identification of variables (items)

In the EFA analysis, the variables (items) were identified using the communality value. The communality is the proportion of each variable's variance that can be explained by the factors. If the communality is low (less than .40), the variable may have nothing in common with the other variables and is most likely to be deleted (Hair et al., 2019). In this study, all 31 ABI-T items demonstrated communality ranging from .584 (item 12) to .851 (item 26); hence, all 31 items were retained for further analysis.

STEP 5: Determination of the number of components (factors)

The majority of the methods for determining the number of components (factors) in an EFA analysis rely on eigenvalues (more than 1), the scree plot, and the percentage of total variance explained (60 percent or greater) (Hair et al, 2019). In this study, the 31-item ABI-T was extracted into four factors based on eigenvalues greater than one and the scree plot (as shown in **Figure 2**), accounting for 72.858 percent of the total variance (60.046 percent in the first factor, 5.265 percent in the second factor, 3.953 percent in the third factor, and 3.595 percent in the fourth factor).

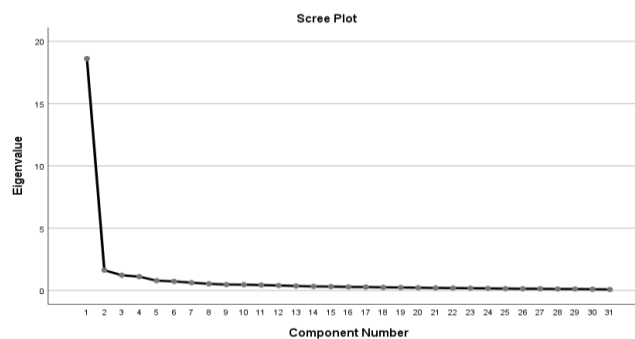


Figure 2: the scree plot of the ABI-T (31 items)

STEP 6: Extraction and rotation methods

Principal component analysis (PCA) was employed in this study to extract the ABI-T factors. The PCA is a dimensionality reduction method aimed at reducing the number of observable variables to a smaller number of core components when variables are normally highly correlated. According to the PCA findings, all 31 items of the ABI-T were extracted into four components. Nevertheless, certain items' factor loading was distributed across multiple components, resulting in cross-factor loadings. Oblique rotation with Promax and Kaiser normalization methods were used to overcome these issues.

However, there were still cross-factor loadings for items No. 5 (I'm not enthusiastic about studying) and No. 24 (I get upset when things don't go as planned), thus the decision was taken based on the theoretical concept along with the factor loading that was the highest. Item No. 5 had the highest factor loadings in

Factor 2 (Decreased cognitive function); hence, it was assigned to Factor 2. For item No. 24, despite the fact that the highest factor loadings are located in Factor 2, but it should be loaded in Factor 1 (Emotional instability) according to the theoretical concept. As a result, Item No. 24 was agreed to be loaded on Factor 1. The results of ABI-T factor extraction and rotation are shown in **Table 3**.

Table 3: Factor loadings of the ABI-T (31 items)

ITEMS	FACTOR			
	F1: Emotional instability	F2: Decreased cognitive function	F3: Lack of motivation	F4: Exhaustion
Item 27	.939			
Item 25	.929			
Item 29	.899			
Item 26	.882			
Item 28	.848			
Item 23	.673			
Item 30	.667			
Item 31	.651			
Item 22	.490			
Item 13		.876		
Item 14		.857		
Item 16		.853		
Item 18		.761		
Item 15		.758		
Item 17		.631		
Item 20		.562		
Item 19		.532		
Item 12		.507		
Item 24	.382	.483		
Item 21		.470		
Item 5		.372	.365	.313
Item 9			.908	
Item 7			.744	
Item 10			.739	
Item 8			.737	
Item 11			.731	
Item 6			.523	
Item 4				.763
Item 2				.518
Item 3				.484
Item 1				.476
Eigenvalue	18.614	1.632	1.225	1.114
% of variance explained	60.046%	5.265%	3.953%	3.595%
% of cumulative variance explained	60.046%	65.311%	69.264%	72.858%
Internal consistency (Cronbach's α)	.955	.955	.906	.880

Extraction Method: Principal Component Analysis; Rotation Method: Promax with Kaiser Normalization.

STEP 7: Naming and defining the factor

In conclusion, the ABI-T had 31 items that were extracted into four factors:

1) *Emotional instability* is a negative emotion caused by academic burnout that emerges as uncontrollable emotion, pressure, disappointment, and blunted emotion.

2) *Decreased cognitive function* is defined as a reduction in memory, concentration, focus, and executive function as a result of academic burnout, which leads to poor academic performance, frequent errors, or procrastination.

3) *lack of motivation* refers to a lack of inspiration in learning, a lack of determination, and a perception that the content you are studying does not suit your needs.

4) *Exhaustion* is defined as feeling fatigued, tired, having little or no energy, and requiring a great deal of effort to study.

DISCUSSION

The ABI-T was a novel measurement aimed at detecting early signs of academic burnout among Thai university students. A preliminary evaluation of item analysis and the scale's factor structure was proposed during the developmental process. The findings indicated that the ABI-T items generated by the literature synthesis review yielded 31 items. Regression analysis revealed that all of the items were significant predictors of the academic burnout composite score. Following that, the ABI-T factor structure was extracted using the EFA method to be four core components, namely, emotional instability, decreased cognitive function, lack of motivation, and exhaustion.

In comparison to the existing measurement, most studies adapted the Maslach Burnout Inventory-General Survey (MBI-GS) to the academic context as the Maslach Burnout Inventory-Student Survey (MBI-SS), and the three-factor structure (exhaustion, cynicism, and professional efficacy) was partially verified in student populations (Portoghese et al, 2018; Wickramasinghe et al, 2018; Pérez-Mármol, and Brown, 2019; Puranitee et al, 2019a; Charoentanyarak et al, 2020; Pérez Fuentes et al, 2020; AlShahrani et al, 2022). One crucial assumption was that employers and students had comparable experiences. In other words, it was automatically assumed that the concept of burnout was the same for employees and students. However, no actual data has yet to substantiate this premise. Thus, it is most effective when the measurement is designed with the academic context in mind. and the ABI-T substantially filled this gap.

The core factors of the ABI-T were discussed in comparison to other current measures of academic burnout. The factors of *emotional instability (F1)*, *lack of motivation (F3)*, and *exhaustion (F4)* shared similarities in the ABI-T and current measurements of the Maslach Burnout Inventory-Student Survey (MBI-SS) (Schaufeli et al, 2002), the Student Version of the Burnout Assessment Tool (S-BAT) (Schaufeli et al, 2020; Popescu et al, 2023), and the Oldenburg Burnout Inventory-Student Survey (OLBI-S) (Reis et al, 2015). Meanwhile, the MBI-SS included a factor of cynicism additionally.

However, in order to detect signs of academic burnout among higher-education students, one of the most important factors on the scale must be related to *cognitive function (F2)*. Because cognitive function relates to the ability to focus, concentrate, memorize, and perform executive functions (EF) such as cognitive flexibility, self-regulation, self-control, and higher-cognitive organization. Such abilities are critical for determining academic achievement in university students (Madigan and Curran, 2021; Rosales-Ricardo et al, 2021). As a result, it was crucial in developing the ABI-T scale to include cognitive function as one of the core factors, which was consistent with the S-BAT scale (Schaufeli et al, 2020; Popescu et al, 2023).

In addition, there was a discussion about academic burnout among university students in the context of higher education in Thailand. According to Thailand's Ministry of Higher Education, Science, Research, and Innovation's educational policy (from 2021 to 2027), the emphasis has been on strengthening manpower, particularly in the promotion of lifelong and multidisciplinary learning for all learners, and enhancing graduates' ability to meet labor market needs. As a result, Thailand is shifting toward outcome-based education and a skill-based learning approach (Ministry of Higher Education, Science, Research and Innovation, Thailand. 2022). The policy transformation requires university administrators, instructors, and students to raise their performance to match the new criteria. The educational system's high standards and

expectations may result in an excessive academic burden and ongoing academic stress for university students. Previous research on the prevalence of academic burnout among Thai university students found it to be high; however, the majority of these studies were carried out with medical and health science students (Puranitee, et al, 2019a; Puranitee, et al, 2019b; Taikerd et al, 2019; Charoentanyarak et al, 2020). The ABI-T was developed in this study to fill these gaps by measuring signs of academic burnout in non-medical university students. The findings differed from previous ones, which found that academic burnout among non-medical university students was moderate (quartile 3; percentile 56), indicating that major subjects should be considered as one of the covariate factors when determining academic burnout in higher-education students.

LIMITATIONS

The following limitations should be addressed: (1) The study focused on developing the ABI-T as a novel measurement for detecting signs of academic burnout, but with less regard for the variables that contribute to these conditions. Previous studies found that the variables underlying academic burnout were highly varied, including sociodemographic and psychological factors as well as those related to the university context, such as academic pressure, work overload, a lack of appropriate feedback, and a lack of fairness (Aguayo et al, 2019; Shankland et al, 2019; Jagodics and Szabó, 2022). As a result, future research may focus on internal and external aspects related to academic burnout in the context of that particular study. (2) The methods used in developing the ABI-T found in this study were only the preliminary steps of item analysis and factor structure analysis; however, future research should conduct a more in-depth analysis of the scale's psychometric properties, such as construct validity, convergent validity, concurrent validity, test-retest reliability, and intraclass reliability. Furthermore, methods for interpreting the ABI-T score should be addressed, such as assessing the scale's sensitivity, specificity, and ROC curve, as well as developing norms for university students, with the goal of upgrading the ABI-T to a standard psychological measure. (3) Despite the fact that the ABI-T scale was designed for higher-education students, this study only included undergraduates. Thus, the use of ABI-T by graduate students should be investigated further.

IMPLICATIONS

Although the ABI-T continues to be in its early stages of development, it is applicable for use at higher education institutions. The university counseling units may employ the ABI-T for the reason that screening enables early identification of students who are potentially at risk of experiencing academic burnout problems and who may benefit from early intervention. Additionally, screening enables professionals to anticipate how students will respond to common practices, allowing them to better tailor their recommendations to meet the needs of specific students.

The data obtained from the ABI-T is useful in providing recommendations for instructional management strategies both within and outside of the classroom. For example (Salgado and Au-Yong-Oliveira, 2021):

- reorganization of the pedagogy strategies, placing more focus on the practical part of learning;
- reorganization of instructional strategies and development of alternative assessment techniques (that do not rely primarily on examinations or tests);
- offer a variety of curriculum options so that students are able to pursue the subjects they truly appreciate and are appropriate for their vocational pathways;
- promote dynamic instruction to inspire and motivate students;
- assign proper responsibilities that provide a balance between group and individual tasks and are appropriate for the subject material.

Additionally, the information from the ABI-T could be beneficial to university counseling units or university departments that are in charge of the health and wellness of students and staff by implementing

beneficial practices. For example (Salgado and Au-Yong-Oliveira, 2021):

- extend the availability of seminars and workshops for the entire academic community where participants are able to learn how to manage their time, pressure, anxiety, and stress, as well as sessions on emotional resilience, emotional intelligence, and cognitive flexibility;
- extend the delivery of counseling services, mental health education campaigns, and group and individual orientation programs;
- develop an extracurricular physical exercise activity to promote teamwork and individual effort to lessen stress and strengthen interpersonal relationships;
- improve the physical environment of educational institutions to foster comfort, increase the number of social spaces to encourage interaction, and improve the comfort of leisure locations.

CONCLUSIONS

A novel instrument of measurement called the *Academic Burnout Inventory-Thai Edition (ABI-T)* was developed to detect early signs of academic burnout among Thai university students. During the development process, a preliminary evaluation of item analysis and the scale's factor structure was proposed. A total of 31 items on a 7-point Likert scale with the following four key factors have been retrieved from 293 Thai university students: namely, emotional instability, decreased cognitive function, lack of motivation, and exhaustion. The process for uplifting the standardization of the ABI-T was also discussed.

The implications of the ABI-T for higher education institutions are suggested. The information from the ABI-T is useful in recommending instructional management strategies. The ABI-T may also be useful to university counseling units or departments in charge of health and wellness as an alternate screening tool for early identification and monitoring to lower the risk of severe illnesses and enable the best possible therapy.

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Elements for Designing a Mobile Learning Environment for Problem-Solving of Probability: The Experts' Consensus

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ABSTRACT

It is important for students in the Malaysian Matriculation System who learn probability to develop problem-solving skills as it could help in important roles encompassing various fields. This study aims to identify the essential elements for designing a mobile learning environment that facilitates problem-solving of probability based on the consensus of experts in the area. Fuzzy Delphi Method (FDM) was employed to collect data from a panel of nineteen experts whose expertise ranged from Mathematics Education, Matriculation Mathematics, Technology in Education and Instructional Technology. A semi-structured interview was first conducted to come up with the elements and sub-elements required for the FDM questionnaire instrument. The questionnaire was developed using a five-point linguistic scale. The conditions to be fulfilled were that the threshold value (d) needed to be less than or equal to 0.2 and percentage of expert consensus needed to be greater than or equal to 75%. For the defuzzification process meanwhile, the fuzzy score (A) was required to be greater than or equal to the alpha-cut value of 0.5. The results indicated the experts' consensus on the elements objectives, contents, instructional strategies for students' learning, platform and technology. These findings have significant implications for designing the mobile learning environment for problem-solving of probability.

KEYWORDS: Probability; Problem-Solving; Fuzzy Delphi Method; Mobile Learning

INTRODUCTION

Living in a data-driven world today, probability and statistics affect all aspects of life. Concepts such as data, randomness, chance, probability and risk are the concepts in the mathematical realm of probability and statistics that are encountered daily. In keeping up with the age of information, the internet, television and newspapers are widely used. People come face-to-face with a huge amount of data in the working world and need to solve problems and make decisions in uncertain situations. Hence, it is safe to say that most countries include probability and statistics in their curriculum because their use in daily life, their roles in other fields of study and their contribution to the logical inquiry process are recognized (Koparan, 2022). Knowledge in statistics is important to students as when they eventually go into the employment world, the practice of working with the collection, presentation, analysis and use of data becomes applicable in making decisions, solving problems and in designing products and processes (Montgomery and Runger, 2018). It is noted that an increased emphasis has been accorded to the subject of probability in the curricular and this is substantiated with the increasing number of studies on this subject (Koparan, 2019, 2022). However, probability is a top subject where there is a scarcity of comprehensive learning environments. Instructional strategies are often limited to drilling exercises and the chalk and talk approach. For effective learning of the subject, a suitable environment to develop statistical problem-solving skills is required with mobile technology playing a central role in the learning environment.

Due to the myriad of issues pertaining to the learning of probability, namely that of students' inadequate abstract reasoning skills, their weakness in developing their reasoning ability and their usage of inappropriate visualisation forms that causes attention diversion through the illustration of unimportant information, students encounter difficulty in problem solving involving conditional probability (Abdul Rahman & Ansari, 2016; Lukac & Gavala, 2019). The current pedagogy, deemed rather dated (Crompton & Traxler, 2018) employs a more teacher centred learning which also contributes to the existence of time constraint in the delivery of the lessons (Aziz, 2005), hence further halting the development of students' probabilistic reasoning ability which is the essence of conditional probability. This indirectly hampers their progress in conditional probability problem solving. Therefore, it is important to have a learning environment that incorporates the aspect of mobility as well as visualisation suited to the needs of students to assist with their current difficulties in mastering conditional probability problem solving. There does not seem to be any mobile learning environment addressing problem solving in conditional probability and therefore, the need to design one to address the issues faced by students is very much existent. The aspect of mobility of learners' and mobility of devices in mobile learning is also pivotal in addressing the issue of teacher centred learning and time constraint present in the delivery of lessons by enabling learning to happen anytime and anywhere (Rahamat, 2019). The aspect of visualisation through tree diagrams and contingency tables is vital to illustrate clearly and systematically the possibilities or cases that need to be analysed during the process of problem solving (Lukac & Gavala, 2019). Hence by recognising the issues present in students' learning of conditional probability problem solving and the potentialities of mobile learning in addressing the issues, a mobile learning environment integrating mobile technology is designed by taking into consideration the opinion of experts in the areas.

Since the number of mobile phone users have been increasing, pre-university colleges in Malaysia, namely the Malaysian Matriculation Colleges should embrace this technology of learning. As for students, learning mathematics, namely that of conditional probability is not just to settle for the regurgitation of facts, but also to build up their understanding of the concept. Since students need more platforms to practice and communicate in probability language, it would be apt to adopt a mobile learning environment for learning independently or collaboratively with others. The integration of technology in teaching and learning acts as a means of assistance to students who face difficulties in grasping complex concepts. The mobile learning environment designed with the experts will allow conditional probability to be learnt and taught in a more active mode that incorporates a variety of media, namely written, visual and audio. Given the educational climate of Malaysia, this idea will promote greater engagement with the content material and a deep

approach to its learning (Norman & Ghazali, 2022).

Since there has been no research investigating the elements needed to design a mobile learning environment at the moment, this study intends to provide insights on the suitable elements of the mobile learning environment (MLE) for conditional probability problem-solving by taking into consideration the opinion of experts. Thus, this study will be investigating what the suitable elements are for designing a mobile learning environment and will answer the following research question: what are the suitable elements of the mobile learning environment for conditional probability problem-solving according to experts?

METHODOLOGY

With the objective being to design a mobile learning environment (MLE) based on problem-solving of Probability for pre-university level according to the opinions and views of the experts' panel, the Fuzzy Delphi Method (FDM) was employed for this purpose. The FDM is a variant of the traditional Delphi Method that incorporates fuzzy logic principles. It is often used in decision-making and consensus-building processes to handle uncertain and ambiguous information. The FDM was suitable for the objective of this study because developing an MLE involved the handling of complex and ambiguous information involving the objectives, contents, instructional strategies for students' learning, platform and technology. FDM could accommodate this complexity and ambiguity by allowing the experts to express their opinions using the linguistic scale which was well suited for dealing with uncertain information. Besides that, the FDM was useful in achieving the objective of the study as it involved a group of experts who contributed their insights and opinions. In the context of this study, experts from the field of Matriculation Mathematics, Mathematics Education, Technology in Education and Instructional Technology provided valuable input and the FDM helped to aggregate their diverse opinions and reach a consensus on the essential elements and sub-elements for the mobile learning environment. The FDM also assisted in prioritising the sub-elements of the respective elements based on the experts' collective judgements as certain sub-elements may be more critical than others.

Participants

Experts who were selected for the study fulfilled the criteria of having more than five years of experience in their field (Berliner, 2004; Akbari & Yazdanmehr, 2014), possessed the required expertise and were trained in that particular field (Needham, 1990; Mullen, 2003; Powell, 2003). In order to determine the learning environment's design, a consensus among a panel of experts was obtained on the elements and sub-elements of objectives, content, instructional strategy for students' learning and suitable platform or technology. The panel of experts were made up of eight males and eleven females. Their expertise ranged from that of Matriculation Mathematics, Mathematics Education, Mobile Learning, Instructional Technology, Problem-solving and Technology in Education. In particular, there were five matriculation college lecturers, twelve university lecturers, one lecturer from the institute of teacher education and one policymaker. This was to ensure that there was a balance of practitioners and academicians in the pool of experts. The eight experts who were interviewed for the development of the Fuzzy Delphi Instrument were included in the experts' pool that was involved in responding to the Fuzzy Delphi Questionnaire Instrument. The experts possessed eleven years to twenty-eight years of experience in their respective fields of expertise.

Table 1

Summary of Expert Panels' Details

Number of Experts	Area of Expertise	Years of Experience	Position	Highest Qualification
5	Matriculation Mathematics Problem-solving	13 – 17	Senior Lecturer	Master's, PhD
5	Mathematics Education Problem-solving	11 – 26	Associate Professor Senior Lecturer	PhD
4	Technology in Education Mobile Learning	13 – 28	Professor Associate Professor Senior Lecturer	PhD
5	Instructional Technology	11 – 19	Associate Professor Senior Lecturer Senior Assistant Director	PhD

Round 1 of the FDM: Semi-structured interview

The first part of the data collection in the FDM employed the semi-structured interview involving eight experts. The eight experts involved possessed relevant experience and expertise in the areas concerning mathematics education, matriculation mathematics, technology in education and instructional technology. These experts were deemed fit for their role as they were chosen due to their competence and knowledge which helped improve the study's validity. The thematic analysis done saw the emergence of the themes objectives of the MLE, content that was going to be the focus of the MLE, instructional strategies for students' learning and the suitable platform for the delivery of the MLE. Based on the elements and sub-elements that emerged from the opinions of experts, the Fuzzy Delphi Instrument in the form of a questionnaire was developed. Six items were formed for the theme of objective, twelve items for content, six items for instructional strategies for students' learning and thirteen items for platform respectively.

Round 2 of the FDM: Distribution of Fuzzy Delphi instrument

Based on the suggestions of the experts' panel during the interview process, the Fuzzy Delphi Instrument was designed. Through the emergence of elements and their respective sub-elements from the interview done in the first part, the instrument was administered to other experts to determine the agreement extent. In order to ensure there was consistency between the interview findings and elements chosen, the eight experts who were interviewed in Round 1 from the panel of nineteen experts were also included in the questionnaire round.

DATA ANALYSIS

Data yielded via experts' interview was analysed by means of the thematic analysis (Braun & Clarke, 2006). Through this, data was put in categories in order to spot elements to be incorporated into the mobile learning environment. Based on the categories suggested by the experts' panel during the interview process, the Fuzzy Delphi Instrument was designed. Through the emergence of themes from the interview done in the first part, the instrument was administered to other experts to determine the agreement extent. In order to ensure there was consistency between the interview findings and elements chosen, the eight experts who were interviewed in Round 1 were also included in the questionnaire round.

Data from the FDM instrument was analysed by using Microsoft Excel. The issue of fuzziness among

experts was addressed through a linguistic scale similar to that of a Likert scale with the provision of additional fuzzy numbers. These considerations were given attention to in designing the Fuzzy Delphi instrument whereby the level of importance was placed upon the identified elements; objectives of the MLE, content that was going to be the focus of the MLE, instructional strategies for students' learning and the suitable platform for the delivery of the MLE of the problem solving instruction related to the learning of conditional probability by using mobile learning. Only the elements deemed to be relatively important were further considered for the study. The degree of importance, which ranged from 'very unimportant' to 'very important' could be positive or negative (Kardaras et al., 2013). It was represented in a 5-point linguistic scale with 1 = Unimportant, 2 = Little important, 3 = Moderately important, 4 = Important, 5 = Very important. This represents the 5-point linguistic scale for the agreement level. The steps involved in FDM are as follows:

Step 1: Selecting the eligible panel of experts according to the criteria of 10-15 experts (Adler & Ziglio, 1996) or 10-50 experts (Jones & Twiss, 1978).

Step 2: Determining the linguistic scale according to the triangular fuzzy number in order to frame feedback.

Step 3: Calculating the mean of experts' opinions for each dimension.

Step 4: Determining the distance between two fuzzy numbers to determine the threshold, d . If the value of d is less than or equal to 0.2, therefore the experts have all reached a consensus. Otherwise, it requires a round two.

Step 5: Determining the consensus of the group. The group consensus percentage needs to exceed 75%, otherwise needing round two to be conducted.

Step 6: Identifying the Alpha-cut level for the selection of elements to develop the mobile learning environment; literature mostly makes use of an Alpha-cut level of 0.05.

Step 7: Aggregating the Fuzzy Evaluation by adding up all the fuzzy numbers.

Step 8: Carrying out the Defuzzification process which is a conversion technique of the numbers into crisp real numbers.

Step 9: Choosing the elements according to the defuzzification value to rank. The element with the highest defuzzification value will be prioritised and ranked the highest.

FINDINGS

This section reports the FDM consensus from the nineteen experts. The aspects of which the consensus was obtained for are objectives, contents, instructional strategies for students' learning, platform and technology to be used. The conditions to be fulfilled were that the threshold value (d) needed to be less than or equal to 0.2 and percentage of expert consensus needed to be greater than or equal to 75%. For the defuzzification process meanwhile, the fuzzy score (A) was required to be greater than or equal to the alpha-cut value of 0.5.

Objective

Table 2
Sub-elements of Objective

No.	Item	Threshold Value (d)	Percentage of Expert Consensus (%)	Fuzzy Score (A)	Expert Consensus	Ranking
1.	Solve conditional probability problems.	0.194	89	0.704	Accepted	3
2.	Represent problems by using diagrams.	0.183	100	0.705	Accepted	2
3.	Show the steps taken to solve conditional probability problems.	0.162	95	0.716	Accepted	1

Under the element of Objective, Items 1, 2 and 3 obtained an experts consensus of greater than 75% each and a d value below 0.2. Hence, these three items were accepted. Based on the defuzzification values of the accepted items, Item 3 ranked the highest as it had the highest fuzzy score of 0.716 and this was followed by Item 2 which ranked second with a fuzzy score of 0.705 and Item 1 which came in third with a fuzzy score of 0.704 as can be seen on Table 2. This showed that most of the experts perceived “showing the steps taken to solve conditional probability problems” as the most important objective of the MLE.

Content

Table 3
Sub-elements of Content

No.	Item	Threshold Value (d)	Percentage of Expert Consensus (%)	Fuzzy Score (A)	Expert Consensus	Ranking
1.	Real-world contextual problem scenarios	0.154	95	0.726	Accepted	1
2.	Step-by-step instructions on how to solve the problems	0.186	89	0.695	Accepted	3
3.	Diagrams to assist with carrying out steps to solve the problems	0.168	95	0.653	Accepted	4
4.	Prior knowledge related to the problem	0.149	100	0.716	Accepted	2
5.	Independent and dependent events	0.186	89	0.695	Accepted	3

In order to map out the relevant content areas to be included in the MLE, experts’ opinions regarding the items under the Content element were acquired. The threshold value (d), experts consensus percentage, defuzzification value and ranking of each item contained under the banner of Content element with regard to the consensus of the experts are as portrayed in Table 3. Most of the experts were in agreement that Item 1 that is “Real-world contextual problem scenarios” is the most important content as it ranked top with the highest fuzzy score of 0.726. This was followed by Item 4 which was “Prior knowledge related to the

problem” which had a fuzzy score of 0.716. Being jointly ranked third were Items 2 and 5 which were “step-by-step instructions on how to solve the problems” and “independent and dependent events” respectively. “Diagrams to assist with carrying out the steps to solve problems” came in fourth in ranking among all the items which were accepted according to the percentage of the experts’ consensus.

Instructional Strategies for Students’ Learning

Table 4
Sub-elements of Instructional Strategies for Students’ Learning

No. Item	Threshold Value (d)	Percentage of Expert Consensus (%)	Fuzzy Score (A)	Expert Consensus	Ranking
1. Problem based learning	0.102	79	0.758	Accepted	1
2. Co-operative learning	0.186	89	0.684	Accepted	4
3. Collaborative learning	0.168	95	0.684	Accepted	4
4. Inquiry based learning	0.142	100	0.726	Accepted	2
5. Game based learning	0.169	95	0.695	Accepted	3

The element Instructional Strategies for Students’ Learning contained items to plan the approaches in the MLE. The threshold value (d), expert consensus percentage, fuzzy score (A) and ranking of every accepted item under this element gauged by taking into consideration the consensus of the experts is displayed in Table 4. Most of the experts were in agreement that the first item which was “problem based learning” was the most important one to be considered for inclusion in the MLE as it raked the highest fuzzy score (A) of 0.759.

Platform

Table 5
Sub-elements of Platform

No. Item	Threshold Value (d)	Percentage of Expert Consensus (%)	Fuzzy Score (A)	Expert Consensus	Ranking
1. Google Classroom	0.173	95	0.684	Accepted	2
2. Websites	0.149	100	0.684	Accepted	2
3. Education mobile applications	0.183	89	0.674	Accepted	3
4. Interactive learning platforms	0.086	79	0.621	Accepted	5
5. Youtube	0.097	79	0.632	Accepted	4
6. Google Workspace for Education	0.162	95	0.716	Accepted	1

The platform element contained items to plan the platform to deliver the MLE. The threshold value (d), expert consensus percentage, fuzzy score (A) and ranking of every accepted item under this element gauged by taking into consideration the consensus of the experts is displayed in Table 5. Google Workspace for Education came out as the top ranked item with a defuzzification value of 0.716 while the Google Classroom and websites were ranked second with a defuzzification value of 0.684.

Technology

Table 6
Sub-elements of Technology

No. Item	Threshold Value (d)	Percentage of Expert Consensus (%)	Fuzzy Score (A)	Expert Consensus	Ranking
1. Mobile phones/ smartphones	0.102	79	0.758	Accepted	1
2. Laptops	0.168	95	0.705	Accepted	2

The technology element contained items to decipher the suitable technology to facilitate the MLE. The threshold value (d), expert consensus percentage, fuzzy score (A) and ranking of every accepted item under this element gauged by taking into consideration the consensus of the experts are displayed in Table 5. Mobile phones came out as the top ranked item with a defuzzification value of 0.758 while laptop was ranked second with a defuzzification value of 0.705.

DISCUSSION

This section discusses the findings from the analysis of the Fuzzy Delphi Method carried out to identify the experts' consensus of the elements for the mobile learning environment for problem-solving of probability at pre-university level. As stated in the findings earlier, the items under the respective elements were prioritised according to their rankings. The experts' consensus in this study depicted the priority listing of the required elements for the MLE in terms of the objective, content, instructional strategy for students' learning, and suitable platform or technology for delivery. The sub-elements of the respective elements showed acceptance by the experts. The findings were used as a guide in coming up with the elements to develop a MLE for problem-solving of probability at pre-university level.

Under the aspect of objectives, in developing a MLE, it is important that the learning objectives chosen are a reflection of the needs of students in order to make sure that students can then achieve what the MLE intended to convey in the first place. The needs of the students were established through the needs analysis done to identify their perceptions of their problem-solving skills and their ability to problem solve. The experts agreed that problem-solving skills needed to be emphasised as the skills were essential in developing higher order thinking skills. The objectives accepted by the experts were that by the end of making use of the MLE, students should be able to represent problems by using diagrams, show the steps taken to solve conditional probability problems and solve conditional probability problems. These items indicate that the strategy and process of problem-solving should be the focus of the MLE. This finding resonates with (Al-Khateeb, 2018) who acknowledged that these objectives as being slaves to time constraints and the traditional learning setup, hence much more reasonable to be accomplished in a mobile learning setting. Following the evidences put forth by (Shchedrina et al., 2020), the accepted learning objectives for the MLE were arranged according to their level of cognitive complexity.

In designing the content of the MLE, the experts agreed that real-world contextual problem scenarios, prior knowledge related to the problem, step-by-step instructions on how to solve the problem, independent and dependent events and diagrams to assist with carrying out the steps to solve the problems needed to be included in the MLE. The content which received the highest expert consensus here was real-world contextual problem scenarios. With students often questioning the need to study mathematics and statistics (Schukajlow et al., 2017), this was understandable as there have been concerns for mathematics educators related to the inadequacy and lack of relevance of traditional learning methods to engage students in

problem-solving (Kohen & Orenstein, 2021; Sierpinska, 1995; Wu & Adams, 2006). Exposing students to authentic problems of conditional probability has the potential to improve their understanding of real-world situations from a mathematical perspective (Hernandez-Martinez & Vos, 2018). Prior knowledge related to the problem and the step-by-step instructions on how to solve the problem assisted by the usage of diagrams also achieved agreement between the experts for inclusion in the MLE. This shows that focusing on the mechanics of the problem solving coupled with emphasis on visual representation and underlying concepts are central to making a difference in students' ability to solve conditional probability problems (Chow & Van Haneghan, 2016; Even & Kvatinsky, 2010). In Brase (2007), he suggested that the evolution of human capabilities to address probabilities was linked to affordances of previous learning so much so that in cases where there was a lack of such affordances, problem solving was less intuitive. In addition to that, independent and dependent events of conditional probability also achieved the desired consensus of the experts to be considered in the MLE. The high misconception rate of independent and dependent events has been faulted on the lack of prominence they have been given in the curriculum resulting in them only being covered if time permitted (Molnar, 2016). Therefore the inclusion of independent and dependent events in the MLE creates an opportunity for its learning with the affordance of learning happening anytime and anywhere in the MLE.

The outcome of the experts' agreement when it came to instructional strategy for students' learning ranked problem based learning to be the top instructional strategy for the MLE. Problem based learning being a student-centred method of learning is suitable for mobile learning as it controls and guides the activities done by students in that learning environment (Binsaleh & Binsaleh, 2020; Othman et al., 2013; Yusof et al., 2016; Yusoff et al., 2021). The strategies of problem based learning plays an essential role in helping students transfer their experience of analysing the learning activities critically to their day-to-day activities in life especially when they need to solve problems (Chiang et al., 2009; Hawari & Noor, 2020).

For suitable platform for the mobile learning environment, Google Workspace for Education, Google Classroom, websites, education mobile applications, Youtube and interactive learning platforms were accepted for inclusion. Google Workspace for Education which has tools such as Google Classroom that acts as a virtual classroom positively impacted students' learning experience and the platform was accessible and easy to use on mobile devices (Gupta & Pathania, 2021). It has proven to be effective in improving students' access and attentiveness towards learning, and the knowledge and skills gained through the platform makes learning more efficient and enjoyable (Hussaini et al., 2020). Google Classroom is a platform that is good for the landscape of learning today because through Google Classroom, students get to collaborate and discuss in groups while working on their tasks (Ching, 2022). Google Classroom offers several benefits for mobile learning environments such as flexibility, instantaneous deployment of material, mobile-friendly interfaces, more storage space and a platform that is both secure and versatile (Bradley, 2021; Chatterjee et al., 2023; Kayali et al., 2016). Mobile friendly websites are becoming increasingly popular for mobile learning environments given the increasing use of mobile devices for accessing online content.

For suitable technology for the mobile learning environment, mobile phones and laptops were accepted for inclusion. Previous research findings have suggested that mobile phones were a suitable technology for mobile learning environments, providing students with new learning opportunities that were not limited by place and time as well as supporting different learning styles (Ahmad, 2018; Al Hosni, 2016; Bernacki et al., 2020). Laptops are among the devices commonly used for mobile learning (Majeed, 2014). Laptops are suitable for mobile learning environments as they offer benefits of access to learning materials, self-directed learning opportunities and tools for collaboration and engagement (Demir & Akpinar, 2018; Mouza, 2008). Laptops are essential in a mobile learning environment for learning probability due to its capability of giving students the chance of supplemental thinking and enhancing problem-solving skills by enhancing communication and collaboration (Mouza, 2008; Sung et al., 2016).

CONCLUSION

This study intended to identify the required elements to design a mobile learning environment based on problem-solving of probability. The findings of this study suggest that the elements objective, content, instructional strategy for students' learning, platform and technology are essential when wanting to come up with a mobile learning environment for students' learning of conditional probability. This can guide Higher Education Institutions to come up with learning environments which are relevant to students' needs and endorsed by experts in the field. More research can be carried out with experts from other pre-university institutions. The information gained from this study can be used as a concrete input to design a mobile learning environment for problem-solving of probability for pre-university level.

This study will add to the existing body of knowledge with regard to experts' consensus in determining elements for designing learning environments for learners. By addressing relevant concerns about creating and planning a mobile learning environment for students' learning, it is clear that focus needs to be paid to how these efforts are brought together and emphasised appropriately to ensure that the elements incorporated are for the betterment of the present and future learning of the students.

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Training Opportunities and Required Skills for Institutional Research Programs in Japan

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ABSTRACT

While more and more universities in Japan are establishing Institutional Research (IR) offices, there is a need to improve the skills of faculty and staff involved in IR and to provide training opportunities for them. Therefore, this study examined two questions: [Q1] What human resource development programs are currently being implemented in Japan, and [Q2] What knowledge and skills do IR personnel at universities nationwide consider necessary? In relation to [Q1], we summarized the actual status of short-term training programs for IR human resource development held in Japan from FY 2010 to FY 2021, and found an increasing trend in the number of short-term training programs since FY 2014 and fewer training programs involving group work and exercises. Next, we conducted a questionnaire survey of IR professionals across Japan regarding [Q2], and found that many of them said that knowledge and skills corresponding to “contextual intelligence” and “issues intelligence” were necessary, and among those corresponding to “technical/analytical intelligence,” there were differences in their perception of the necessity of these skills. In addition, when asked to self-evaluate their knowledge and skills, some respondents gave lower self-evaluations than they did in terms of perceived need.

KEYWORDS: Institutional Research, Training Programs, Skills Development, Personnel Training in Japan

1. INTRODUCTION

1.1 Background and Issues

In recent years, Japanese universities have been rapidly establishing “Institutional Research” (IR) offices and hiring the requisite IR personnel. According to a survey conducted by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) on the “Status of Reform of Educational Content at Universities” (from FY2011), “the number of universities with an office specializing in university-wide IR” increased from only 7% (56 universities) in FY2011 to 49% (381 universities) by FY2020. Similarly, the “number of universities with full-time staff in offices specializing in IR” increased from 6% (44 universities) in FY2011 to 36% (280 universities) in FY2020, and the “number of universities with full-time faculty in offices specializing in IR” increased from 2% (16 universities) in FY2011 to 17% (133 universities) in FY2020. Additionally, the “number of universities with a full-time faculty member in charge of IR” increased from 2% (16 universities) in FY 2011 to 17% (133 universities) in FY 2020.

This establishment of IR offices in Japan has progressed at such a rapid pace due to the policy advocating the need for such offices and the influence of inducement policies linked to subsidies. The beginning of IR in Japan can be traced back to 1991, when self-inspection and evaluation became obligatory as a result of the generalization of the Standards for the Establishment of Universities (Nakao et al., 2021); however, it has spread rapidly under the influence of policy documents and subsidy policies since the late 2000s (Japan Association for Institutional Research (JAIR), 2022). The word IR clearly appeared for the first time in a policy document by the MEXT in 2008 (MEXT 2008, Kobayashi & Yamada, 2016), in reports in 2012 and 2014, and in guidelines for teaching and learning management in 2020, which have all repeatedly pointed out the importance of IR (JAIR, 2022). Regarding inducement policies in conjunction with subsidies, various new institutional competitive subsidies have been introduced since the “University Reform Action Plan” in 2012, and the establishment of IR and its efforts have been questioned in the selection criteria (JAIR, 2022). In addition, since FY2013, the ordinary expense subsidy system for private universities has also set the establishment of IR offices, human resource development, and initiatives as evaluation items; this has also been a major inducement for private universities to establish IR offices (JAIR, 2022).

While the establishment of IR offices and the assignment of personnel in charge have spread rapidly in Japan as described above, challenges in the management of IR offices and human resource development have also been raised. Shimizu (2019), based on a questionnaire survey of IR offices at Japanese universities, identified issues, such as “lack of manpower and time,” “scattered data,” “worries about aggregation, analysis methods, and reporting methods,” and “unclear objectives of analysis and IR offices.” Simply put, as Funamori (2016) states, IR in Japan is still in a transitional stage, and both the offices and the employment of human resources are still unstable. As these issues have gradually become apparent, the importance of IR human resource development has been pointed out (e.g., Takata 2018). In addition, Murasawa and Iseri et al. (2023), using data merging awareness variables from a questionnaire survey of IR offices in Japan with objective variables from the institutions, found that even after controlling for institutional attributes and years of IR office experience, an increase in the number of offices implementing IR human resource development measures led to more “unclear data collected,” and “unclear analysis.” Additionally, the results revealed that the offices had a lower awareness of issues, such as “unclear data to be collected,” “unclear on the necessary analysis,” and “unclear on the positioning of the organization within the university.” Given these qualitative references and the results of our analysis, we believe that IR human resource development efforts are important for the smooth operation and development of IR offices. In addition, Lin et al. (2018), who surveyed the current IR status in Japan, mentioned, “providing professional development and a career path for institutional researchers is essential to build their capacity, such as providing stable positions for IR staff and training courses to enhance their qualifications (p. 252).” Consequently, we have been engaged in research aimed at building the skill set required for IR personnel and creating a curriculum for their development, as well as a standard textbook

for use in training courses. This research activity is one of three that will be conducted as part of Grant-in-Aid for Scientific Research's “Establishment of an Academic Foundation for University IR, Human Resource Development, and Related Technology.” To achieve this, we are first conducting a survey to determine (Q1) what kind of human resource development programs are currently being implemented in Japan and (Q2) what kind of knowledge and skills IR personnel at universities nationwide consider necessary.

1.2 The status of external IR human resource development opportunities in Japan

In relation to (Q1) above, Iseri, Oishi, et al. (2022) used archived data from “Asagao-ML,” a past mailing list (ML) service for higher education professionals in Japan to determine the actual status of external training opportunities for IR held in Japan from 2010 to FY2021. “Asagao-ML” is widely recognized by Japanese higher education professionals and has often been used as a forum for disseminating information on IR, making it possible to conduct a somewhat comprehensive survey of information on announcements regarding IR training opportunities. From the archived data of more than 11,000 titles and texts of this ML for FY 2003-2021, we extracted those that contained either the words “IR” or “Institutional” in the title or text, and further narrowed down those that were truly related to IR. The result of this extraction was 314 short-term training courses related to training in IR between FY 2010 and FY 2021. A summary of the aggregate results based on this data is provided below. The results show an increasing trend in the number of training sessions held in the first half of 2010, and the number has remained high, exceeding 40 sessions since 2015 (Figure 1).

In addition, although universities are the main organizers of these training sessions, companies have also been increasingly involved in holding these sessions since 2015, and in FY2015 and FY2021, more than 30% of the training sessions were either sponsored or co-sponsored by companies. These trends suggest the influence of the introduction of institutional competitive grants and recurring subsidy programs that made IR one of the evaluation items after FY2012, and that there were several ICT companies and educational businesses that saw these developments as a commercial opportunity. The survey also revealed that the percentage of “participatory” training, in which participants engage in hands-on exercises and group work, was low. The percentage of “participatory” training has remained at about 20-30% every year since FY2015, with the majority of training sessions consisting only of listening to case studies and lectures. To clarify (Q2) above, we then conducted a questionnaire survey in FY2022 of IR personnel at universities throughout Japan. The results are discussed in detail in the subsequent sections of this paper.

2. METHODS

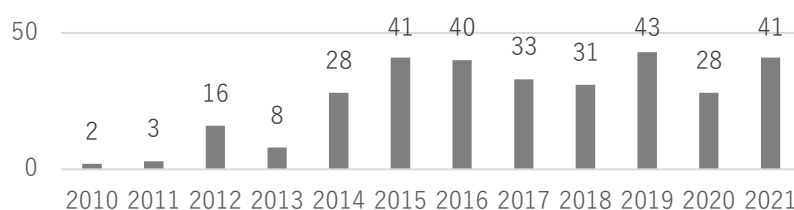


Figure 1: The number of external training opportunities for IR held in Japan

To accomplish the aforementioned objectives, we conducted a questionnaire survey of IR professionals across the country in FY2022. The outline of the questionnaire survey is as follows.

Objective: To clarify the awareness of IR as a subject of academic research, and the actual state of knowledge and skills of personnel in charge of IR in Japan

Target: Faculty and staff belonging to national, public, and private universities in Japan, who are primarily responsible for IR-related activities

Survey period: Late December 2022 - early February 2023

Collection method: A request letter was sent to a total of 806 Japanese universities (86 national universities, 94 public universities, and 626 private universities), asking them to respond via Google Form on an individual basis, not on an office basis.

Valid responses: 282 (one respondent, who did not provide consent for the research, was excluded)

Questions: Respondent's position as an IR, respondent's field of expertise, final academic degree, years of experience in research activities, years of experience as an IR practitioner, effort rate for IR work, field of activity of IR office, past and future treatment of IR personnel, views on IR-oriented research, requests and suggestions for promoting IR activities, knowledge and skills that are necessary (27 items in all), self-evaluation of knowledge and skills (27 items in total), and reasons for acquiring knowledge and skills.

Among the above questions, items related to the skill sets of IR personnel are shown in bold and underlined. These items were formulated through the following process. First, we organized the past IR questionnaire surveys in Japan according to whether they were conducted on offices or individuals. Then, the knowledge and skill items from the “Survey on the Knowledge and Skills of IR (Evaluation) Professionals” (Shimada & Ohno 2022) and the “survey for the development of a brand-new curriculum for the training of IR personnel” (Oishi 2021), which were conducted on individuals, were listed. The items from these surveys were then broadly grouped or subdivided by the collaborators by comparing and contrasting the three layers of “organizational intelligence” described by Terenzini (1993), resulting in the 27 items shown 3.4 and 3.5 later in this section. The 27 knowledge and skill items were classified into four categories. Before making this classification, a confirmatory factor analysis with maximum likelihood estimation and promax rotation was conducted using the responses for the necessity of knowledge and skills. As a result, five factors were extracted. We named them A = technical/analytical intelligence (1), B = technical/analytical intelligence (2), C = generic skills, D = contextual or issues intelligence, and E = other independent items. After this confirmation, A and B were merged in this paper and broadly classified into four types of knowledge and skills. The confidence coefficient (Cronbach’s alpha), after the merge, ranged from 0.75 to 0.90.

Although 282 valid responses were obtained, it is difficult to calculate the exact response rate because there are no statistics that accurately indicate the population size of the number of IR professionals in Japan. However, based on the Full Time Equivalent (FTE) survey of IR officers for Japanese universities by Shiraishi and Hashimoto (2018), the weighted average FTE value for all national, public, and private universities in Japan is 0.85. Although the current FTE value may have increased considering the difference in time periods and subsequent policy support for IR, we can infer from this figure that there is approximately one IR person per university in Japan. And since the number of universities to which we sent the request letter is 806, the approximate population size is considered to be about 806. If the population size is 806, the collection rate is estimated to be about 35% (282/806). In terms of the estimated recovery rate, the sample is not unrepresentative. However, this anonymous survey does not confirm the institutional affiliation of the respondents and there are no statistics available to show the true distribution of IR professionals in Japan. Therefore, it is difficult to estimate how representative the sample is of the population in terms of respondents’ attributes. We plan to conduct a more detailed study in this regard.

The results, focusing on the basic attributes of the respondents, as well as their knowledge and skill needs and self-assessment are presented in the paper.

3. RESULT AND DISCUSSION

3.1 Respondent's Position

Regarding the respondents' positions, 199 (70.6%) were IR practitioners, 56 (19.9%) were heads of the IR department, 4 (1.4%) were in charge of IR administration and general affairs, 13 (4.6%) were handling both IR and non-IR tasks, and 10 (3.5%) were university staff, faculty, or executives (Figure 2).

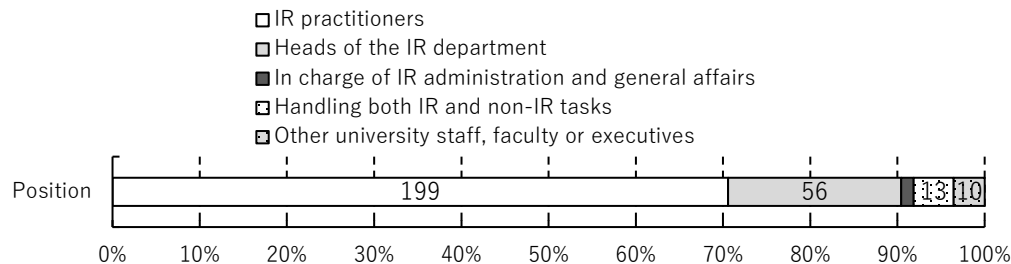


Figure 2: The position of the respondents

3.2 Respondent's last level of education

Concerning the respondents' last level of education, 133 (47.2%) were bachelor's degree holders, 61 (21.7%) held master's degrees, 76 (27%) held doctorates, and 12 (4.3%) were in other categories or missing (Figure 3). Note that according to MEXT (2016), 75.9% of full-time university faculty members have a master's degree or higher as their final education, whereas according to the Nationwide Survey of University Staff (2021), this percentage is 7.6% of the staff. The fact that about half of the respondents in this sample had a master's degree or higher as their final education suggests that the sample includes a large number of respondents who are involved in IR as highly educated staff or faculty members.

3.3 Respondent's years of experience in IR practice

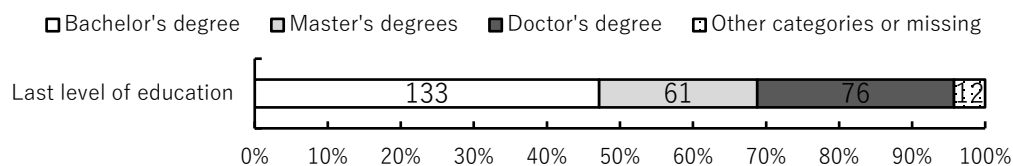


Figure 3: The respondents' last level of education

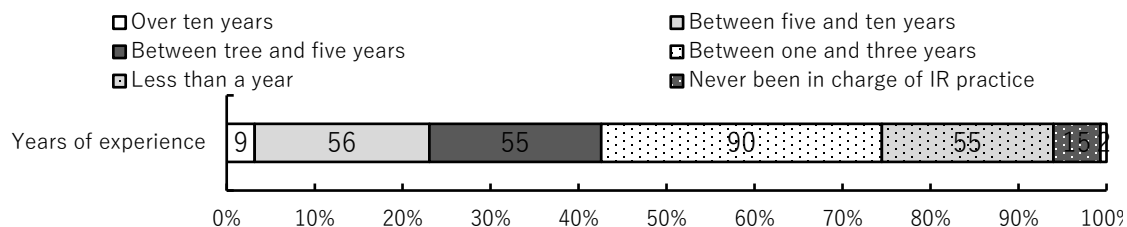


Figure 4: Years of experience as an IR practitioner

In terms of the respondents' years of experience as an IR practitioner, 9 (3.2%) had over ten years, 56 (19.9%) had between five and ten years, 55 (19.5%) had between three and five years, 90 (31.9%) had between one and three years, 55 (19.5%) had less than a year, 15 (5.3%) had never been in charge of IR

practice, and 2 (0.1%) were missing (Figure 4). Broadly speaking, about half of this sample had been practicing IR for three years or more, and about half had been practicing IR for less than three years.

3.4 Necessity for knowledge and skills in IR

As shown in Figure 6, there are 27 items of knowledge and skills, and they were classified as follows, referring to “Organizational Intelligence” by Terenzini (1993): from the top of Figure 6, “Higher education” to “Other higher education institutions” were classified as “contextual intelligence” or “issues intelligence,” and from “Related to data bases” to “ICT literacy” were classified as “Technical/analytical intelligence.” Then, “Presentation skills” through “Interpersonal negotiation skills” were classified as generic skills, and “Ethics in handling data” and the following four items were classified as other independent items. A summary is presented below. Note that in the following tabulations, each item is excluded from the list of items for which there was no response. The denominator (n) used to calculate the percentages differed by response, but all ranged between 278 and 281.

First, 216(76.9%) answered “Necessary” for knowledge of “Higher Education” and 184(65.5%) for knowledge of “Higher education policy.” Knowledge of “Teaching and research aspects of own institution,” was answered by 222(79.0%), and Knowledge of “Organizational and managerial aspects of their institution” was answered as “Necessary” by 199(70.8%) . These were all items that were answered as necessary by a relatively large number of respondents. Although the figures are omitted, a comparison of the above-mentioned response trends among respondents with less than 3 years of IR experience (n=140, excluding those with no IR practice) and those with 3 years or more of IR experience (n=120) shows that respondents with 3 years or more of IR experience were more likely to answer “Necessary” for “Higher Education” and “Higher Education policy” than those with less than 3 years of IR experience. The results show that the percentage of respondents who answered “Necessary” was about 10 percentage points higher for the two items of “Higher Education” and “Higher Education policy” among those who had been in charge of IR in Japan for at least three years.

Next, looking at the items corresponding to “technical/analytical intelligence,” “Related to databases” was answered by 169(60.1%), “Data analysis infrastructure” by 183(65.1%), and “Data aggregation and descriptive Statistics” was answered by 195(69.9%), “Data visualization” by 199(70.8%), “Related to spreadsheets (Excel, spreadsheets, etc.)” by 208(74.3%), and “ICT literacy was answered as “Necessary” by 191(68.0%). On the other hand, the percentage of “Necessary” for the other items related to “technical/analytical intelligence” was less than 50%.

Finally, General skills and other items are identified. Presentation skills” and “Interpersonal negotiation skills” were all selected as “Necessary” by more than 50% of the respondents. Ethics in handling data” was answered as “Necessary” by 222 (79.0%), while the other items were answered by less than 20%.

From these results, we discuss the structure of knowledge and skills required of IR professionals in Japan and the possible implications for human resource development programs. Some items under “technical/analytical intelligence” are highly required in Japan possibly because this intelligence is positioned at the bottom of the essentials list for IR personnel in the U.S. However, the other items included in this intelligence were not highly necessary, indicating that there is a hierarchy within this intelligence. Therefore, it is possible to separate the essential from the optional items. Based on this classification, we can examine the subject structure of human resource development programs, taking into account the learning stage. We found that the need for “contextual intelligence” and “issues intelligence” was high in Japan. In addition, the need was higher for those with more years of experience, suggesting that the management level in IR offices perceived this intelligence to be more necessary. This is consistent with the fact that these two intelligences were originally considered to be higher on the list of “technical/analytical intelligence.” The percentage of respondents who believed that presentation and interpersonal negotiation skills were necessary was about 10% higher for people with experience of three

or more years. These results suggest the need for training opportunities to develop the knowledge and skills of management-level professionals in IR offices.

3.5 Self-assessment of knowledge and skills in IR

Next, we will review the self-assessment of the aforementioned knowledge and skills. Although the survey questionnaire asks self-assessment on a 5-point scale from “5. I have mastered it fairly well” to “1. not at all,” However, this paper will focus on the ratio of the sum of “5. I have mastered it fairly well” and “4. I have mastered it to some extent” (= “Mastered it fairly well & to some extent”). Note that, as with the need tally, the denominator of each percentage calculation excludes non-response.

First, 191(68.2%) responded that their knowledge of “Higher Education” and 160(57.1%) responded that their knowledge of “Higher education policy” corresponds to “Mastered it fairly well & to some extent.” 197(70.4%) had knowledge of “Teaching and research aspects of their institution” and 166 (59.3%) had knowledge of “Organizational and managerial aspects of their institution.” “Mastered it fairly well & to some extent,” These were all above 50%, but the percentage of respondents who “Mastered it fairly well & to some extent” was 8% point to 10% point lower than the percentage of those who answered “Necessary” about necessity.

Second, items corresponding to “technical/analytical intelligence” are identified. The percentages of “Mastered it fairly well & to some extent” were 124 (44.3%) for “Related to databases,” 121 (43.2%) for “Data analysis infrastructure,” 151 (53.9%) for “Data aggregation and descriptive statistics,” 154 (55.0%) for “Data visualization,” “Related to spreadsheets (Excel, spreadsheets, etc.)” was selected by 208 respondents (74.3%), and “ICT literacy” by 167 respondents (59.6%). These “technical/analytical intelligence” also had a smaller percentage of “Mastered it fairly well & to some extent” than those who responded “Necessary” for necessity, with the exception of “Related to spreadsheets.”

Third, General skills are identified. “Presentation skills” was answered by 163(58.2%), “Documentation skills” by 153(54.8%), “Ability to propose improvements” by 134(48.2%), and “Interpersonal negotiation skills” was answered by 144 (51.4%), and the percentage of “Mastered it fairly well & to some extent” was around 50% for all of them. These general-purpose skills did not differ significantly from the percentage of respondents who answered “Necessary” about necessity.

Finally, Other items are identified. 166(59.3%) answered “Mastered it fairly well & to some extent” for “Ethics in handling data.” However, this percentage was about 20% point lower than the percentage of those who responded “Necessary” about Necessity. This difference may be due in part to the fact that some universities do not have clear standards for the handling of data handled in IR work. In fact, 81.9% of the respondents answered “Very much so & Somewhat so” for another item asked in this survey, “I would like to see the development of standard guidelines for the handling of personal information related to research in the field of IR.” The inability to refer to clear standards may have led to low self-evaluation. In addition to the considerations noted in each item, we discuss these results from the human resource development perspective. Some knowledge/skills received less than 10% of positive responses compared to the percentage of “necessary” responses. In future IR training, it would be important to consider the ways to develop this knowledge and skills. Some of these skills could be developed through work experience and other training programs. Therefore, it is crucial to consider how to streamline the knowledge and skills that should be emphasized during IR training.

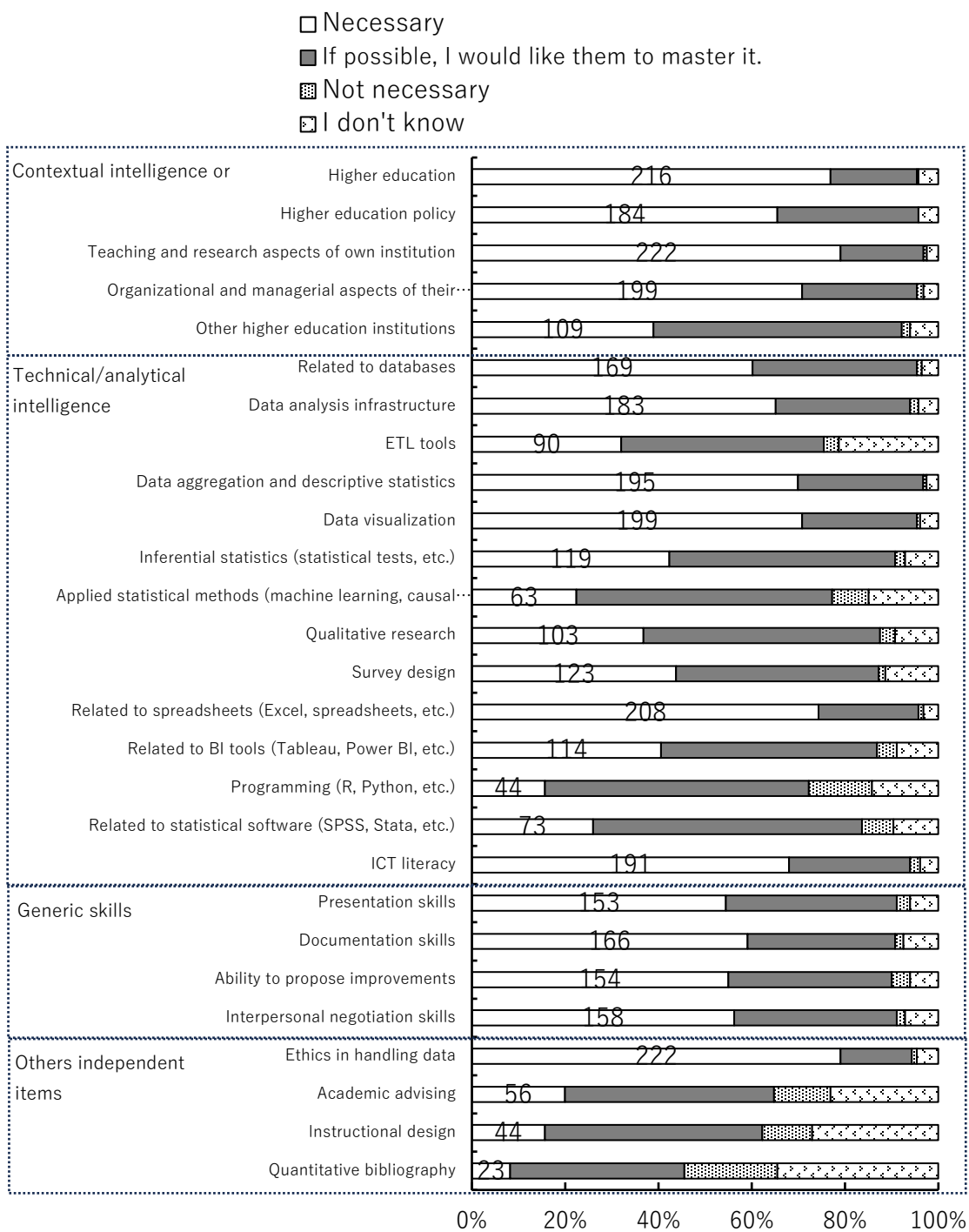


Figure 5: Necessity for knowledge and skills in IR

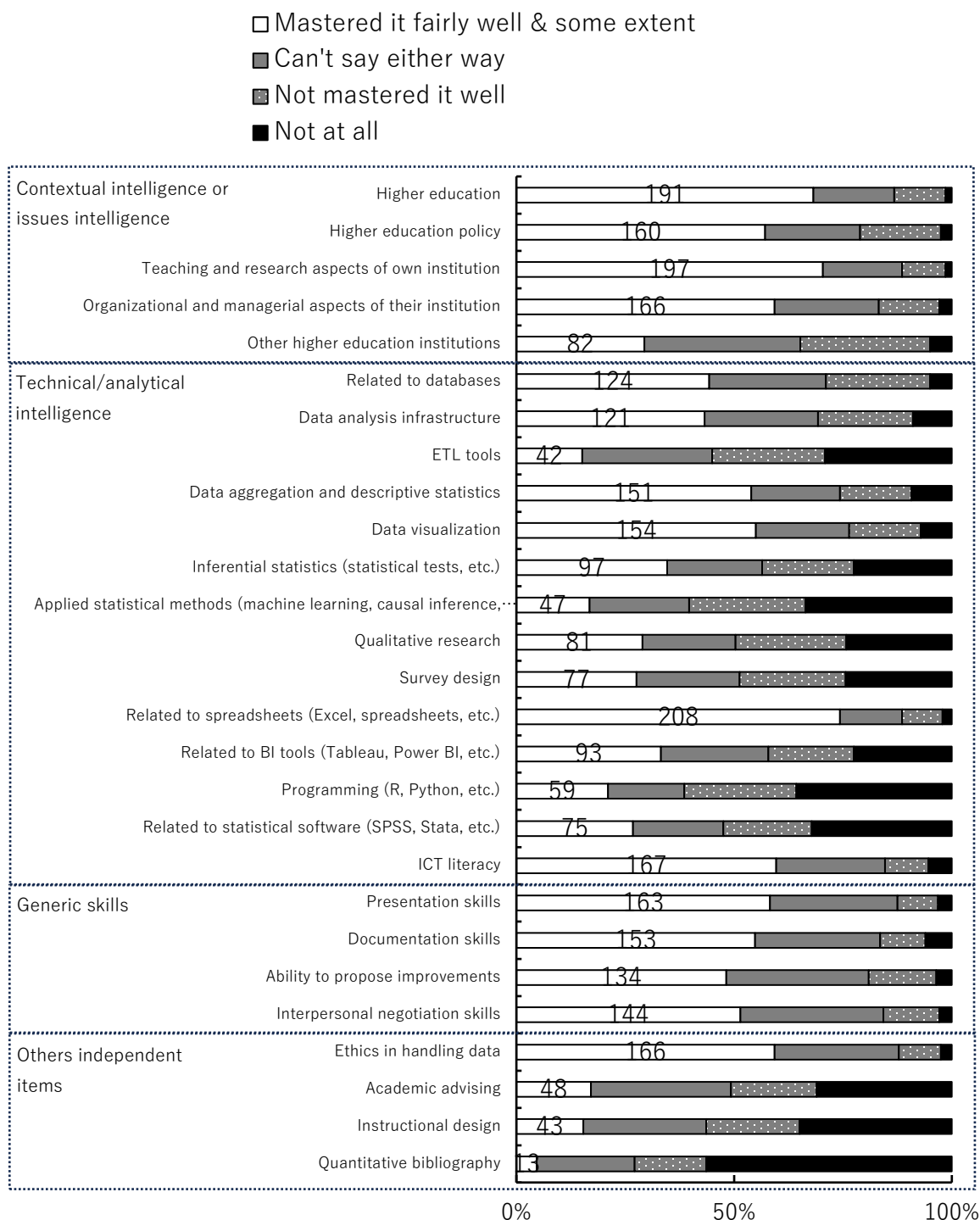


Figure 6: Self-assessment of knowledge and skills in IR

4. SUMMARY AND ISSUES

There are three main findings from this analysis. First, there was a multi-layered nature to the knowledge and skills that IR professionals consider necessary, beyond the three tiers identified by Terenzini (1993). With regard to “technical/analytical intelligence,” there were indications of a difference between necessary, foundational skills, such as data handling and visualization, and sufficient, developed skills, such as applied statistical methods and qualitative research methods. Second, in Japan, many IR professionals said that “contextual intelligence” and “issues intelligence” were necessary. This suggests that “contextual intelligence” and “issues intelligence,” as well as “technical/analytical intelligence,” are major requirements for IR professionals in Japan. Third, compared to the necessity of these knowledge and skills, the percentage of positive responses in the self-assessment tended to be small. From this point of view, it seems necessary to consider how to develop these skills in the design of IR human resource development opportunities in Japan in the future.

The following three points can be identified as future issues to be addressed in order to fulfill the objectives set forth at the beginning of this paper. The first is to further organize and investigate IR human resource development opportunities. The results of the survey on IR human resource development opportunities in Japan, which focused on external training opportunities, were introduced at the beginning of this report, but human resource development opportunities do not stop there. In addition to internal training, there are other training programs that should be included in the survey, such as the half-yearly training programs that began at two national universities in FY2019. Second, it would also be necessary to investigate the structure of overseas training programs and their actual operation. Third, based on a detailed analysis of the survey results, skill-set items and evaluation criteria should be examined. These issues will be the subject of future research.

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Exploring English-Medium Instruction Courses in Taiwanese Higher Education: A Case Study of a University in Taiwan

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ABSTRACT

This study investigated the impact of bilingual education on academic performance in Taiwan. Students' grades were categorized into high achievers, average performers, and low achievers. The School of Management (SM) and the College of Electrical Engineering and Computer Science (CEECS) had the highest proportion of high achievers. In contrast, the College of Engineering (CE) had more average performers and low achievers. The language of instruction significantly affected students' grades in specific subjects. The CE performed better in non-English-Medium Instruction (EMI) courses, while the SM performed better in EMI courses. However, no significant difference was observed in grades for students in the CEECS. Regarding students' entrance channels, only the Mechanical Engineering, Finance and Economics, and Computer Science and Information Engineering departments showed significant differences. Students admitted through the General Scholastic Ability Test performed better in these departments than in other channels. To support talent development in Taiwan, there is a need to address challenges in EMI education, such as teaching methods, grading criteria, and students' foundational abilities. Additionally, providing additional support to low-achieving students in the CE and investigating the instructional approach in different subjects is recommended. Attention should also be given to students admitted overseas and other admissions to ensure their success in EMI courses.

KEYWORDS: English as a Medium of Instruction, Learning effectiveness, Quality Education

INTRODUCTION

Promoting higher education is crucial for a country's socioeconomic development, showcasing its industrial focus and cultivating skills for international leadership (Wright et al., 2015). In today's globalized world, Taiwan recognizes the importance of specialized disciplines, language proficiency, and global interaction in higher education. To enhance its international role in technology development, Taiwan has set the goal of becoming a bilingual country by 2030, emphasizing English as a Medium of Instruction (EMI) in higher education (Ministry of Education, 2021).

Bilingual education has been successfully implemented in various countries, such as Singapore and the Philippines. In addition, English became an official language in Hong Kong due to colonial history (Lee, 2015). These countries or regions prioritize bilingualism and maintain the mother tongue as an independent subject. Other countries, including Canada, Germany, the United States, and Finland, have implemented bilingual policies to bridge socioeconomic gaps and support marginalized languages (Seidlhofer, 2011; Chen, 2022).

Taiwan's approach to bilingual education differs from other countries as it aims to accelerate internationalization and prepare students for the global job market. Achieving this goal poses new challenges for Taiwanese universities. The issues that have arisen include determining the proportion of EMI in specialized subjects, balancing required and elective courses, and improving instructors' communication skills and teaching abilities in English. The study on implementing bilingual courses in higher education in Taiwan aims to assess students' academic performance and provide recommendations to improve instructional approaches.

THE RESEARCH AIMS AND CRITICAL QUESTIONS

This study analyzes university students' learning outcomes majoring in engineering, management and electrical engineering, and computer science in EMI courses, affected by students' backgrounds, such as entrance channels and English proficiency. The study aims to discuss course arrangements and instructional designs during the early development of EMI courses. The research questions are as follows:

RQ1. Is there any difference in the learning performance of students taught in EMI and non-EMI courses?

RQ2. Are there differences in learning outcomes between EMI and non-EMI courses within the same academic year?

RQ3. Do students with different entrance channels exhibit variations in learning outcomes in EMI courses?

LITERATURE REVIEW

Current status and challenges of bilingual course instruction

Chang and Chang (2022) emphasize creating an English language environment and utilizing bilingual immersion education to foster students' lifelong learning vision for the second language (Chiang, 2022). Lu (2021) suggests integrating language learning into the curriculum through content and language-integrated learning (CLIL) and diverse activities (Yang, 2014). When assessing effectiveness, avoiding relying solely on English-speaking ability for bonus points and establishing a friendly learning environment is essential. Su and Tang (2010) recommend adopting a student-centered teaching design for professional, general education, and language courses in universities, while subject courses in science and mathematics should employ an instructor-centered design. Chow (2018) proposes promoting collaborative learning between local and international students through cross-cultural issues, facilitating mutual learning and communication.

Furthermore, Chiang (2022) emphasizes the positive impact of stimulating students' intrinsic motivation in bilingual education. Joint courses with foreign universities can encourage interaction between local and international students, creating a cross-disciplinary and cross-cultural environment that reduces language anxiety. Chung and Lao (2021) found that university students do not strongly prefer courses taught solely in Chinese, with English supplementation, or entirely in English. Their survey of 22 classes revealed that the majority of the classes received grades above the departmental average. This indicates that students are satisfied and enjoy the courses as long as appropriate course selection and teaching materials are provided. Students initially perceive English-taught courses as more challenging, but they often experience a sense of accomplishment in their final grades. Bilingual instruction with lively or slightly less challenging content, starting from a student-centered approach, is acceptable to students and allows them to achieve a sense of bilingual accomplishment. However, it is essential to note that not all university courses are suitable for EMI, particularly in STEM disciplines where basic professional knowledge may be challenging for students to understand and enhance their English proficiency (Yao, 2020).

However, bilingual teaching presents challenges and dilemmas for the instructors and schools at different learning stages. Instructors may need help with their busy teaching load and lack of English proficiency and practical bilingual teaching experience (Chen, Y.L., 2022), which can affect their confidence (Chang & Chang, 2022). Furthermore, creating a bilingual environment requires school support and a shared understanding between administration and teaching staff to avoid conflicts that hinder course effectiveness. Continuous professional development and teaching experience are crucial for improving the evaluation of English-taught courses (Chung & Lao, 2021). However, it is essential to consider not overburdening the instructors when promoting professional development activities (Liu, 2022). For instance, developing bilingual collaborative communities can provide a supportive environment for the instructors to share resources and experiences.

Learning differences in multi-Channel admissions

With the aim of alleviating students' burdens and promoting their development, diversified university entrance channels have been established. Taiwan has two kinds of exams: the General Scholastic Ability Test (GSAT) and the Advanced Subjects Test (AST), including three main entrance channels: the individual application channel, the multi-star project, and the exam-based channel. The first two belong to GSAT, while the last one is AST. These channels reflect variations in students' backgrounds and learning approaches (Cheng & Wang, 2021). Monitoring students' learning performance after entrance is crucial for higher education institutions. Researchers have compiled relevant studies as a reference for bilingual education development.

In a study conducted at National Taiwan University, Hong (2004) found that students admitted through the multi-star project performed the best academically, followed by individual applicants, and then students admitted through exam-based channels. Furthermore, a similar study conducted at National Tsing Hua University by Chiu (2012) yielded consistent results. Wang and Huang (2010) also found similar findings in a Taiwan Integrated Higher Education Database. Relatively, Yu (2005) observed that students admitted through the exam-based channel at Chinese Culture University had better academic performance than those admitted through the individual application channel. Overall, students admitted through the GSAT phase tended to have better academic performance due to their self-awareness and ability to choose fields of study aligned with their interests and capabilities.

Furthermore, Chiang (2014) noted that at National Chiao Tung University, students admitted through the individual application channel demonstrated better English proficiency, while those admitted through the exam-based channel had weaker English proficiency. However, no significant weaknesses were observed in students admitted through the multi-star project. In terms of background, students from urban areas exhibited significantly better English proficiency than non-urban students. Additionally, females

outperformed males in English proficiency.

Comparing the performance of students from different entrance channels helps understanding differences between backgrounds and learning styles (Hong, 2004; Yu, 2005; Wang & Huang, 2010; Chiu, 2012; Chiang, 2014). According to the Ministry of Education's plan to prioritize the individual application channel as the main entrance channel for diversified university admissions, the number of students admitted through individual applications is expected to increase gradually, accounting for approximately 60-70% of admissions. As a result, admission is expected to be more competitive for the individual application channel. It may lead to fluctuations in enrollment quotas, which can impact students' qualifications and academic performance. Therefore, when developing bilingual instruction, it is crucial to analyze the composition of students from different universities and departments and consider their learning conditions to avoid significant disparities in bilingual learning outcomes or issues such as low enrollment in language courses.

METHODOLOGY

Participants

The study included a total of 1303 students from the College of Engineering (CE), School of Management (SM), and College of Electrical Engineering and Computer Science (CEECS), that had taken EMI courses in Fall 2021 and Spring 2022. It is noted that all 1303 students were included in the study, called the experiment group. A control group was also selected, consisting of 1279 students who took the same courses in Fall 2020 and Spring 2021. The total number of EMI courses is 19, and we excluded the cases because the courses in the control group were either taught in English or not offered during the academic year. And the study design and process are as shown in Figure 2.

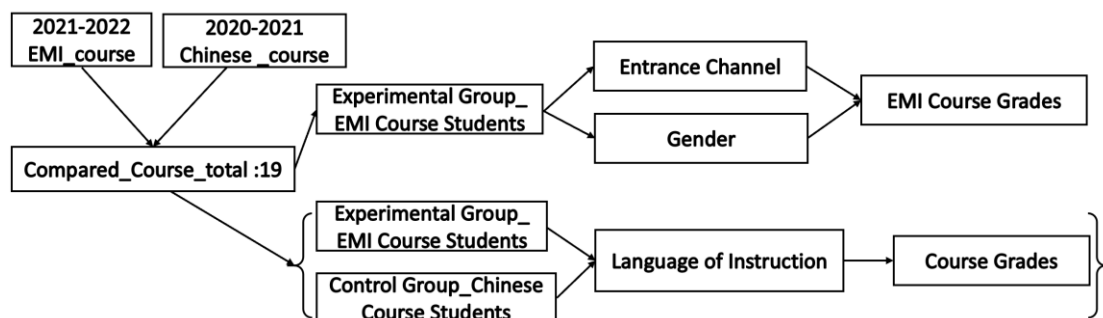


Figure 2: The experimental and control group's research framework

The learning background of the experimental group and the basic information of the EMI course
In the EMI experimental group, 71.2% of the students are male, and 28.8% are female. Regarding entrance channels, our analysis reveals that 61% of the students were admitted based on the GSAT, 28.4% were admitted based on the AST, and the remaining students gained admission through special talents or overseas recruitment, among other channels. This distribution aligns with the current selection programs implemented by the Ministry of Education for universities. It demonstrates a high enrollment rate and academic continuity among second-year students at the case university, indicating the effectiveness of enrollment and student suitability (Table 1).

Table 1: Entrance Channels of the Experimental Group

College	GSAT	AST	Others
CE	345	194	68
SM	194	101	43
CEECS	253	76	29
Total	792	371	140

Approximately 80% of students in the three colleges had high participation rates in freshman-level English courses. In advanced English courses, participation rates varied: 42.5% (258) for the CE, 76% (257) for the SM, and 41.3% (148) for the CEECS. Regardless, students consistently achieved grades above 80, indicating strong academic performance. There were no significant performance differences among students from the three colleges. However, the SM had a higher proportion of continued enrollment in advanced English courses than the other colleges, possibly due to scheduling and academic pressures influencing course selection.

EMI courses are primarily offered in the sophomore stage, requiring students to have a solid foundation in their respective fields. The case university predominantly employs lecture-based teaching methods, with only a few elective courses incorporating teamwork. Students' assessment is based mainly on exams and reports, emphasizing midterm and final exams for required courses and reports for elective courses. Final grades for the CE cluster are around 75 points out of 100, while SM and CEECS students' grades are around 80 points, which indicates that students' learning performance remains satisfactory despite English instruction.

Data analysis and limitation

In the data analysis section, descriptive statistics are used to analyze the distribution of grades in the experimental group. Furthermore, independent samples t-tests are conducted to examine the differences in different languages of instruction. Subsequently, one-way ANOVA is employed to investigate the differences among students from different entrance channels, and post hoc comparisons are used to assess the differences. Additionally, the study examines the differences between the individual application and the multi-star project admissions of GSAT.

This study only analyzed first-year students' experiences with EMI courses at a specific university. In the future, it is recommended to expand the research to include students from different years who have taken EMI courses, conducted comparative studies, and delved deeper into understanding EMI course performance and whether the instructors have made different designs and adjustments in EMI courses.

RESULTS

Is there any difference in the learning performance of students taught in different languages in the same course?

This study categorized semester grades into three groups: high achievers (80-100 points), average performers (60-79 points), and low achievers (0-59 points) for both the experimental and control groups. Analysis of these categories revealed that the SM and the CEECS had the highest proportion of high achievers, each accounting for over 60% of their respective groups. The CE had the highest percentage of average performers, approximately 50%. However, the CE also had a greater number of low achievers compared to the other colleges (Figure 2). Overall, the majority of students, regardless of the language of instruction, successfully completed exams or reports and earned credits for the courses. The number of students who failed the courses did not significantly increase due to EMI, except for the low-achieving students in the CE, who may require additional support and guidance.

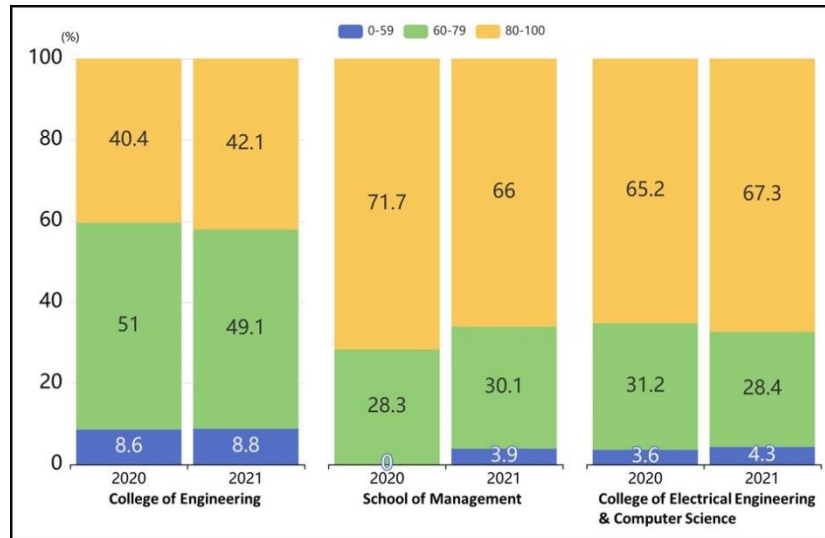


Figure 2: The percentage of grades of experimental and control groups in EMI and non-EMI course

A further analysis focusing on individual subjects compared the experimental and control groups regarding the language of instruction for the CE, SM, and CEECS colleges. Table 2 showed that out of the 19 subjects, there were statistically significant differences in 5 subjects, while there were no significant differences in 14 subjects. The result indicates that the language of instruction does not affect the learning performance in most subjects. Among the five subjects with significant differences, only the EMI courses in Statics and Mechanics of Materials had lower grades than the non-EMI courses. The remaining four subjects had higher grades in the EMI courses compared to the non-EMI courses.

Table 2: Comparison the subjects of EMI and non-EMI Courses

subject (Department)	Language	Sample	Mean	SD	t-value	p-value
Electrical Circuits and Electronics (Mechanical Engineering)	EMI	45	81.3	8.5	-4.83	0.001
	non-EMI	53	70.1	14.2		
Statics & Mechanics of Materials (Mechanical Engineering)	EMI	109	64.4	16.7	4.07	0.001
	non-EMI	102	72.5	12.2		
Soil Mechanics A (Civil Engineering)	EMI	33	72.5	13.6	-7.75	0.001
	non-EMI	33	93	6.8		
Financial Management (Finance)	EMI	40	88	9.5	-2.23	0.03
	non-EMI	45	84.1	6.3		
Signals and System (Electrical Engineering)	EMI	148	87.5	9.9	2.58	0.01
	non-EMI	137	84.2	11.7		

In the year of taking EMI courses, is there any difference in students' learning performance in EMI and non-EMI courses?

A dependent samples t-test compared semester grades between EMI and non-EMI courses for the experimental group to assess the impact of EMI courses on students' learning burden. The results showed a significant difference in the grades of EMI and non-EMI courses for students in the CE (z-value = 4.44, $p < 0.05$) and the SM (z-value = -4.72, $p < 0.05$). However, students in the CEECS did not exhibit a significant difference in their grades between EMI and non-EMI courses (z-value = 1.18, $p > 0.05$). Post-hoc comparisons revealed that students in the CE performed better in non-EMI courses, while students in

the SM performed better in EMI courses. Notably, the performance of students in the CEECS was unaffected by the language of instruction. This variation in performance could be attributed to differences in the proportion of required and elective courses in EMI arrangements, as the instructors often apply more lenient grading criteria for elective courses than required courses (Table 3).

Table 3: Comparison of EMI and non-EMI Grades in The Experimental Group

College	Language	Sample	Mean	SD	Z	p-value
CE	non-EMI	607	78.03	10.4	4.44	<.05
	EMI		76.27	12.9	Z	p
SM	non-EMI	338	80.76	13.6	-4.72	<.05
	EMI		83	14.4	Z	p
CEECS	non-EMI	358	82.35	14.3	1.18	0.235
	EMI		82.34	14.4		

How does the student learning effectiveness of EMI courses compare across different entrance channels?

We investigated whether the entrance channels influence students' performance from the 11 departments in the three colleges in the EMI courses by using a one-way analysis of variance (ANOVA). The analysis results are shown in Table 4. Among the entrance channels, only the Mechanical Engineering, Finance and Economics, and Computer Science and Information Engineering departments showed statistically significant differences. Post-hoc comparisons revealed that students admitted through GSAT performed better than those admitted through AST and others in all three departments. However, no significant differences were found between students admitted through the AST and others, which suggests that the performance of most students in different departments in EMI courses is unaffected by their entrance channels. However, students admitted through special admissions or overseas admissions in a few departments may need to exert more effort to compensate for their relatively lower performance.

Table 4: Comparison of Entrance Channel of the Students

Department		Sample	Mean	SD	f-value	p-value
Mechanical Engineering	GSAT	130	74.6	12.2	7.76	0.001
	AST	70	74.5	12.9		Post hoc
	Others	138	68.8	14.3		1>2&3
Finance	GSAT	47	84.1	8.2	5.87	0.004
	AST	29	84	5.9		Post hoc
	Others	43	78.2	11.3		1>2&3
Electrical Engineering and Computer Science	GSAT	91	78.7	1.6	8.1	0.001
	AST	22	78.9	2.1		Post hoc
	Others	11	57.4	10.4		1>2&3

On the other hand, the current admission mode for universities in Taiwan primarily relies on the GSAT for student selection, which is also the case for the case study college. Therefore, this study divided students into two categories: those admitted through individual application and those admitted through the multi-star project. Independent samples t-tests were conducted to examine the performance of these two groups of students in EMI courses. The results indicate that none of the three colleges showed significant differences, which implies that students' performance in all three colleges, regardless of whether they were admitted through the individual application or the multi-star project, is consistent in EMI courses.

DISCUSSION

The language barrier does not significantly affect students' performance in EMI courses, and they can achieve good grades with genuine effort. Grading standards are similar between EMI and non-EMI courses,

indicating that the language of instruction does not hinder students' proficiency in professional knowledge and skills. To enhance the quality of the curriculum, the instructors should focus on improving their ability to interpret professional knowledge in English, expanding course content, and participating in EMI Teacher Training Programs. These measures will facilitate more in-depth and comprehensive academic learning experiences for students.

The number of required and elective EMI courses varies across disciplines, potentially affecting students' performance in both EMI and non-EMI courses. Grading standards may differ based on course requirements rather than the language of instruction. Of the 38 EMI courses studied, 74% had consistent grading standards for both EMI and non-EMI instruction. This result suggests that students' performance and stress in EMI courses are mainly determined by their understanding and application of the subject matter rather than language proficiency. Instructors should consider students' learning load and concentration levels, particularly in lecture-based courses. They can adjust their teaching methods using simple language explanations and incorporating interactive learning activities to create a positive and supportive environment, enhancing students' engagement and academic progress.

Regarding the impact of different entrance channels on students' performance in EMI courses, only 27% of departments showed variations. Students admitted through special talent or overseas admissions performed less than those admitted through individual applications and the multi-star project. However, no significant differences were found between individual application students and those admitted through the multi-star project. Individual application students often demonstrate self-directed solid learning skills and high motivation. In contrast, multi-star project students emphasize long-term steady progress and consistently perform across subjects. Both types of students are capable of handling the workload of EMI courses.

RECOMMENDATIONS

This study suggests that both required and elective courses can be conducted in an EMI format while ensuring language and academic content delivery. The phase of taking EMI courses can be scheduled between the second and fourth years of study. In the initial stage, the proportion of EMI and non-EMI courses should be at most 50% per semester, while in the fourth year, it is possible to attempt 100% EMI courses. However, it is advisable to provide partially English-based courses for first-year students who are still adapting to university life.

In terms of teaching methods, the majority of courses currently still rely on a lecture-based approach. In bilingual education, the instructors often forget the fundamental principle that students' absorption and comprehension of fully English courses are of utmost importance (Lin, 2022). This oversight may lead to students bearing higher learning risks, needing more interactive learning experiences, being disinterested in the course, and needing help maintaining their focus. Additionally, language is embedded with culture, and while local students may understand the direct translation of Chinese concepts into English by the instructor, it may need to be clarified for overseas students. Therefore, the instructors should consider students' backgrounds and proficiency levels when designing effective English language usage patterns that align with international standards. Furthermore, the instructors can continuously enhance their English teaching skills by participating in English-medium courses offered by foreign universities or engaging in teaching exchanges during the summer or winter breaks.

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Learning Space and Academic Productivity of Research Students of College of Business Management and Accountancy for AY 2022-2023

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ABSTRACT

The learning spaces available to our students are continuously evolving. During the pandemic, our own homes served as alternatives to classrooms because of the virtual set-up of classes. Now that the world is slowly recovering, more cafes and co-working spaces are emerging that serve as alternative learning spaces. This study aimed to identify the preferred learning spaces of College of Business Management and Accountancy (CBMA) research students and determine the effects of learning spaces on research students' productivity. The research approach is quantitative in nature through an adapted survey questionnaire that tackled physical and social characteristics of their preferred learning space. The average mean score was used to treat the quantitative data using a 5-point Likert scale. The target participants of this study were 100 CBMA students who are currently taking up Research 2 courses. With a mean rating of 4.52, results show that students prefer a classmate/friend's house as a learning space outside the university. On the other hand, the library is the preferred learning space within the university with a mean rating of 4.09. In terms of physical and social characteristics, a spacious area where they can quietly work individually is what they definitely prefer in a learning space. The research further shows that majority of the respondents agree that learning spaces influence their individual productivity and motivation to work on their research that ultimately inspired them to finish their research.

KEYWORDS: Learning space, Academic productivity, Tertiary students

INTRODUCTION

As we move in a fast-paced world, the learning spaces available to our students are also evolving. Within the pandemic, our own homes even serve as a working space. We just make the arrangements to study in a conducive environment (Borkala, 2021) whether at home, school and beyond the formal walls of education. When it comes to academic performance and how it may be impacted by learning spaces, there is a gap to be filled in the literature. This generation's students have a different set of characteristics, practice new study habits and consider other factors that affect their academic productivity compared to the past generations (Upadhyaya & Vrinda, 2020).

Learning Space

Universities and schools are social spaces for open engagement of knowledge that enhance students' enjoyment of learning (Mkonto, 2021). Now, as we thrive beyond the pandemic, new ways of learning with the high usage of online platforms require changes in the learning space. Modern ICT facilities support new ways of learning and give students the freedom to study anytime, anyhow, and anywhere (Beckers et al., 2016). It can be the student's home which is bound up with the establishment of study habits and routines (Card & Thomas, 2018). It can also be an extension of a school such as co-work spaces and cafes. In a school in the US, an extension of the campus or co-working space that immerses students in current workplace trends and harnesses the energy of innovation was explored to enhance the school programs (Goldstein, 2018). Hence, the learning spaces are no longer containable inside the university premises or formal places of instruction.

In a study by Peuker et al., (2022), the preferred study and learning spaces and their specific characteristics were explored to meet the current needs of the students. This study clearly suggests that through time, both pedagogical and technological changes must coincide to maximize the learning experiences of students in their preferred learning spaces. Both the use of innovative pedagogies and design of new learning spaces must continue to evolve to meet the dynamic needs of present and future learners (Oliveras-Ortiz et al., 2020). These changes in the physical environment are utilized for individual study to maximize concentration and collaborative study to enhance communication (Beckers et al., 2016). Students nowadays have varied preferences and consider notable characteristics in learning spaces.

Characteristics of Learning Space

Literature shows that students particularly look for physical and social dimensions in a learning space (Beckers et al., 2016). In terms of physical dimension, creating a perfect ambience to study such as a clean and decluttered desk with sufficient lighting and ventilation can affect the learning power of students (Borkala, 2021). A cooler temperature with a little ambient noise and the presence of charging outlet in a learning space also affect the probability of better academic performance of students (Peuker et al., 2022). Furthermore, arrangement in the physical space such as big windows and natural light have the power to improve students' learning beyond their abilities (Oliveras-Ortiz et al., 2020; Peuker et al., 2022).

When it comes to social dimension, in a study by Card and Thomas (2018), a shared house or dormitory for students living far from their families, has potential as a space for peer learning. Having mutual characteristics of living independently and studying at their own pace, the shared house serves as a study hideaway for these students. Beyond the students' homes, learning spaces outside the classroom and other open and flexible spaces in schools, make students not only feel more comfortable but also more excited about learning (Kennedy, 2020; Oliveras-Ortiz et al., 2020). Anywhere in campus can be transformed into an informal learning space so in addition to formal places of learning like the library, comfortable and social spaces in schools such as pathways and gathering spots serve as a learning space (Yuan, 2019). These numerous spaces of the school provide retreat to students to work on their own or in groups

(Kennedy, 2020). As a whole, a school building that is open, inviting, noise-efficient, and secure promises a better learning experience for students (Oliveras-Ortiz et al., 2020). Outside the school, a café is another informal learning space. It serves as a break from traditional library, apartment, and/or dormitory where there is less distraction. Another place beyond the campus is a co-working space which gives the students a glimpse of the reality of future work after formal education is another learning space enjoyed by our present learners (Goldstein, 2018). This space gives the students access to the real working world and prepare them when they leave school.

With the growing number of research on learning space, there is still a dearth of studies about its relation to the academic productivity of students. Now more than ever, this should be explored in the midst of the various changes in education system in the recent decade.

Academic Productivity

It is critical for educators and schools to pay attention to the subtle yet impactful influence of learning space on students' academic productivity. Learning space affects the students' willingness and desire to engage in learning (Oliveras-Ortiz et al., 2020). An effective learning space creates an environment that makes it more likely for learning to take place (Kennedy, 2020). According to Sleeter (2015), research indicates that students are likely to perform better academically if learning spaces are safe, inclusive, collaborative, and recognize the prior learning and experiences of students (as cited in Mkonto, 2021).

The impetus for this study is the inquisitiveness of the researchers to determine the relation of learning space to the academic productivity of students. The researchers who are also faculty members find the results of this study to be highly beneficial to them as educators, to all the research students in the College of Business Management and Accountancy (CBMA) and UST-Legazpi as a whole. Finishing research is already a tough challenge for students yet with the presence of a preferred learning space, accomplishing this gargantuan task will be achievable. In addition, the administration will be able to adjust the learning spaces available in the university to meet the needs of the students. Lastly, research work will be a more enjoyable journey for the students as they work productively on their preferred learning spaces. Therefore, the objectives of this study were to discuss the preferred learning spaces of CBMA research students and assess its effects on their academic productivity. Specifically, it aimed to:

- a. identify the preferred learning spaces of CBMA research students
- b. determine the effects of learning spaces on research students' productivity

METHODOLOGY

The research approach was quantitative in nature through a survey questionnaire. The use of average mean score was used in treating the quantitative data using a 5-point Likert scale.

Research Participants

The target participants were 100 CBMA students as adapted from Peuker et al., (2022) study. They were currently taking up Research 2 course during the second semester of AY 2022-2023 so these students needed increased productivity on writing their research.

Research Locale

The participants came from CBMA of UST-Legazpi. Given that it has the highest number of third- and fourth-year students among the four (4) colleges of the university, it is also expected to have the highest number of research students.

Research Instrument

After a thorough review of the literature, the survey questionnaire was adapted from the study of Beckers et al. (2016) and modified based on the scope of the current research. For the first part, the students were asked to mark their opinion on a list of propositions, based on a five-point Likert scale from (1) absolutely not preferred to (5) definitely preferred. This said portion of the questionnaire was divided into two (2) parts namely preferred learning space location and preferred characteristics of learning space in terms of physical and social dimensions. Likewise, on the next part, the participants were asked to value the effect of these learning spaces on their academic productivity from (1) fully disagree to (5) fully agree.

Data Gathering Procedure

The research team visited the classrooms to ask the students to volunteer in filling out the questionnaire at the end of a lecture. The survey questionnaire was distributed in four (4) Research classes of CBMA with the assistance of the Research teacher. The accomplishment, collection, and compilation of the questionnaire took over a period of two (2) months.

Ethical Consideration

The participants were treated with respect and courtesy during the distribution of questionnaire. A short introduction of the purpose of the study was also done during the classroom visit.

Data Analysis

The use of average mean score was used in treating the quantitative data.

RESULTS AND DISCUSSION

The research instrument was distributed and answered by 100 respondents from the College of Business Management and Accountancy (CBMA). Majority of the respondents (53%) were third year students who were in the initial phases of their research. The remaining respondents were fourth year students who were in the final phases of writing their research papers. Of the 100 respondents, 34 of them were male while 66 were female. The respondents' ages ranged from 19 to 25 years old, with majority of the respondents coming from the age range of 21 to 22 years old. The summary of the demographics of the students is presented in Table 1.

Table 1. Summary of Respondents' Demographics

Sex	Frequency
Male	34
Female	66
Age	Frequency
19	1
20	8
21	35
22	36
23	14
24	4
25	2

Year Level	Frequency
3 rd Year	53
4 th Year	47

The students were asked their preferred learning space while working on their research. The first four learning spaces presented are those located outside the university and are seen in Figure 1. The results indicate that students are neutral in their preference of the home as a learning space with 34% of the students choosing this as their response although it can be noted that 31% of the student respondents preferred learning spaces at home. Majority of the students (47%) are also neutral in selecting a friend's or classmate's house as learning space while 34% definitely preferred this setup. The respondents are also neutral in selecting public places such as a café in town as learning space with 29% selecting the said indicator. Lastly, the neutral and preferred indicators both got 34% when it comes to their preference of a quiet public place, such as a co-work space as learning space while working on their research.

Learning space in a classmate/friend's house received the highest mean rating of 4.52 that corresponds to an adjectival rating of "definitely preferred." It can be inferred that this option got the highest mean rating since most of these students are working on their research in pairs or groups, making them accomplish more while working together, especially in their classmate's house. The study of Card and Thomas (2018) discussed that for students, their homes or accommodations still serve as an important learning space for them and that shared accommodations with other people can even be a great avenue for peer learning. Mean ratings of 3.82 and 3.72 were also recorded for the preference of quiet public spaces such as a co-working space and the home as learning spaces respectively, corresponding to an adjectival rating of "preferred." It can be noted that public places such as a café in town as learning space received the lowest mean rating of 3.16 corresponding to an adjectival rating of "neutral."

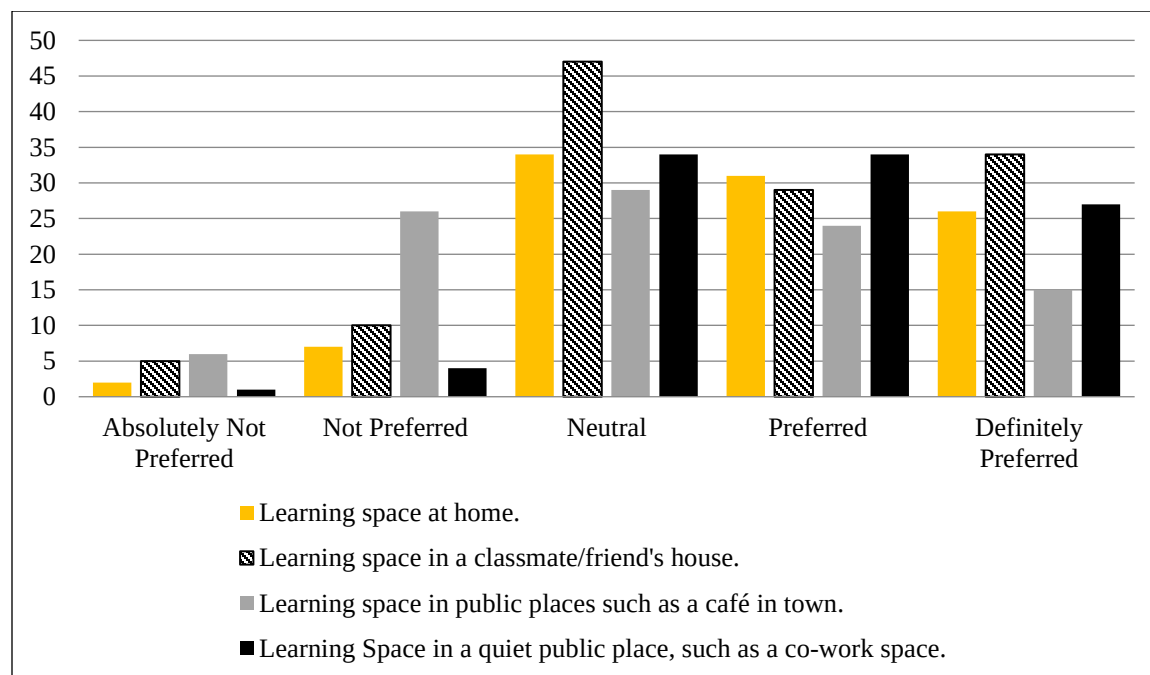


Figure 1. Student responses on preferred learning space outside the university

The respondents were also asked regarding their preferred learning space within the university. The results of this part of the research instrument are presented in Figure 2. The results show that 30% of the students are neutral in their preference of using the classroom as learning space with 29% of the students still

prefer to work on their research inside the classroom. Majority of the students (42%) definitely prefer the library as their learning space. It can be inferred that this is where most of the students prefer to work on their research since this is where resources such as previous theses and research works from others are readily available. The two other options, corridors/open spaces and canteen/café, are neutrally preferred by the respondents with 32% and 37% respectively.

With a mean rating of 4.09, the library is the most preferred learning space within the university, with the mean rating corresponding to an adjectival rating of “preferred.” The classroom is the second preferred learning space within the university with a mean rating of 3.66 that indicates that the respondents are neutral in selecting the classroom as a place where they can work on their research. Ultimately, the other two options, canteen/café and corridors/open spaces, both receive an adjectival rating of “not preferred,” with their mean ratings at 3.06 and 2.88 respectively. Studies show that the design of the traditional classroom from back during the Industrial Revolutionary Age may not be able to support the needs of the learners of the future that is why there is already a need to create facilities in the university that can allow students to collaborate and engage with each other without being too uptight as the current library set-up that we are using today (Oliveras-Ortiz et al., 2020).

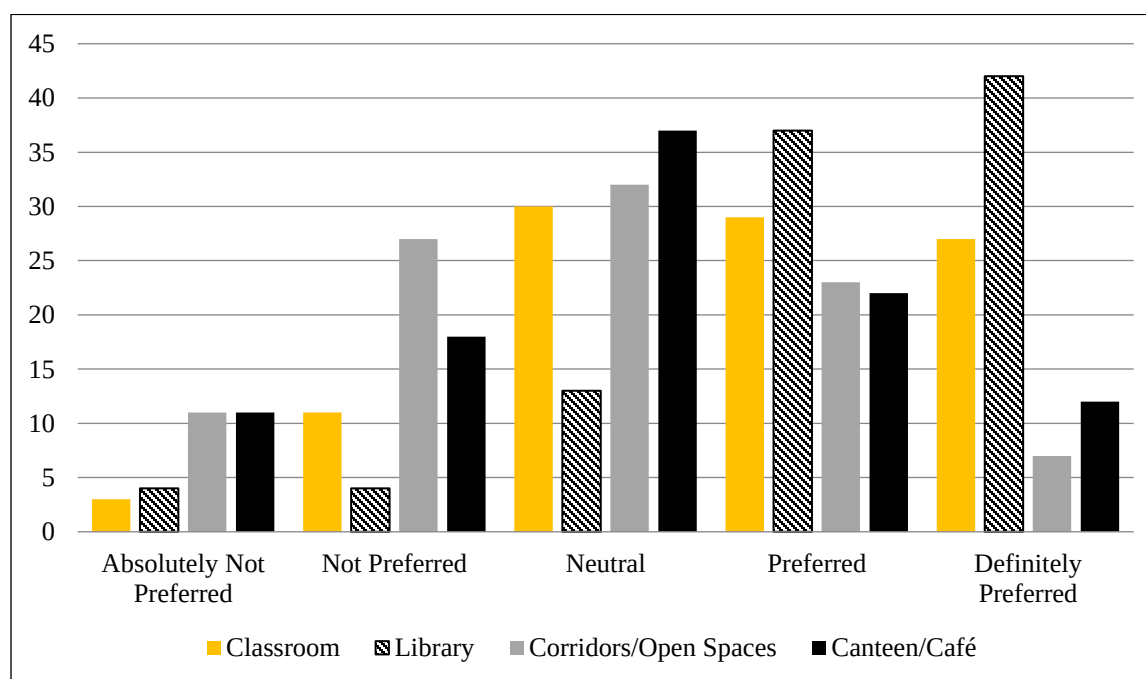


Figure 2. Student responses on preferred learning space within the university

The research instrument presented a list of physical and social characteristics that students preferred in a learning space. The respondents were asked to rate the characteristics from “absolutely not preferred” to “definitely preferred” on a 5-point Likert scale. The mean ratings of the physical characteristics of learning spaces are presented in Figure 3. Among the ten physical characteristics, the most important for the respondents was the spacious area of the learning space with a mean rating of 4.24 that corresponds to an adjectival rating of “definitely preferred.” Working on their research would require them space to write, space to put other materials and references, and space to work with others. A spacious learning space would be able to accommodate more people in the learning space and a spacious area to work on their research would allow students to keep their workflow and increase productivity. It can be noted that the physical characteristic with the second highest mean rating was the presence of charging outlets with a mean rating of 4.23 that also corresponds to an adjectival rating of “definitely preferred.” The study of

Peuker et al., (2022) identified the access to charging outlets as the most important characteristic that students look for mainly because students nowadays heavily use their phones and laptops in accomplishing their academic requirements.

Seven of the ten characteristics received an adjectival rating of “preferred.” Among these, the highest was the presence of printing facilities with a mean rating of 4.18. The comfort of the furniture received a mean rating of 4.1 and the cold and cozy temperature received a mean rating of 4.0. This shows that students give importance to comfort in selecting the learning space where they can work on their research requirements. The remaining characteristics received mean ratings below 4.0 but are still preferred by the respondents. The existence of natural light received a mean rating of 3.9, the presence of plants received a mean rating 3.82, the decoration of the learning space received a mean rating of 3.75, and the presence of big windows received a mean rating of 3.65. Aside from providing good lighting, the physical characteristics that received mean ratings below 4.0 add to the overall aesthetics and design of the learning space and not as much to its functional aspect. The physical characteristic that received the lowest mean rating of 3.52 was the presence of background music. The respondents are generally neutral with the said characteristic since there are students that prefer working in quiet environments over spaces with music in the background.

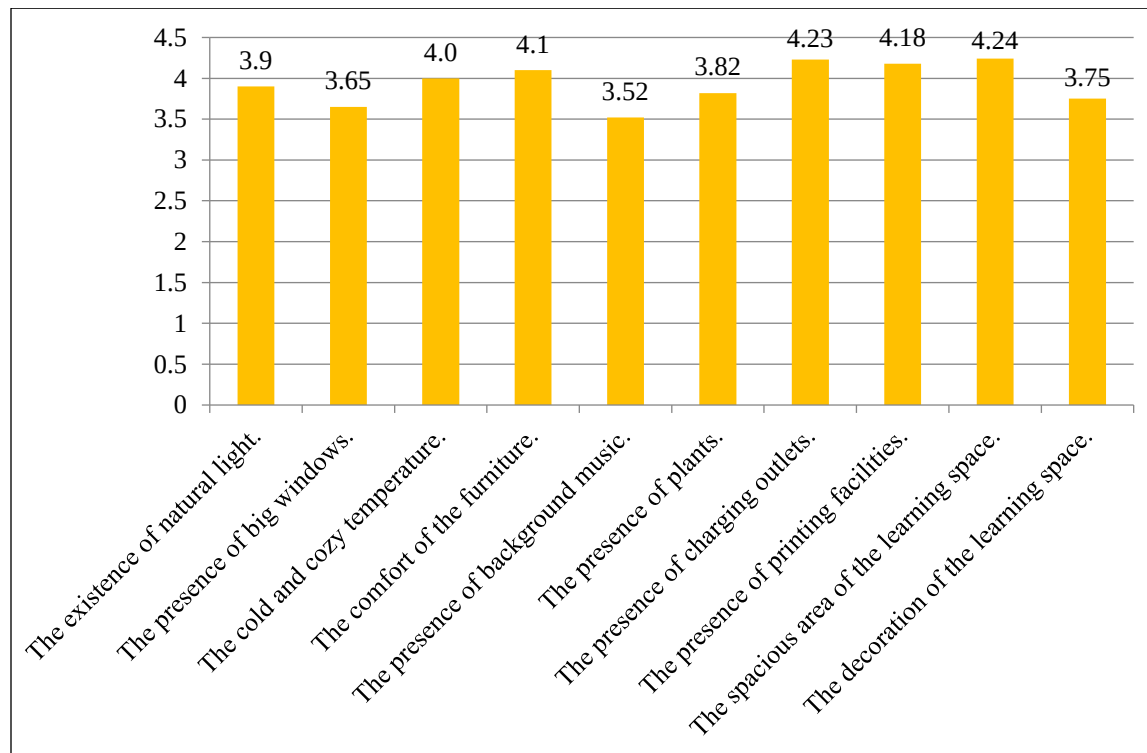


Figure 3. Mean ratings of physical characteristics of learning spaces preferred by students

Other than the physical characteristics of learning space that the students prefer, the research instrument also included social characteristics that the respondents rated on a five-point Likert scale. The mean ratings of the social characteristics of learning spaces are presented in Figure 4. The social characteristics that received an adjectival rating of “definitely preferred” are the quietness of working individually with a mean rating of 4.36 and the active exchange of ideas with others with a mean rating of 4.30. The results of these social characteristics are supported by the choice of the respondents to use the home or the library as learning spaces where students can either work quietly alone or work with others in a serene environment.

The other three social characteristics received an adjectival rating of “preferred” with the privacy of working alone receiving a mean rating of 4.19, the collaborative work with others receiving a mean rating of 4.01, and the vibrant social atmosphere receiving a mean rating of 3.96, the least among the five social characteristics presented.

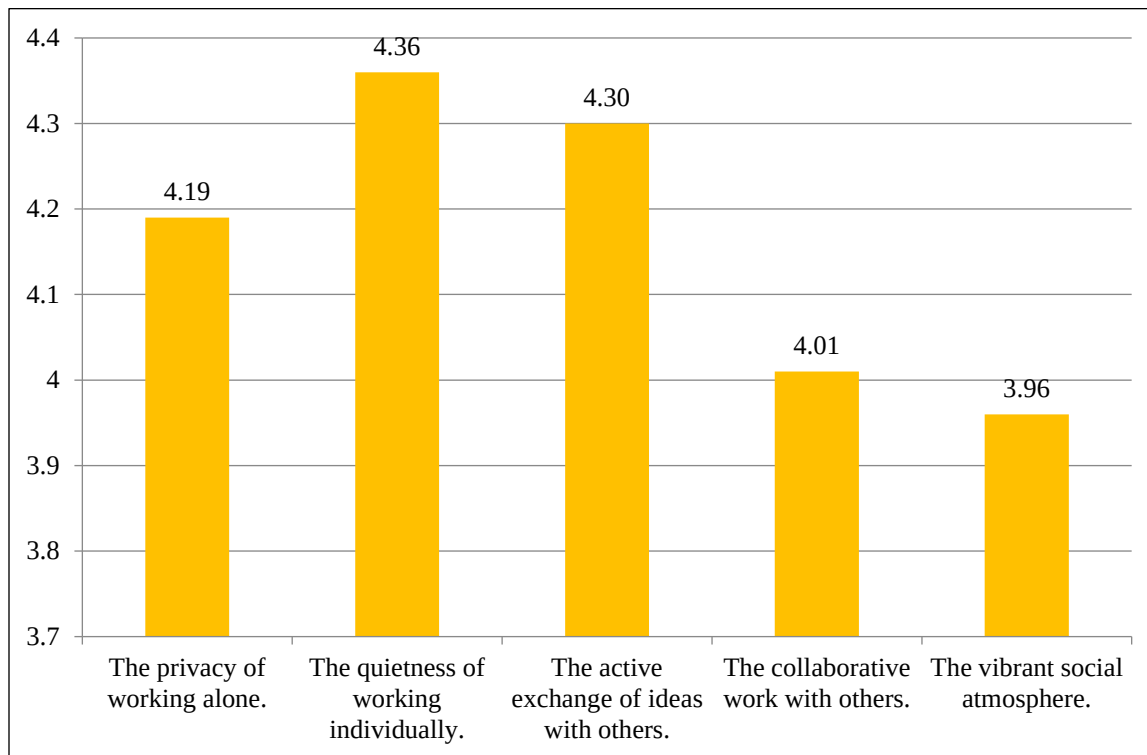


Figure 4. Mean ratings of social characteristics of learning spaces preferred by students

The final part of the research instrument presented the students with five statements about learning spaces. The respondents were asked to indicate whether they fully agree or disagree with each statement using a 5-point Likert scale. The results are shown in Figure 5.

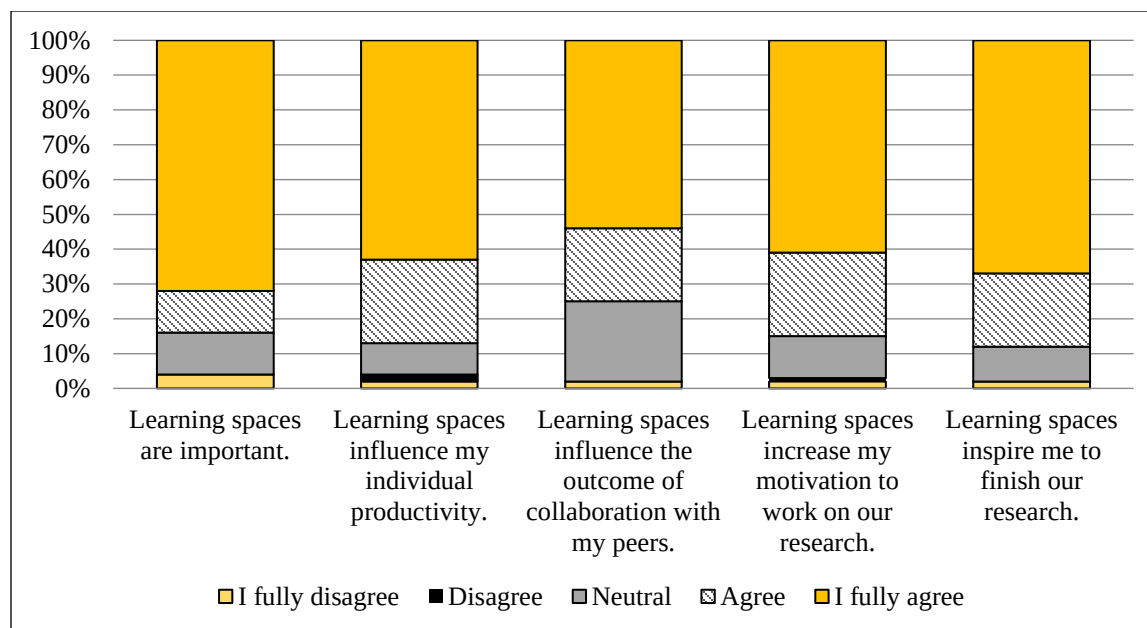


Figure 5. Agreement or disagreement of students to statements about learning spaces

All five statements received mean ratings equivalent to the adjectival rating of “fully agree” based on the indicators in the 5-point Likert scale. The highest mean rating of 4.51 was given to the statement “learning spaces inspire me to finish our research.” This result shows that the characteristics of learning spaces affect the productivity of the research students using them. The respondents also recognized the importance of learning spaces as shown by the mean rating of 4.48 for the statement “learning spaces are important.” The statement “learning spaces influence my individual productivity” received a mean rating of 4.44, further strengthening the result that learning spaces inspire the respondents to finish their research. A mean rating of 4.41 was given to the statement “learning spaces increase my motivation to work on our research” while a mean rating of 4.25 was given to the statement “learning spaces influence the outcome of collaboration with my peers” further emphasizing the positive effects of learning spaces to the students’ productivity. The study of Oliveras-Ortiz et al. (2020) emphasizes that a great design of a learning space may allow academic success to grow and prosper.

CONCLUSION

The following conclusions are hereby derived:

1. CBMA research students definitely prefer a classmate/friend’s house as a learning space over other learning spaces outside the university with a mean rating of 4.52. When it comes to learning spaces available inside the university, the library, with a mean rating of 4.09, is preferred by the students but not as much as they prefer working on their research outside the university. In terms of the physical characteristics that they look for in a learning space, a spacious area and the presence of charging outlets are the top physical characteristics that the respondents prefer to see in a learning space while quietness of working individually and the active exchange of working with others are the top social characteristics that they prefer. The quietness of working individually can be achieved in the library while the active exchange of working with others can be achieved in a classmate/friend’s house.

2. In terms of the effects of learning spaces on research students' productivity, all five statements registered a rating higher than 4.20. The mean ratings of the statements are as follows: learning spaces are important (4.48), learning spaces influence my individual productivity (4.44), learning spaces influence the outcome of collaboration with my peers (4.25), learning spaces increase my motivation to work on our research (4.41), and learning spaces inspire me to finish my research (4.51). The mean ratings indicate that learning spaces affect the academic productivity of research students.

RECOMMENDATION

As the needs of learners continue to shift, educators cannot continue to design learning spaces that have been utilized for centuries (Oliveras-Ortiz et. al., 2020). There is a need to explore on preferred learning spaces of other group of students from various academic departments. Given that the different academic programs have different needs for their course requirements, a university-wide study must be conducted to include respondents from all the program offerings of the university. The result of the future study will be able to determine a more inclusive learning space that can be a benchmark for future renovation of existing learning spaces such as the library with areas both for quiet study and collaboration with others or as a guide in planning for the construction of a new learning space in the university. Further research can be conducted to study not just the physical and social aspects of learning spaces, but its environmental and financial implications as well.

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Scientific Literacy Increasing to Achieve the Profile of Pancasila Student as A National Defence Action

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ABSTRACT

In early 2022, Primary and Secondary Education in Indonesia implemented the Independent Curriculum. The independent curriculum is a curriculum with extracurricular learning and a variety of content to optimize the students' ability to explore concepts and strengthen their competences. Scientific literacy is one of the skills that support the students in solving the problems that exist in their environment, as shown by their ability to process, reason, and present the knowledge learned in everyday life. In the Independent Curriculum, students focus on freedom to think creatively, have character, and perform a scientific literacy skill in accordance with Pancasila values, which is called the Pancasila Student Profile. This research was conducted with the aim of analyzing the increase in scientific literacy to achieve the goal of Pancasila students as an Independent Curriculum Outcome. The population in this study was all tenth grade students at Christian Kalam Kudus Surabaya High School, with a total sample of 30 students who were determined through the saturated sample method. This research is a quantitative study, and the type of research is classroom action research. The results of the study explain that there is an increase in scientific literacy with a problem-based learning model (PBL) to achieve a Pancasila Student Profile with indicators of critical, independent, and creative reasoning, where the resulting value of r (correlation) is 0.592 and the R-Square value is 0.336, so that the resulting percentage is 33.6% with a df value of 1. So, it can be concluded that the problem-based learning model (PBL) can increase scientific literacy to meet the needs of Pancasila students.

KEYWORDS: Independent Curriculum, Profile of Pancasila Student, Scientific Literacy

INTRODUCTION

The rapid development and progress of Science and Technology (IPTEK), especially information technology, have had many positive and negative impacts on the world of education, both formal and informal. The rapid development of science and technology must be balanced with students' understanding of their interactions with this development. As a result of these developments in science and technology, the world of education is aggressively developing 21st century life skills, especially scientific literacy skills for students (Haerani, 2020). The curriculum is the "spirit" of education, which must be innovative, dynamic, and always evaluated in accordance with the times and science and technology, especially those that meet the skill requirements needed by the public and graduates.

The curriculum plays a very strategic and crucial role in the implementation and success of education (Mariati, 2021). Curriculum development must also pay attention to educational needs that can provide opportunities and experiences for students to realize their full potential for excellence (Suwandi, 2020). Currently, the education curriculum in Indonesia is independent. The independent curriculum is the curriculum that was changed by the Minister of Education and Culture from the 2013 curriculum. The Merdeka Curriculum is a curriculum with a variety of internal learning contents whose contents are more optimal so that students have sufficient time to deepen concepts and strengthen competence.



Table 1. History of Indonesian Curriculum

The aim of this curriculum is to improve human resources and the quality of education in Indonesia. However, the training provided in this curriculum varies from basic education to higher education. Therefore, the role of all layers is necessary for the success of these programs (Vhalery, 2022). An independent curriculum is a curriculum that gives freedom to students to learn and explore their abilities freely and understand the effective use of acquired knowledge in everyday life, so that understanding of science is not only limited to theory but also in terms of its implementation (Irwan, 2020). The independent curriculum emphasizes literacy skills in various concepts, especially the use of information and technology.

Everyone uses technology to search for and share fulfilling scientific information about understanding the universe, scientific issues, and current scientific developments, both for personal needs and scientific innovation in the field of science (Syahputri dan Hikmah, 2019). This is done because the quality of education, especially scientific literacy, in Indonesia is still low compared to other developing countries (Fu'adah, 2020). The quality of education is very low and directly proportional to the quality of human resources (Sumarra, 2020). According to Pisa in Rizkita (2016), scientific literacy is the ability to use scientific information, identify questions, and draw conclusions based on evidence to understand and make decisions about nature and natural changes made by humans.

Scientific literacy is a necessary skill for students (Mursalin, 2021). The need for students with science knowledge has encouraged developed countries to think about building science education for their students from an early age. Scientific literacy is divided into 4 categories: science as a body of knowledge, science as a basis for investigation, science as a basis for thinking, and the interaction of science, technology, and society (Nurmidah, 2018, Marisa dan Hamidah, 2020). This literacy is an important skill for students to use to solve existing problems through collaborative scientific thinking (Sakdiah, 2023). It cannot be denied that scientific literacy makes a major contribution to the development of science. In general, the scientific literacy skills of students in Indonesia are still below average compared to other countries. PISA (Program for International Student Assessment) announced that Indonesia is ranked 60 out of 65 with an average science score of 383 (the international standard score of 500) (Situmorang, 2016; Ummah, 2018). Therefore, the action that needs to be taken by educators in schools is to carry out learning that contains scientific literacy, supporting learning media so that students' scientific literacy skills are honed and can get used to working on questions based on scientific literacy (Rohana, 2018; Warningsih, 2020).

The Ministry of Education and Culture in Vhalery 2022 said that educational transformation through an independent learning policy is a step toward realizing superior Indonesian human resources with a Pancasila student profile. According to the World Economic Forum (2016), students in the 21st century must have 16 skills. Broadly speaking, these 16 skills are divided into three parts, namely literacy, competence, and character. In addition, students must be prepared to follow these changes to be able to react to changes in socio-culture, work life, the business world, and rapid technological developments. The Pancasila student profile helps in realizing Indonesian students as lifelong learners who have global competence in line with Pancasila values. By applying the Pancasila student profile, students should be able to take appropriate actions to address existing problems, so that later it is hoped that students can participate actively and make a real contribution to the surrounding environment (Nahdiyah, 2022).

Through the Ministry of Education and Culture, the Indonesian government stipulates six dimensions of the Pancasila Student Profile that must be developed in current students: (1) global diversity; (2) mutual cooperation; (3) creativity; (4) reasoned criticism; (5) independence; and (6) faith, fear of God Almighty, and noble character. The six dimensions of the Pancasila profile are used as intracurricular and extracurricular activities that will support competencies that are able to give birth to Pancasila students in the future (Kemendikbud Ristek, 2021). When the six dimensions of the Pancasila student profile are applied to students, it becomes a strategy to reduce negative incidents or students' deviant behavior at school or in society and becomes a student's contribution to defending the country. The form of defending the country is love for the motherland, awareness of the nation and state, belief in the power of Pancasila, sacrifice for the nation and state, and the initial ability to defend the country (Rahayu, 2019). This study aims to look at increasing scientific literacy to improve the profile of Pancasila students as an act of defending the country.

RESEARCH METHODS

The type of approach used in this study is quantitative approach and the type of research used is classroom action research. This type of classroom action research is a form of research that is reflective in nature and involves taking certain actions in order to improve classroom learning practices in a more professional manner (Mahmud, 2008). This research consists of four stages: (1) the planning stage, (2) the Implementation Stage, (3) the Observation Stage, and (4) the Reflection Stage. The implementation of this research was carried out in two cycles, with two meetings in each cycle.

Before giving treatment, researchers always start learning by praying according to their respective religions. This is done so that students are more prepared to accept learning. In the classroom action research stage, before being given treatment, students were given a pretest instrument to measure their initial abilities. After obtaining the pretest data as initial data, they were given treatment according to the stages of

classroom action research. In the first meeting cycle, the researcher gave questions related to electrolyte and non-electrolyte solutions to provoke students to think. Then the researcher asked students to find information related to electrolytes and non-electrolytes. After students search for definitions and examples of electrolytes and non-electrolytes in the first meeting, the results obtained are that students are able to explain the meaning of electrolyte and non-electrolyte solutions and are able to provide an explanation why these solutions are called electrolyte and non-electrolyte solutions. This also fosters students' curiosity about these electrolyte and non-electrolyte solutions, so that they are more active and independent and work together to find information related to electrolyte and non-electrolyte solutions.

At the second meeting, at the reflection stage, the researcher gave directions and explanations to the students. Along with the emergence of student questions raised because of the emergence of curiosity when looking for information related to electrolyte and non-electrolyte solutions, at this second meeting, students began to easily explain "what compounds can be called electrolyte and non-electrolyte solutions", and some students began to understand the difference between the symbols for solution and melt in the reaction equation, although at first some students thought the two symbols were the same. This shows that students have started to be literate and are able to provide examples of cases that are similar to the material provided.

In the second cycle of the first meeting, at this stage of reflection, the researcher gave a reading module to students to add scientific literacy. The researcher also answered the questions that arose after the students read the module. At this meeting, students were able to explain that "acid, base, and salt solutions are electrolyte solutions, while organic compounds such as sugar and urea are non-electrolyte solutions" in the literacy sources they read. And in this meeting, students are also more active and creative in asking questions. At the second meeting, students were even more creative in their learning, so that at the reflection stage they were able to explain that electrolyte and non-electrolyte solutions can be found in various sectors of life. At this second meeting, the researchers also conducted a review related to electrolyte and non-electrolyte solutions as a whole. Before learning ends, the researcher also conducts a post-test as part of the final research data.

This research was conducted at Sw Kalam Kudus Christian High School in Surabaya. The population in this study were all students of class X-IPA at Sw Kalam Kudus Christian High School in the 2022/2023 academic year. Data collection was carried out using the saturated sample method, that is, the entire existing population was sampled (Jati, 2017). The sample consisted of 30 students. The technique used in data collection is the test instrument. The test instruments used include pretest instruments and posttest instruments. The test instrument was prepared based on learning indicators for Electrolyte and Non-Electrolyte Solutions.

Furthermore, the researcher conducted a normality test as a prerequisite analysis test, after obtaining the pretest and posttest data. The Normality Test is carried out to evaluate the distribution of data in a group of data or variables to see whether the distribution of data is normally distributed or not. The test used in this study is the Kolmogorov-Smirnov test using the SPSS 26 program. To test the research hypothesis using a simple linear regression analysis technique (simple r-linear). In simple regression, the data used usually has an interval or ratio scale. Data processing was done with SPSS (Statistical Product and Service Solution) version 26.00.

The simple linear regression formula is as follows:

$$Y=a+bX$$

Where:

Y = Dependent variable (value to be predicted)

X = Independent variable (independent variable)

a = Constant (value of Y if X=0)

b = regression coefficient (positive or negative effect)

RESULTS AND DISCUSSION

There are four categories of scientific literacy in the instruments that researchers deploy. The four categories are the science category, which is the body of knowledge; the science category as the basis of investigation; the science category as the basis for thinking; and the correlation category of science, technology, and society. We can see in the first figure, namely the percentage of the first category, namely science as a body of knowledge. According to Abdulkarim in Hamidah 2020 the category of science as a branch of knowledge in general must present a lot of scientific knowledge, facts, concepts, principles, laws and hypotheses. In the picture, we can see that before being given the pretest results obtained, students who were able to answer correctly were 28%. Meanwhile, after being given treatment, the results obtained increased to 72%.

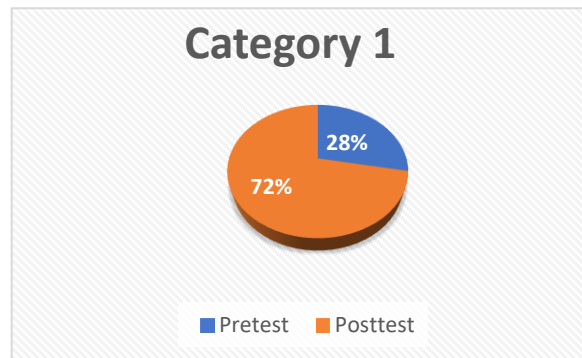


Figure 1. Categories of Science as the stem of knowledge

So it can be said that in this category, students can answer questions correctly, and the results obtained are in line with the results of research from Irwan 2020. Therefore, we must know that student learning abilities are strongly influenced by the extent to which students' cognitive functions can develop through the process of educational touch (Fu'adah 2020).

According to Sumarra 2020, science as the basis for student investigations is still low; this is due to the learning process at schools still using traditional methods. This is also supported by Marisa 2020 and Haerani 2020, who say that students do not like traditional and classical learning. Figure 2 shows that students answered the pretest results correctly by 31%. After being given the treatment, the posttest results increased to 69%. The increase obtained in this study is the result of implementing learning that fits the needs of students, and students' high scientific competence is in line with the results of Rohana's research (2018).

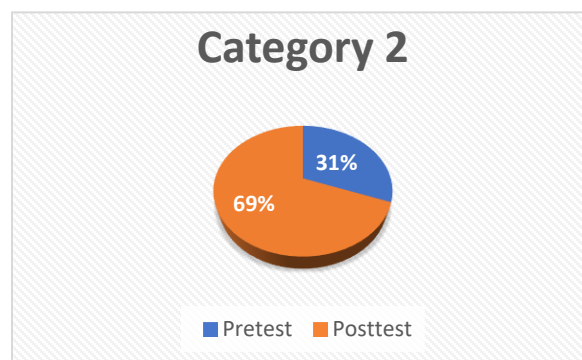


Figure 2. Science categories as a basis for investigation.

Figure 3 shows science as a basis for thinking. According to Warningsih 2020, science as a basis for

thinking must show how students' creative activities are seen through the existence of thinking activities that have been structured and motivated by their curiosity, imagination, attitudes, and beliefs. Science as a basis for thinking also describes the development of an idea related to emphasizing the empirical nature and objectivity of science (Ummah, 2018). In figure 3, the category of science as a basis for thinking has the highest increase of the four categories of scientific literacy. This is shown from the results of the students' pretest (19%) and the posttest results (81%). The more often students learn about one topic, the better their ability to think about that topic, this is in line with the results of Egen's research in Nurwandari 2018.

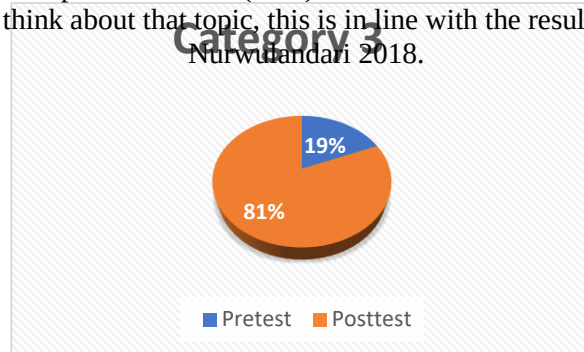


Figure 3. Categories of science as a basis for thinking

Figure 4 shows the correlation between science, technology, and society; this category shows an overview of the relationship or impact of science on society or the environment (Syahputri, 2019). In this category, it is known that scientific literacy skills are not only limited to the ability to memorize but also apply science in everyday life and apply their knowledge in the environment (Hikmah, 2019). Figure 4 shows that the ability of students in this category increased to 69%. This ability must be mastered by students to understand problems related to the environment. The results obtained are supported by the results of Mursalin's 2021 research, which says that good correlations between science, technology, and society go hand in hand with good environmental care attitudes.

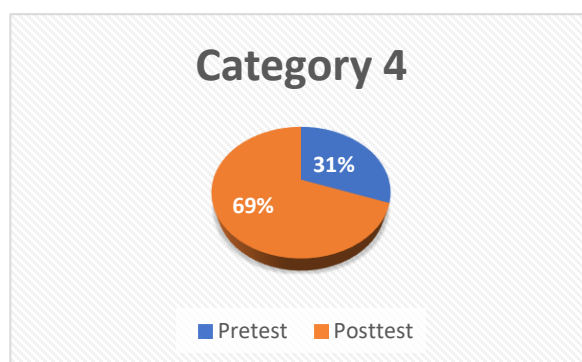


Figure 4. Correlation categories of science, technology and society

Based on the diagram above, it can be seen that the value of scientific literacy in the four categories has increased significantly and has different results. If seen from the results of the pretest, if it is averaged, then those who answered correctly are in the range of 20%, but after being given treatment, the value increases automatically, and the range also increases to 80%. The most significant increase in scientific literacy competency is in the third category, namely science as a basis for thinking.

In this normality test, the researcher used the Kolmogorov-Smirnov SPSS 26 test with the condition that if $\text{Sign} > 0.05$, then the class is normally distributed. Whereas if $\text{Sign} < 0.05$, then the class is said to be not normally distributed. The significance level of the normality test in this study is shown in Table 2. From Table 1, it can be seen that the results of the normality test are normally distributed.

One-Sample Kolmogorov-Smirnov Test

		Pre
N		30
Normal Parameters ^{a,b}	Mean	49.83
	Std. Deviation	8.546
Most Extreme Differences	Absolute	.150
	Positive	.150
	Negative	-.137
Test Statistic		.150
Asymp. Sig. (2-tailed)		.082 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

Table 2. Normality Test Result

After the prerequisite analysis test was carried out in the form of a normality test, the researcher tested the hypothesis using a simple regression analysis technique. This simple linear regression analysis is used to determine the direction of the relationship between the independent variables and the dependent variable. Does this variable have a positive or negative relationship? Simple regression analysis is also used to predict the value of the dependent variable if the value of the independent variable increases or decreases.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	24.181	3.734		6.476	.000
NilaiLiterasi	.760	.039	.965	19.588	.000

a. Dependent Variable: NilaiBerpikir

Table 3. Constant Value

Based on Table 3, the value of a = constant number of unstandardized coefficients is 24,181. The constant value indicates that if the independent variable is assumed not to exist, then the value of the dependent variable is 24,181. Thus, the value of students' critical thinking before or without scientific literacy is 24,181. Value b = coefficient number of unstandardized coefficients of 0.760. The value of the regression coefficient means that for every 1 point increase in scientific literacy, students' critical thinking skills will increase by 0.760. Thus, the value of the regression coefficient is 0.760 (positive), indicating that scientific literacy has a positive effect on students' critical thinking skills. Based on the results of this analysis, the regression equation.

$$Y = 24.181 + 0,760.$$

A measurement of the value of determination is carried out to determine the magnitude of the contribution of the independent variable (X) to the dependent variable (Y). Determining the value uses the results of Table 3 of the SPSS 26 output with the title Model Summary.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.965 ^a	.932	.930	1.16294

Table 4. Determinant Value

Based on Table 4 shows a determination value (R²) of 0.932. The determined value (R²) is then calculated as a percentage, then $KD = R^2 \times 100\% \leftrightarrow 0.932 \times 100\% = 93.2\%$. Thus, scientific literacy affects students' critical thinking skills by 93.2% and the rest ($100\% - 93.2\% = 6.8\%$) is influenced by other factors in scientific literacy.

Range Value	Frequency	
	Pretest	Posttest
22,5-33.5	14	0
33.5-44.5	7	0
44.5-55.5	9	0
55.5-67.5	0	0
67.5-78.5	0	0
78.5-89.5	0	4
89.5-100.5	0	26

Table 5. Pretest and Posttest value frequency data

Based on Table 5, it shows that the majority of students' pretest answer scores are in the interval between 23-44, namely 21 people or 70%. While the other frequency distribution is between 45-55 intervals of 30%. Based on Table 5, it shows that the majority of students' posttest answer scores are in the interval between 78-90, namely 4 people or 13%. While the other frequency distribution is between 91-100 and 87%. From the frequency of the pretest and posttest data presented, it can be seen that before being given treatment, the scores they got were in the range of 23–54. Whereas after being given treatment, student scores increased and were in the range of 85–100. This proves that there was an increase after the researcher gave the treatment.

From each student's response, the researcher saw that the more they searched for information and the literacy sources they read supported, the higher the desire to ask and the higher the scientific literacy carried out. This can be seen from the many sources that students read and the activeness of students during learning that applies the six dimensions of Pancasila student profiles and learning that focuses on students according to the independent curriculum. By applying the six dimensions of the Pancasila profile during learning, it becomes one of the students' actions in defending the country. Defending the Country does not have to be shown by participating in criticism and taking up arms; students who study seriously and in accordance with the six dimensions of the Pancasila profile can also carry out acts of defending the state during their education. During the post-test, it was easier for students to answer and understand questions because they had often read and gotten a lot of information that they understood and had just learned, so what these students did also increased their scientific literacy.

CONCLUSION

According to the conclusions obtained in this study based on the results of this analysis, it was found that

each category of scientific literacy experienced an increase based on the results of the pretest and posttest. The simple linear regression equation obtained is $Y = 24,181 + 0.760$. The results of calculating the value of the simple linear regression coefficient are around 0.760 (positive), indicating that scientific literacy has a positive effect on students' critical thinking skills. The magnitude of the role of scientific literacy that influences students' critical thinking skills is 93.2%, and the rest ($100\% - 93.2\% = 6.8\%$) of students' critical thinking skills is influenced by other factors outside of scientific literacy. During the learning process, the researcher saw that the students applied the six dimensions of the Pancasila student profile. This is a form of state defense action that students can easily carry out at their current stage of adulthood. Defending the country doesn't have to be physical attacks, but as the next generation, students studying hard have made an effort to defend the country.

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A Study of the “Double World First-Class Universities Construction Project” in Chinese Higher Education: A Historical Overview and Future Outlook

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ABSTRACT

In order to transform China into a powerhouse of higher education and promote the internationalization of Chinese higher education, the Chinese government and the Ministry of Education implemented the first round of the "Double World First-Class Universities Construction Project (Double First-Class)" in 2015. The second round of the project also started in 2022. This study aims to review the goals, summarize the implementation results, explore the issues and problems of the first round of "Double First-Class," and find implications for the ongoing second and future third rounds of policy. The study used the literature review analysis method to collect and analyze government policy documents, real-time data, and academic papers published in China on the "Double First-Class." The results showed that the fundamental goal of the "Double First-Class" is to cultivate top universities and disciplines to make China a world power in higher education. The detailed goals focus on constructing top teaching staff, cultivating outstanding research talents, and improving scientific research levels. Nonetheless, science and engineering are overemphasized, while the arts and social sciences are ignored, and there have been controversial problems, such as the corruption of professors. Based on our findings, we further provided the implications of developing a systematic education management and evaluation system, introducing senior professional scholars, and strengthening the management system to improve China's higher education competitiveness during the second and future third rounds of the project.

KEYWORDS: Chinese higher education, Policy, World class universities, Double world first-class universities construction project

INTRODUCTION

The construction of world-class universities and world-class disciplines in China has become a hot topic in the higher education sector, which is highly valued not only by the Ministry of Education but also by provincial governments and relevant universities, as well as by teachers, students, and the whole society. Therefore, to promote China as the powerhouse of higher education and achieve the historic leap from quantitative to qualitative change, in October 2015, the Ministry of Education (MOE) issued the "General Plan for Coordinated Promotion of the Construction of World First-Class Universities and World First-Class Disciplines" for the whole country. Subsequently, in January 2017, MOE issued the "Implementation Measures for Coordinated Promotion of the Construction of World First-Class Universities and World First-Class Disciplines" and released the first batch of construction universities and disciplines (Ministry of Education [MOE], 2015; 2017a; 2017b; 2019a; 2019b). In 2022, based on the results of the first round of construction, the national government and the MOE summarized experiences and jointly proposed a new/second round of "Double First-Class" construction in collaboration with the national "14th Five-Year Plan". The second batch of "Double First-Class" construction universities and disciplines was also announced (MOE, 2021; 2022a; 2022b).

The "Double First-Class" construction project has attracted significant financial support from the government and social enterprises. The initial funding budget for constructing world-class universities is nearly 100 billion yuan at the national level. There were 49 "world first-class universities" and 98 "world first-class colleges" (such as China University of Petroleum, China University of Geosciences, China University of Mining and Technology) (MOE, 2022). The universities have made great efforts and invested many resources in improving scientific research, reforming the research system, building cross-disciplinary platforms, building national key research bases and think tanks, and strengthening the construction of industry-academia-research platforms (MOE, 2018). On the other hand, the distribution of disciplines in the first round of the "Double First-Class" construction project was unbalanced, overemphasizing science and engineering while ignoring humanities. Among the 330 construction disciplines in the 49 construction universities, 253 are science and engineering majors, accounting for 77%; 77 are humanities majors, accounting for about 23% (Ministry of Education Information Center, 2021). In addition, although the quantity of academic research has increased significantly, the quality of academic research needs to be further strengthened.

Therefore, this study aims to conduct a literature review analysis based on official documents such as government reports, national strategic plans and government policies, real-time information data from the Ministry of Education, and academic journal articles related to China's "Double World First-Class University" construction project. According to the analytical framework, we will closely review the goals and the university types of China's first round of the "Double First-Class" construction project and identify the implementation status quo and remaining issues. Finally, we hope to draw some implications for the ongoing second and future third round of "Double First-Class" projects. The specific research questions of this study were as follows:

- (1) What are the goals and university types of China's "Double World First-Class Universities Construction Project"?
- (2) What are the implementation status quo and remaining issues of the first round of the "Double First-Class" projects, mainly focusing on the teacher faculty, talents cultivating, and scientific research construction aspects?

LITERATURE REVIEW

In order to cultivate competitive and creative human resources against the rapidly changing economy and society in the 21st century, a vast amount of human resources and capital resources have been invested in higher education. While there is no precise definition, many scholars have argued that "world-class

universities" and "world-class departments" have basic commonalities across various concepts of "world-class," including productive faculty, excellent students, flexible administration, plentiful funding, and international engagement (Allen, 2021; Wei & Ko, 2020; Xu, 2022). Advanced countries such as Europe and the United States do not have specific criteria for 'world-class universities' and 'world-class disciplines,' Ivy leagues such as Harvard, Oxford, and Stanford have been recognized as role models of world-class universities and world-class disciplines because they have a 100-year history and have nourished many talented individuals in various domains (such as politics, culture, economics, and science and technology), making a global impact (Huang, 2015; Li & Xue, 2022). In the case of China, the Chinese Ministry of Education (2017a) identified "world-class universities" and "world-class disciplines" as having outstanding research results, a high internationalization level, excellent teaching staff, rich research funds, orderly school management and administration, excellent students, a complete range of disciplines, good infrastructure, and creative output.

At the same time, there was a research fever on "world-class universities" and "world-class disciplines" in China. From 1998 to 2023, the most popular keywords in the literature on world-class universities and world-class departments were "first-class university," "world-class university," "double first-class universities," "first-class university construction," "talent cultivation," "department construction," "higher education," "quality of education," and "Chinese characteristics" (Yu, Zhao, Wang, & Li, 2021). Many studies have addressed the issue of world-class universities in China based on one or several case studies of the "211" and "985" projects, China's first formalized world-class university construction projects (Liu, Turner, & Jing, 2019; Qiu & Ou, 2016). In addition to domestic cases, there have been many comparative studies with advanced education countries such as the United States, Germany, Japan, and Korea (Huang, Wang, & Huang, 2020; Liu & Ko, 2020; Qiu & Ou, 2016; Yang, Chen, Liu, & Du, 2023). For example, Qiu and Ou (2016) conducted a comparative study of the German "Plan of Excellence," the French "Plan of Excellence for Universities," the Japanese "COE (Center Of Excellence Project) Plan," and the Korean "BK 21+ (Brain Korea) Project", and analyzed the background, content, and effects of the policies in each country. However, a lack of research analyzes China's first round of the "Double World First-Class University Construction Project" as a whole, from goals and implementation status to issues and problems (Huang, 2015; Wang, Chang, & Lin, 2022). Therefore, this study aims to draw an overall view of the first round of the "Double First-Class" project and intends to offer the Chinese case of World-Class University constructions as a piece of step-stones for future studies and other geographies.

RESEARCH METHOD

The literature review approach was employed in this study to fulfill the research objectives. The following keywords were used as the search query for the literature: "world first-class university construction[双一流大学建设]," "world first-class disciplines construction[双一流学科建设]," "double first-class construction[双一流建设]," "double first-class projects[双一流项目]," "double first-class universities[双一流大学]," "first-class disciplines construction[一流学科建设]," and "first-class universities construction[一流大学建设]." Furthermore, a total of 36 resources, including 9 official documents (from 2015 to 2023), 5 real-time information data, and 22 academic papers (from 2020 to 2023) related to China's "Double World First-Class Universities Construction Project" that were published from the official homepages of the Central Government of China and the Ministry of Education, Chinese Social Sciences Citation Index (CSSCI) database were collected. Then, through the literature review of the collected documents, we tried to understand the goals and implementation status of the first round of China's "Double First-Class" project. Finally, based on the above results, this study aims to identify the issues of the first "Double First-Class" project and draw insights for the ongoing second and future third round of construction projects. The research analysis framework of China's "Double World First-Class Universities Construction Project" is shown in Figure 1.

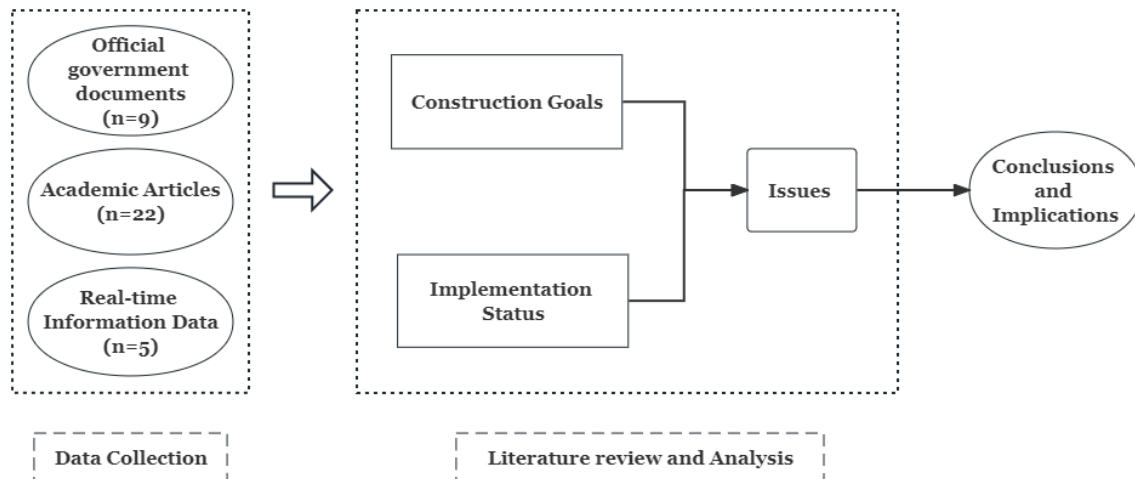


Figure 1. Research framework of the study.

RESULTS

The goals of China's "Double World First-class Universities Construction Project"

In October 2015, the Ministry of Education issued the Comprehensive Plan for the Construction of World First-Class Universities and World First-Class Disciplines, and made a new arrangement for the priority construction of higher education, and included the priority construction projects such as the "211 Project," "985 Project," and "Excellent Academic Innovation Platform" in the construction of world-class universities and first-class departments. In September 2017, the "Notice on Promulgating the List of First-Class Construction Universities and Disciplines" was announced. The first list of construction universities and disciplines was published, including Peking University, Renmin University of China, Tsinghua University, Nanjing University, Zhejiang University, with a total of 140 universities and 465 disciplines. In 2022, the new "Double First-Class" construction list has added eight disciplines from 7 universities, which are all provincial and local HEIs. It can be seen that after the first round of construction, only promoting the construction of national comprehensive top colleges and universities is not enough to achieve the goal of becoming a powerhouse of higher education, and more attention should be paid to the development of local colleges and universities (MOE, 2022a; 2022b). "Double First-Class" construction project aims to promote high-level universities and colleges to enter or lead the ranks of the world higher education, accelerate the modernization of the management system and governance capacity of higher education, raise new levels of advanced talent training, scientific research, social services, and cultural heritage, become a capacity for knowledge discovery and scientific and technological innovation, and develop excellent Chinese culture. Three steps of the fundamental goals and four specific aspects of objectives are shown in Table 1.

Table 1. Goals of "Double World First-Class Universities Construction Project"

The fundamental goal of China's "Double First-Class" project:	
1	By 2020, some universities and departments should be at the forefront of the world's top universities and the world's top departments.
2	By 2030, more universities and departments will be among the world's top, and the overall quality of higher education will be significantly improved.
3	By the middle of the 21st century, the number and quality of first-class universities and first-class faculties will be at the forefront of the world, and a higher education powerhouse will be built.

The specific objectives of China's "Double First-Class" project:		
1.	Teacher faculty	- Accelerate the development and recruitment of top scientists. - Focus on young teachers and innovation teams. - Foster innovation teams across disciplines and areas.
2.	Innovative talents	- Cultivate creative, applied, and multidisciplinary talent. - Establish a clear evaluation system with a complete quality assurance system.
3.	Scientific research	- Focus on building national leading and international first-class departments and disciplines. - Complement the scientific research system, develop cooperative innovation, optimize resource allocation, and enhance technological innovation capabilities.
4.	Culture spread	- Strengthen research and propaganda on China's excellent traditional culture and socialist core values, and promote the construction of a socialist advanced culture by fulfilling the role of educators.

Furthermore, China's "Double First-Class" project aims to build "first-class universities and first-class disciplines with Chinese characteristics" so that the Chinese universities must be scientifically classified and rationally positioned to form their characteristics. Experts emphasized the need to actively promote and guide the classification and qualitative development of "Double First-Class" universities (Huang, Wang, & Huang, 2020; Wang, Gu, & Yuan, 2022). Accordingly, the universities of the "Double First-Class" project were divided into four categories: research-oriented, major-oriented, applied-oriented, and skill-oriented, according to the specific educational goals of each university, as shown in Table 2.

Table 2. University Types of "Double World First-Class Universities Construction Project"

Type	Contents	Categorization	Vision Plan
Research-oriented	- Comprehensive research HEIs - Industry-specific research HEIs - Regional research HEIs - Characterized Regional Research HEIs - Applied research HEIs * (includes undergraduate, master's, and doctoral programs)	- Teacher level (teacher quality) - Classroom quality (quality of instruction)	World, National, Regional, and Industry First-Class HEIs
Major-oriented	-General Universities/Colleges -Specialized Universities/colleges * (includes undergraduate, masters, and doctoral programs)	- Academic quality (quality of scientific research)	
Applied-oriented	-General Applied Universities/colleges -Applied technology universities/colleges * (includes undergraduate, master's, and doctoral programs)	- Student level (quality of students) - Operational positioning (vision plan)	
Skill-oriented	-Technical and vocational colleges * (includes undergraduate and graduate programs)	- Operating characteristics (culture)	

Implementation Status of China's "Double World First-Class Universities Construction Project"

a. Basic Implementation Status: Since implementing China's "Building World Class Universities" program, significant achievements have been made in the international rankings of selected construction universities. In 2017, only four universities were ranked in the top 100 of the QS World University Rankings, and in 2018 and beyond, they retained six. In particular, Zhejiang University jumped from 110th in 2017 to 45th in 2022 (QS, 2017; QS, 2022). From 2015 to 2022, two of China's most prominent universities, Peking University and Tsinghua University, jumped from 48th and 49th, respectively, to a joint 16th place in THE's World University Rankings. In 2022, THE's list included 97 universities in China, ranking fourth after the United States, United Kingdom, and Japan (Times Higher Education, 2022). Evaluation indicators such as teaching and learning, scientific research, faculty quality, and international outlook are often used to calculate university rankings (Cui, Li, & Zhang, 2023; THE, 2022). Despite these achievements, there is still a large gap between Chinese universities and the goal of being "world-class" (Qiu & Ou, 2016; Zhao & Hu, 2020). Another notable achievement was the increased internationalization of "Double First-Class" universities. To meet the requirements of strengthening participation in international higher education research, many universities have accelerated the pace of internationalization. For example, Tsinghua University has established nearly 600 English medium instruction (EMI) courses and 28 graduate degree programs in English education, while Peking University offers 77 EMI courses in 24 departments to undergraduates. Statistics from the Chinese Ministry of Education show a steady increase in international students studying in China, including those studying for masters and doctoral degrees. In 2019, 18,421 foreign teachers were working in Chinese universities, an increase of 2989 from 15,432 in 2014, and the number of foreign teachers with doctoral degrees continues to grow (Ministry of Education Information Center, 2020; 2021). It indicates higher educational requirements for foreign teachers and an improvement in the quality of international teachers. International cooperation and university exchanges have also been strengthened in educational science and research.

b. Teacher Faculty Construction: First-class faculty recruitment emphasizes recruitment from off-campus sources, while teacher training involves the development of existing teachers on campus. Whether it is recruitment or training, it is a vital link and method of faculty building, with the end goal of restructuring the faculty. In terms of faculty development programs, Peking University promotes the "Scholarly Talent Plan," Tsinghua University promotes the "Arborist talent program," and Zhejiang University promotes the "Hundred People Plan" (Guo & Duan, 2020). Universities also give preference to overseas talents and those with prestigious titles. Fudan University has recruited Nobel Prize winners, Zhejiang University has recruited Turing Prize winners, and Peking University has recruited a professor from a famous first-class university in the United States (Zhu & Liu, 2020). Although many achievements have been made in constructing first-class teacher faculty, many issues remain. First, due to the lack of creativity of teachers, some universities still need to adjust their teaching programs promptly, and the design of professional education needs to be in line with the times (Zhu & Liu, 2020). With the increasing competition in universities, the problem of excessive pursuit of utilitarianism by university teachers has become more serious, and the fierce competition in education has forced teachers and research scholars to engage in academic corruption and lack of teaching management content (Guo & Duan, 2020). These phenomena not only led to the loss of teachers' human resources but also led to the decline of the comprehensive teaching ability of universities. In addition, an insufficient talent pool is also one of the critical problems faced by modern university faculty construction (Li & Xue, 2022; Zhu & Huang, 2023).

c. Cultivate Talents Construction: In order to cultivate high-level talents, HEIs create high-quality professional courses, reform teaching methods, and establish a competence training system. Professional courses are offered with more emphasis on practicality, application, and creativity, thus stimulating students' learning motivation, improving the quality of teaching, and enhancing the overall quality of

teaching (Liu, Turner, & Jing, 2019). Professors and teachers continue to innovate teaching methods, carefully design content consistent with practice, and create a relaxed and pleasant learning atmosphere (Ministry of Education Information Center, 2020; 2021). "Double First-Class" universities established a three-tier competence cultivation system of "foundation + practice + innovation," which requires each discipline to build a good foundation, practice well, and be innovative (Yan & Du, 2022). However, there are remaining issues in student cultivation in the current state of talent construction. First, the boundaries of the humanities and sciences must be clarified, which restricts students' critical thinking capabilities and is not conducive to promoting cross-disciplinary and complex talents (Li, 2023). Furthermore, teachers must have a reasonable teacher-student ratio to prevent teachers from caring for all students simultaneously. Sometimes a counselor needs to manage 100–200 students. Such administrative loopholes may cause students' stress and psychological burden not to be helped and resolved promptly, causing some students to ask for leave or even drop out of school (Wang, Lu, & Liang, 2023).

d. Scientific Research Construction: In 2020, the total number of SCI/SSCI papers published by Chinese researchers exceeded 390,000, ranking second in the world. Among them, the total number of papers published by Chinese universities in JCR Q1 journals exceeded 51,000, an increase of about 18% over 2019 (Ministry of Education Information Center, 2020). The analysis of the academic research performance of the first round of the "Double First-Class" project shows that the total number of articles has reached the level of world-class universities during the construction, indicating that the research scale of domestic construction universities has a significant quantity of increase in scientific research (Cheng, Lu, & Li, 2020). However, the analysis shows that the quality of the research papers is below the world average. The overall research quality still needs to improve with the world's top universities (Liu, Luo, & Liu, 2023). At the same time, it also indicates that the transformation of scientific research results needs to be improved. A study on the patent conversion of domestic universities found that except for Tsinghua University, other universities' international patent selection ability is generally poor, indicating a significant gap between domestic scientific research construction in theoretical and experimental research (Jiang & Qin, 2022).

CONCLUSIONS AND IMPLICATIONS

This study analyzed the goals and implementation status of China's first round of the "Double World First-Class Universities Construction Project" through the literature research method, using official documents from the government and the Ministry of Education, real-time information data, and academic papers to identify issues that arose during the first round of construction and to draw implications. According to the results, the fundamental construction goal of the first "Double First-Class" project is to build world-class universities and disciplines and make China a global higher education powerhouse. As for the detailed goals, they mainly focused on building first-class teacher faculty, cultivating excellent talents, and improving scientific research. Overall, the first round of construction has achieved good results in many aspects. The world rankings of first-class universities and disciplines have risen significantly since 2015. Both the central and local governments have injected more financial support into the "Double First-Class" project. Constructing a first-class teaching faculty has encouraged experienced and young professors to use innovative and creative teaching methods from abroad and domestically. Universities have made great efforts to cultivate excellent talents, from building infrastructure to reforming teaching methods and developing creative teaching content.

However, while many achievements have been made, several issues and problems have yet to emerge. There is a problem that the support for the academic fields is very unbalanced, and the construction HEIs overemphasize science and technology and neglect the humanities domain. Due to the insufficiency of professional teaching faculty members and over-competition, problems of poor research performance and corruption have arisen in the spotlight. It has also been criticized that the quality of scientific research lags behind the quantity. Therefore, the following implications are drawn to resolve these issues and problems for the ongoing second and future third round of "Double First-Class" construction projects:

1. The construction of a first-class teacher faculty and the recruitment system of professional teaching talents should be strengthened to create a new management environment for university teachers.
2. In constructing excellent and innovative talents, HEIs' teaching methods must be adjusted to adapt to the information age, online learning, and other new teaching and learning situations. Learning is a joint effort of teachers and students, and although students are the main subjects of learning, the role of teachers in the teaching process cannot be ignored.
3. To strengthen cooperation in management, implementation, and evaluation so that the foundation and guarantee of the system are firmly established. From a national perspective, constructing first-class universities is a long-term, resource-intensive endeavor. High-quality management, adequate policy, and financial support are essential for improving the academic quality of first-class universities.

There are limitations to this study, and further research should be pursued. For example, the literature research method and policy analysis framework used in this study are practical and operational in analyzing policies' purpose and implementation at a macro level. However, there are limitations in analyzing each of the specific components, and future research could conduct more in-depth studies on the specific details of policy implementation and the primary targets, such as using more substantive quantitative and qualitative methods to conduct follow-up surveys and research on university teachers, leaders, students, and policy decision-makers. In addition, unlike China, other countries and regions have different views on constructing first-class universities and disciplines. We hope that our research on China's "Double First-Class" construction project will provide an example for other regions, and we also look forward to more comparative studies in this field in the future.

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The Influence of Critical Thinking Skills in the HOTS Dimension on Science Literacy

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ABSTRACT

In improving the quality of education in Indonesia, the curriculum currently used is the Independent Curriculum and the implementation of the National Assessment with 2 areas namely Literacy and Numeracy to evaluate the entire learning process in Indonesia. The Independent Curriculum has six dimensions that must be achieved. One of the dimensions is the HOTS Dimension. This study aims to analyze the influence of critical thinking skills in the HOTS dimension on scientific literacy to achieve the Profile of Pancasila as one of the Independent Curriculum's outcomes. The population of this study was Grade 10 students of a Private Senior High School (SMA) Kalam Kudus Surabaya, East Java, with a total sample from 30 students who were determined through the saturated sample method. The research result explains that there is an influence of critical thinking on students' scientific literacy by using the Problem Based Learning with the r-value (correlation) = 0.965. If we interpret the r-value $0.8 < r < 1$ means that the correlation is at a very strong level, $\text{sig} = 0.000$; and the R-Square value is 0.932 so that the effect of critical thinking in the HOTS dimension on students' scientific literacy is 93.2%. with a df value of 1, it means that it reaches to 1, meaning that the influence of critical thinking skills in the HOTS dimension on scientific literacy is at a strong level. So, it can be concluded that if the students' ability to think critically in the HOTS dimension then they are better to perform scientific literacy in achieving the Profile of Pancasila Student as one of the Independent Curriculum's outcomes .

KEYWORDS: Independent Curriculum, HOTS, Pancasila Student Profile

INTRODUCTION

The Indonesian government is currently making various efforts to improve the quality of education in Indonesia. The effort goes from Human Resources, Curriculum, Learning Media, to Evaluation. The development of the curriculum of the 2013 Curriculum is now a self-reliant curricula where this curriculum has six student profiles, one of which is critical, it is in accordance with SK No. 044/H/KR/2023 decided to implemeniate independent curriculums on educational units (kemendikbud, 2020)

The curriculum must be able to encourage students to learn continuously so that they are motivated to learn for life, and finally, students must be trained to continue to think critically in solving surrounding problems and material in the learning process (Murshid et al., 2023). In the process of learning chemistry subjects, the problem that is currently often found is the difficulty of teachers transferring knowledge directly to students due to the student's paradigm of "chemistry is an abstract science".

In the independent curriculum, there is a national evaluation called the Computer-Based National Assessment, with the main component being the Minimum Competency Assessment (AKM). Based on the results of the researchers' initial research at the Kalam Kudus Christian High School in Surabaya, the AKM results for the literacy field showed that students showed a good level of reading literacy with a percentage of 72.41%. However, in the initial research conducted by the researchers, it was found that students still had difficulty understanding the context of chemistry questions.

Based on the opinion of Itsna et al. (2022), critical thinking is a process that actively involves students' intellectuals, skills, evaluations, analyses, and syntheses so that it can be related based on Bloom's taxonomy. Critical thinking is not only about higher-level thinking in cognitive terms but also how students can analyze information so they can create new ideas. Chemistry has characteristics of critical thinking because of the need to think critically when analyzing problems in the surrounding environment. In the research of Itsna et al. (2022), critical thinking is a process that actively involves students' intellectuals, skills, evaluations, analyses, and syntheses so that it can be related based on Bloom's taxonomy. Critical thinking is not only about higher-level thinking in cognitive terms but also how students can analyze information so they can create new ideas. Chemistry has characteristics of critical thinking because of the need to think critically when analyzing problems in the surrounding environment. One of the factors that can affect critical thinking skills in chemistry is scientific literacy skills. This is because science learning directs students to be critical in problem solving (Chayana, 2017).

Based on the National Assessment Data Source by the Ministry of Research and Technology (2022), literacy ability is the percentage of students based on their ability to understand, use, reflect on, and evaluate various types of informational and fictional texts. So the researchers saw that there was a discrepancy between the results obtained and the existing goals. Where it should be is that if students have good literacy, they can understand the context of the questions well too (Andriyani, 2023). Chemistry in general aims to enable students to master science as content, context, and processes in life (Rohmaya, 2023). This is in line with the aim of the Program for International Student Assessment (PISA) to promote scientific literacy. The results of the PISA test in the field of science inform us that the scientific literacy scores of Indonesian students are still far below the average when compared to international average scores, meaning that the level of scientific literacy is in a low position (Rohmaya et al., 2022). Researchers see that the priority areas for literacy are mathematical literacy and reading literacy. Science literacy should also be emphasized in students. This is because, according to the OECD (2018 (in Yusuf, 2022), scientific literacy involves students' knowledge and skills in identifying questions and acquiring new knowledge so that HOTS dimensions and students' higher-order thinking skills in the Merdeka Curriculum can be achieved.

According to Brookhart in the journal Susilowati and Sumaji (2021) the HOTS (High Order Thinking Skills) dimension can be seen from transfer, critical thinking and problem solving, so that critical thinking is closely related to the HOTS dimension. According to Wibawa and Agustina (2019) education currently leads to the HOTS learning system where this dimension is a student's thinking process at a higher cognitive level. But the HOTS Dimension also includes critical, logical, reflective, metacognitive, and creative thinking. So that in bloom taxonomy students can reach up to lever C6 (Create). According to Norrizqa (2021) scientific literacy in a student can directly improve the student's higher-order thinking skills. Students' high scientific literacy will also make a high contribution to students' critical thinking skills (Razzaq et al, 2021).

METHODS

In this research, the researcher used the classroom action research method. With the design of the one group pretest - posttest design, this type of research is an attempt to be able to solve learning problems with direct application in class (Kurniawan, 2023; 113). In this study there were four stages, namely, (1) Planning Stage, (2) Implementation Stage, (3) Observation Stage, and (4) Reflection Stage (Hasan et al, 2023). The implementation of this research was carried out in 2 cycles with 2 meetings in each cycle.

At the planning stage the researcher plans for the implementation of the learning activities that will be carried out by the researcher. In this case the researcher prepares each research device to be used such as the Learning Implementation Plan, Assessment Instrument, and learning media to be used. Next is the implementation stage, at this stage the researcher carries out learning activities in accordance with what has been planned at the planning stage. The researcher gave an initial test and then gave treatment to students carrying out scientific literacy independently and looking for as much information as possible about electrolyte solutions. After students carry out literacy activities to understand the concept of electrolyte solution material, the researcher conducts a posttest on students.

Observation Stage, at this stage there are two sample activities that are observed, namely, student learning activities and learning activities. Observations on the student learning process were observed by researchers while observations of the learning process were observed by one of the teachers at the school. The results of this observation are used by researchers as material for reflection on improvements in subsequent learning. The reflection stage is carried out by the researcher at the end of the cycle and is carried out together with the results of the teacher's observations to evaluate the success of the activities carried out as a basis for designing the next cycle.

The independent variable of this study is the ability to think critically while the dependent variable is scientific literacy. The research was conducted at the senior high school level, namely SMA Kr. Kalam Kudus Surabaya, Indonesia with a total sample of 30 students using a non-probability sampling technique. The research was conducted for four months from January to April 2023 with H0: Critical thinking skills have no effect on scientific literacy, and Ha: critical thinking skills have an effect on scientific literacy.

The data collection technique used in this study was the test method given at the pretest to find out students' understanding of the material to be taught, then a posttest was carried out to find out students' understanding after class action was carried out. The test instrument is given as many as 14 questions in the form of multiple choice. The data obtained was then carried out by classical assumption tests in the form of normality tests and linearity tests as a condition of the simple r-linear regression analysis technique to see the correlation of the dependent variable and independent variables in this study, then the research results were described descriptively. In drawing conclusions from the hypothesis, the researcher tested the hypothesis with the Paired Sample t-test and then conducted the R-Square test to see how much influence critical thinking skills had on scientific literacy. Based on critical thinking skills, according to Facione (2022), there are several indicators, namely interpretation, analysis, inference, and explanation. The

researchers processed the data quantitatively to see the percentage of achievement of critical thinking indicators based on the theory of Facione and Ennis.

RESULTS OF THE STUDIES

Statistical tests were analyzed using descriptive statistics. This was done to find out the description of variable data such as the amount of data, average value, minimum value, maximum and standard deviation (Priyanto, 2023), while the recapitulation of the results of the analysis is according to table 1.

Table 1. Statistical Description

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	30	14	57	35.80	11.757
Posttest	30	86	100	96.73	4.402
Valid N (listwise)	30				

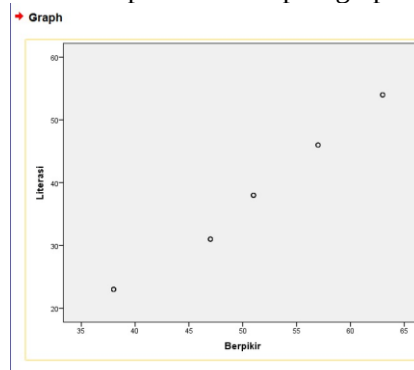
In the research before testing the hypothesis, the researcher tested the classical assumptions, namely the normality test and the linearity test. The normality test was carried out using the Kolmogorov-Smirnov method with the results in table 2 that the significant value is $0.082 > 0.05$, it is stated that the sample is normally distributed.

Table 2. Kolmogorov-Smirnov Normality Test

		Pre
N		30
Normal Parameters	Mean	49.83
	Std. Deviation	8.546
Most Extreme Differences	Absolute	.150
	Positive	.150
	Negative	-.137
Test Statistic		.150
Asymp. Sig. (2-tailed)		.082

The linearity test was carried out using a scatter plot graph to be able to see the direction of the positive and negative linear relationship between the two variables. Based on the scatter plot graph in graph 1, it can be seen that the points in the data plot form a straight line pattern from the bottom left up to the top right.

Graph 1. Scatter plot graph



In determining the hypothesis, the researcher conducted the t test used to find out the regression model of the independent variable partially to the dependent variable so that it can make a hypothesis decision. Based on table 3, the sig value of this study is $0.00 < 0.05$, so the null hypothesis of the study is rejected in the sense that students' critical thinking competence influences students' scientific literacy. There are several criteria as a basis for decision making H_0 is accepted if the p-value < 0.05 then the null hypothesis is rejected, this means that the independent variable has a significant effect on the dependent variable.

Table 3. Result of Paired Samples T-test

		Paired Differences					t	df	Sig.(2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval Of the Difference				
					Lower	Upper			
Pair 1	Pre-Post	-59.533	13.067	2.386	-64.413	-54.654	-24.955	29	.000
Pair 2	Pretest-Posttest	-47.367	10.257	1.873	-51.197	-43.537	-25.294	29	.000

Table 4. R-Square Table

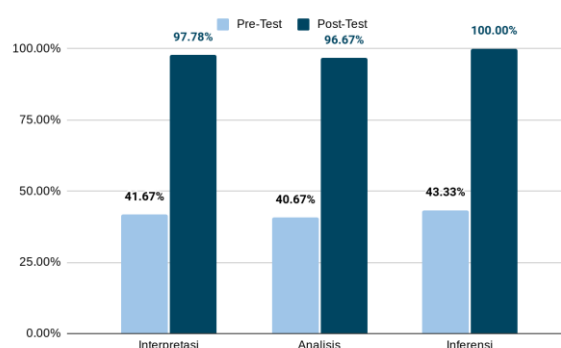
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.965	.932	.930	1.16294

Based on table 4, a simple linear regression R test was carried out to see what percentage of the influence exerted by critical thinking skills in the HOTS dimension on student literacy was carried out by students. The results of the study explain that there is an effect of critical thinking on students' scientific literacy by using Problem-Based Learning with a value of r (correlation) = 0.965. If we interpret the value of r $0.8 < r < 1$ it means that the correlation is at a very strong level, $\text{sig} = 0.000$; and the R-Square value is 0.932 so that the effect of critical thinking on the HOTS dimension on students' scientific literacy is 93.2%. with a df value of 1 means achieving 1, meaning that the influence of the HOTS dimension's critical thinking skills on scientific literacy is at a strong level.

The assessment process to get scores from literacy and critical thinking uses distractor multiple choice where in one question there are 5 choices with 1 correct answer and 4 distractor answers. in this case there is a 1 in 4 chance of the student answering correctly. So questions with correct answers get a score of 0.20 and if answered incorrectly get a score of 0.80.

If seen based on the value processing of the pre-test and post-test questions given by the researcher, there is a high increase in scores for each sample, there is no decrease in value and in accordance with Norrizqa's theory (2021) that an increase in the value of scientific literacy in a student can directly improve one's higher-order thinking skills. This is in accordance with the analysis between pretest and posttest values which are associated with Facioni's critical thinking indicator criteria in research (Laili, 2022)

Graph 2. Percentage of Critical Thinking Indicator Results



Based on the graph above, the results of the percentage of posttest scores for each criterion indicator of critical thinking have increased very high. Interpretation from 41.67% to 97.78%, Analysis from 40.67% to 96.67% and inference increased from 43.33 to 100%. At the beginning of the pre-test students get relatively low scores because they find it difficult to analyze the questions and understand what the questions mean, when students do scientific literacy more often students will receive a lot of information and often process this information with new sentences, this makes it easier for students to understand the meaning of sentences and also understand the meaning of the HOTS questions given by the teacher.

In fact, researchers see that student scores have increased very significantly, this is in line with the statement of Razak et al (2021) high student scientific literacy will also make a high contribution to students' critical thinking skills. If students have a high level of critical thinking, the scientific literacy carried out by students is also high, so that when solving HOTS-based questions, it is easier for students to solve these problems. In table 3 which shows the scatter plot graph there is a positive relationship between the critical thinking variable and the scientific literacy variable. The positive relationship in question is meaningful if students' critical thinking skills increase, the scientific literacy that students apply also increases.

There are several indicators to analyze whether the level of students' critical thinking increases or not, the criteria for critical thinking are presented in the table below:

Table 5. Critical thinking indicator table

Criteria	Indicator
F (Focus)	Students understand the problems given
R (Reason)	Students provide reasons based on facts/evidence that are appropriate at each step in making decisions or conclusions
I (Inference)	Students conclude correctly
	Students choose the right reason (R) to support the conclusions made.
S (Situation)	Students use all the right information with the problem
C (Clarity)	Students use further explanations about what is meant in the conclusions made

Students can explain the terms in the problem

Students provide examples of cases that are similar to the problem.

Sumber: Agustiani dkk., (2022), *Jambura Journal of Mathematics Education*, 3(2), 107-119.

Overall students have shown all the indicator criteria of critical thinking, focus (F) students understand the problems that the teacher gives, reason (R) students can provide reasons based on evidence that are in accordance with the sources of scientific literacy that students get, interference (I) students can provide clear conclusions and giving appropriate reasons at the end of learning, situation (S) students confidently use all the information students have read and explain to their classmates, clarity (C) students can give examples or similar problems regarding electrolyte solutions.

These indicator criteria can be seen in the reflection stage at each meeting in cycle I and cycle II, in cycle I the first meeting the responses given by students according to the criteria of reason (I) and focus (F) can explain the definition of an electrolyte solution to explain how a solution can be called electrolyte solution. Students realize that the more often they think about a question or are curious about a word that students are reading for the first time such as the word "conduct electricity" in this situation the student is in accordance with the situation criteria (S) so that students are increasingly looking for reading sources regarding electrolyte solutions. The second meeting of the reflection stages of students began to easily explain "what can be called an electrolyte solution" and some students began to understand the difference between the symbols for solution and aquos in the reaction equation even though previously students thought the two forms had the same characteristics so that students were in accordance with the clarity criteria (C) provide examples of cases that are similar to the material provided.

In cycle II of the first meeting, at this reflection stage students explained that students continued to want to read about electrolyte solutions because students had a curiosity about the word "Acid solution is an electrolyte solution" in the literacy sources that students read. At the second meeting, students were even more active in learning so that at the reflection stage they were able to explain that electrolyte solutions are not only in the laboratory but also in everyday life.

From each student's response, the researcher saw that the more critical the literacy source was, the higher the desire to answer each question, so that the scientific literacy that was carried out was also higher. This can be seen from the number of sources that students read. In accordance with the independent curriculum regarding student independence in learning, learning becomes centered on students. During the post test, it was easier for students to answer and understand the questions because they had often read these sentences when they were doing scientific literacy, and they even understood a lot of information that they had just learned in Phase F.

CONCLUSION

From a series of research activities carried out, the researcher draws the conclusion that students' critical thinking skills in the HOTS dimension have an influence because they have a sig value on the t-test p-value of $0.00 < 0.05$ and the two variables have a directly proportional (positive) relationship as seen from scatter plot diagram in table 3. Students' critical thinking skills increase, so does the scientific literacy that students apply in the sense that the more critically students respond to or find information, the more often students will seek information. The influence of critical thinking in this study is very high, which is equal to 93.2%, as seen from the R-square value of 0.932. Thus, it can be concluded that the HOTS Dimension Critical Thinking Skills have a significant influence on Scientific Literacy.

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Can the Higher Education Sprout Project Serve as A Buffer Against the Adverse Effects of Socioeconomic Disadvantage on Students as They Grow?

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ABSTRACT

Given the interrelatedness of educational inequality with other forms of inequality and its impact on school management, the Taiwanese Ministry of Education has taken steps to address this issue. In recent years, the Ministry has not only expanded financial assistance to economically disadvantaged students to facilitate their education but also invested \$27 million annually in the Higher Education Sprout Project since 2018, with the aim of addressing the overall learning process of such students in universities and colleges. It is crucial to identify and improve the implementation of educational assistance programs and their interaction with financial aid measures, as this is not only an important academic issue but also a primary basis for education policy decision-making and support system planning. Therefore, empirical data is needed to provide evidence to support policy implementation and assess its overall effectiveness. This study examines the impact of financial aid measures and the Higher Education Sprout Project on the dropout risk and learning performance (including semester grades, class ranking, and department ranking) of economically disadvantaged students from different income levels. Data from a private technological university in Taiwan from 2018 to 2022, as well as administrative data, were used in this study. The findings of this study will provide evidence to support policy decisions and intervention strategies for supporting economically disadvantaged students in higher education.

KEYWORDS: Economically disadvantaged students, Dropout risk, Learning performance, Higher Education Sprout Project

1. INTRODUCTION

Since 1994, with the expansion of higher education institutions in Taiwan, the accessibility of higher education has indeed increased for economically disadvantaged students. However, although there has been a gradual fulfillment of the "quantity" aspect of equal opportunities in higher education, an examination of the effectiveness of the "Scholarship Program for Underprivileged Students in Higher Education Institutions" by the Ministry of Education in Taiwan reveals that from 2017 to 2021, the number of scholarship recipients in private vocational colleges was approximately five to six times that of national vocational colleges, three times that of private universities, and four times that of national universities (Ministry of Education, 2023a). This indicates that in Taiwan, despite expanding higher education institutions in the 1990s and implementing admission measures such as special talent selection, disparities between elite families and underprivileged families still persist.

Considering that educational inequality is often intertwined with other forms of inequality, such as the inequalities experienced by economically disadvantaged students in the learning process, which may affect their academic success and educational stability, and subsequently extend to their employment and social participation upon entering the workforce (Donnelly, 1987; Sirin, 2005; Liu et al., 2020). In recent years, the Ministry of Education in Taiwan has implemented reforms not only at the entrance stage through the reduction of entrance examination fees and changes in admission channels but also after students' enrollment. Measures such as tuition fee waivers and the expansion of the "Scholarship Program for Underprivileged Students in Higher Education Institutions" since 2007 have been implemented to provide financial assistance to students. Furthermore, since 2018, the "Enhancing the Public Nature of Higher Education: Improving Financial Assistance Mechanisms and Facilitating Social Mobility" project (referred to as the educational support program) has been carried out through the Higher Education Sprout Project. It aims to assist economically disadvantaged students in balancing their academic studies and living expenses through a guidance mechanism emphasizing learning over part-time work, ensuring comprehensive support for their overall learning journey in higher education institutions (Ministry of Education, 2023b).

It is worth noting that although several studies have discussed the scholarship policies of the Ministry of Education for university students in the past, many of them focused on the historical development of scholarship policies or proposed reform suggestions based on the integration of various sectors' comments on these policies. The question remains whether the educational support program has effectively reduced the dropout risk for economically disadvantaged students. Has the implementation of assistance policies resulted in improved academic performance for students? To date, there is no clear answer to these questions regarding the effectiveness of policy implementation.

Identifying the impact of policy measures on the dropout risk and academic performance of economically disadvantaged students is an important academic topic and a crucial basis for educational policy decision-making and support system planning and intervention. Therefore, empirical evidence is needed to provide support and appropriately respond to the overall effectiveness of policy implementation. This study utilizes data collected from a private technological university in northern Taiwan (referred to as the case university) between 2018 and 2022, including scholarship data for economically disadvantaged students, academic records for day students from 2016 to 2019, tuition fee waiver data, scholarship application data for the "Scholarship Program for Underprivileged Students in Higher Education Institutions," course grades data for each semester, and dropout data. The study aims to investigate the impact of the educational support program on the dropout risk and academic performance of economically disadvantaged students. The specific research questions addressed in this study are as follows:

- (1) What are the differences in the academic trajectories within the first four years of enrollment between economically disadvantaged and general students? Can the educational support program effectively reduce the dropout risk for economically disadvantaged students within the first four years of enrollment?
- (2) Does the educational support program positively impact the academic performance of economically disadvantaged students?

2. REFERENCE REVIEW

2.1 The Importance of Enhancing Educational Equity

Economically disadvantaged students' academic achievement is highly scrutinized for several reasons. From the perspective of educational equality, obtaining better education means having a greater advantage in admission and economic achievements compared to others, directly influencing an individual's future career development (Brighthouse and Swift, 2006; Koski and Reich, 2007). Therefore, educational achievement should stem from personal "talent" or "effort" and should not be influenced by social class or other factors (Swift, 2003). During students' educational journey, it is the state's significant responsibility to ensure fairness in the "educational competition" (Brighthouse and Swift, 2006), while schools must ensure that all students have equal opportunities and resources to compete fairly in the labor market (Brighthouse and Swift, 2008; 2009). This means that every student, regardless of factors such as race, gender, or social class, should have access to equal educational opportunities and resources. On the other hand, students who are disadvantaged in their educational journey due to their family's socioeconomic background, despite having comparable "talent" and "effort," need compensatory measures to address their circumstances. These students can overcome their disadvantages and achieve educational equity by providing additional educational resources.

From an economic perspective, education is considered the most effective means of intergenerational mobility. Therefore, equal educational opportunities are indispensable in addressing social immobility between the rich and the poor. Brand and Xie (2010) utilized two large-scale longitudinal studies, the National Longitudinal Survey of Youth (NLSY) conducted in 1979 and the Wisconsin Longitudinal Study (WLS) initiated in 1957, to examine the impact of college education on graduates' earnings. The authors found that the effect of college education on earnings varies across different groups with distinct family or ability backgrounds. The research results indicated that individuals with a lower inclination to complete college education (e.g., those from disadvantaged socioeconomic backgrounds or with lower ability) experience significantly higher returns on their earnings if they complete college. In other words, education enables disadvantaged groups to achieve economic mobility. Subsequently, Bloome et al. (2018) conducted a similar analysis using the 1979 and 1997 NLSY data and obtained comparable findings. Their research suggested that the expansion of higher education coupled with increased returns on education allows students from disadvantaged socioeconomic backgrounds to have the opportunity to improve their social status, contributing to the limited expansion of intergenerational income elasticity in recent years. Therefore, the authors proposed that governments should focus on "how many people have completed college education" when formulating educational policies instead of focusing on "who has completed college education" when formulating educational policies.

Fair education is closely related to a country's long-term resource development and competitiveness enhancement. Levin (1972) pointed out that national policies should focus on investing in educational resources because insufficient education carries significant costs for a country and society. These costs include reduced income, decreased tax revenue, increased social welfare expenditures, higher crime rates, declining public health, reduced political participation, and reduced social mobility. Nobel laureate in economics, James Heckman, also emphasized that in the past, government policies often treated fairness

and efficiency as opposing aspects, assuming that pursuing fairness would inevitably sacrifice efficiency. However, in reality, fairness and efficiency can complement each other, as exemplified by promoting policies for educational equity. Promoting educational equity in society is not only a measure of "fair justice" or "social welfare," but also a policy that benefits the overall society and promotes national economic development (Heckman, 2011).

The policy mentioned above recommendations are based on multiple longitudinal studies spanning several decades, involving the subjects of policy interventions themselves and their offspring. These studies, which are still ongoing, have attracted the attention of governments worldwide, leading to an increased emphasis on investing in educational resources for economically disadvantaged students. According to statistics from the Organization for Economic Co-operation and Development (OECD), among 43 educational systems globally from 2008 to 2017, 20 education systems identified reducing disparities in student learning achievement as an important education policy goal, and 29 education systems prioritized addressing the gaps resulting from socio-economic status (OECD, 2018).

2.2 The negative factors that economically disadvantaged students face in their education

While education is considered a stepping stone to promoting equal opportunities or social mobility, a series of past literature has consistently pointed out that the process of economically disadvantaged students successfully completing their education is not easy. This can be broadly categorized into three aspects within the higher education environment: "access to education," "student life," and "financial hardship."

Firstly, concerning access to education, over the past thirty years, as the expansion of higher education institutions has become a global trend, discussions on educational equality have shifted from the vertical differences in educational opportunities between those who pursue higher education and those who do not (Mare, 1980) to exploring horizontal differences within the same educational stratum. Lucas (2001) pointed out that the allocation process of higher education opportunities actually comprises two aspects: "quantity" and "quality." Through empirical analysis, Lucas introduced the theory of "Effectively Maintained Inequality" (EMI).

Within the framework of the EMI theory, students not only decide whether to continue their education but also choose different paths for their educational advancement. Therefore, even if the education system expands to allow everyone to enter university, family background continues to significantly influence educational opportunities. Students from privileged social strata still have a greater chance of entering schools with stronger screening mechanisms and better academic reputations. In contrast, students from disadvantaged social strata can only choose schools with weaker selection mechanisms and lower academic reputations (Lucas, 2001). This result has been corroborated in subsequent studies (Ayalon and Shavit, 2004; Gerber and Cheung, 2008; Marginson, 2016; Duta and Iannelli, 2018; Kopycka, 2021). Furthermore, in a literature review study by Björklund and Salvanes (2011) on family background and children's education, they concluded, "In every society where we have data, children's educational achievement is positively correlated with their parents' level of education or other parental socio-economic status indicators."

Given the consistent findings, the expansion of higher education institutions has not had a positive impact on class inequality. Subsequently, the focus of scholars has shifted to the academic lives and financial burdens of economically disadvantaged students.

Regarding academic life, the literature suggests that economically disadvantaged students often face higher levels of stress due to receiving less support for skill development in their original families and having lower parental expectations. This, in turn, affects their experiences in university, making them a higher-risk group for dropping out. Several recent studies focusing on first-generation college students indicate that

these students often face academic unpreparedness, higher financial pressures, lack of family and peer support, and difficulties related to cultural transition. This makes them more susceptible to mental health issues and results in lower retention and graduation rates compared to non-first-generation college students (House et al., 2020; Schuyler et al., 2021).

Regarding financial difficulties, research shows that economically disadvantaged students often struggle with high tuition fees or student loan pressures, which can lead to them discontinuing their education. Alternatively, they may have to work long hours, which affects their study time, academic performance, career choices, and future opportunities (Wu, 2009). Long-term tracking studies by Kim and Chatterjee (2019) and literature reviews by Bartholomae and Fox (2021) have further highlighted that student loan debt has a negative impact on students' life satisfaction, mental health, and overall well-being.

3. DATA AND METHOD

3.1 DATA

The case study discussed in this research is located in northern Taiwan and primarily focuses on science and engineering disciplines. The university comprises a College of Management, Service Industries, and Humanities and Design. The university provides student scholarships and financial aid by the law to assist and support economically disadvantaged students. Regarding student living expenses, the university strengthens its financial aid measures through budget allocation, subsidies from the Ministry of Education, and alumni donations, ensuring that students can study without financial worries and receive assistance to complete their education.

Regarding implementing comprehensive student support programs, the case study university adopts the concept of "empowerment" proposed by Solomon (1976). It promotes various learning programs in the three dimensions of "learning empowerment, career empowerment, and life empowerment." These programs aim to establish a support and care system for economically disadvantaged students, cultivate their professional and practical skills for future employment, and enhance their overall capabilities. Students who participate in the comprehensive student support programs and complete the required tasks can receive incentives through learning achievement checks, which contribute to "replacing part-time work with learning."

The data collected for this study consists of two main parts. The first part includes de-identified basic information of day-time department freshmen at the case study university from 2016 to 2019. It also includes students' course grades for each semester from 2016 to 2021, dropout data, tuition fee waiver data, and scholarship application data for the "Higher Education Disadvantaged Students Scholarship Program." The second part of the data is obtained from implementing the comprehensive student support program by the Student Affairs Office at the case study university. It covers 2018 to 2021 and includes data on incentive scholarships provided to economically disadvantaged students.

3.2 METHOD

The relevant research methods are described as follows: Firstly, this study employs survival analysis as the empirical research method to understand the effectiveness of the educational support program in ensuring a secure learning environment for economically disadvantaged students. The study analyzes the academic trajectories of economically disadvantaged students enrolled between 2016 and 2019 and compares them with those of general students.

Survival analysis is a statistical method used to analyze the probability of a specific event occurring within a certain period for a group of individuals. In this study, the survival time refers to the duration of students' enrollment, and the specific event of interest is "dropout." Dropout is determined based on the recorded

date of withdrawal, and any dropout occurring before the completion of the fourth year of enrollment is considered as an event. The duration from student enrollment to dropout is the survival period. The risk rate at any given time represents the dropout probability, and the complementary measure is the survival rate.

The Kaplan-Meier method, will be used to estimate and compare the cumulative survival functions of student groups with varying enrollment durations. The Log-rank test will be conducted to examine whether there are significant differences in the survival rates among different groups.

In order to gain a more detailed understanding of the dropout patterns within four years among students of different backgrounds, this study classifies economically disadvantaged students into three categories: 1) high-frequency participants in the educational support program (referring to the top 20% of students who participated in the program for a cumulative number of semesters within the same cohort), 2) low-frequency participants in the educational support program, and 3) non-participants in the educational support program. Additionally, to observe the differences in dropout patterns between economically disadvantaged students and general students, this study includes general students in the analysis and categorizes them into two groups: 1) students who have applied for student loans and 2) students who have not applied for student loans. However, it is important to emphasize that this study cannot control for the influence of unobserved factors on student dropout events since the Kaplan-Meier method is a non-parametric estimation approach. Therefore, the classification in this study is based on observable student characteristics for preliminary observations and does not imply direct causal relationships.

Secondly, when assessing the academic performance of economically disadvantaged students, it is important to consider that semester grades may be influenced by different grading criteria employed by different instructors each semester, the academic college in which the student is enrolled, and the specific subjects taken. Therefore, this study defines the dependent variable ($Grade_{it}$) as the class rank of students' semester grades. This allows us to observe the impact of the improved educational assistance program on the academic performance of economically disadvantaged students.

The model specification for $Grade_{it}$ is as follows:

$$Grade_{it} = \beta_0 + D'_{it}\beta_1 + X'_i\gamma + v_{it} \quad (i = 1, \dots, n; t = 1, \dots, T), \quad (1)$$

The equation D_{it} represents a binary variable indicating whether student i participated in the improved educational assistance program in semester t . If D_{it} equals 1, it means that student i participated in the program during that semester, while a value of 0 indicates non-participation.

In equation (1), X_i refers to the student's characteristics, such as family income level, gender, academic college, and admission method. These variables capture the individual characteristics that may influence academic performance. The term v_i represents the error term in the regression model, accounting for unobserved factors and random variation.

4. RESULT

Figure 1 presents the results for students enrolled in the academic years 2016 to 2019. From the graph, it is evident that there are significant differences in the student survival curves among different categories, and the results of the Log-rank test are all significant (p -value = 0.000). This indicates that students of different types exhibit significant differences in their survival curves.

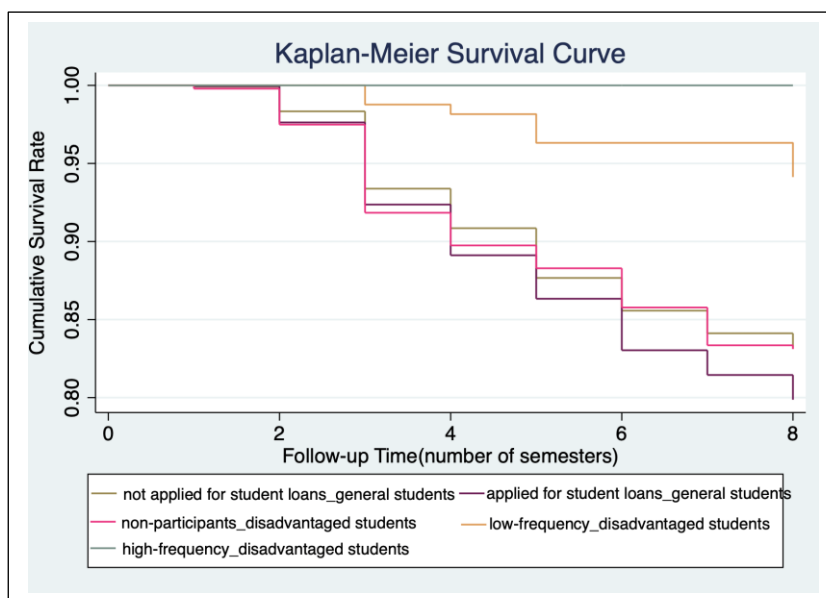
Overall, among the five student categories, three categories show similar survival curves: 1. General students, 2. General students who have applied for student loans, and 3. Economically disadvantaged students who did not participate in the educational support program. These three categories of students

experience a significant drop in their survival curves in the third semester after enrollment, followed by a slight decline in the fourth to eighth semesters. When comparing the magnitude of the decline in the third semester, it is observed that economically disadvantaged students who did not participate in the improved study assistance program have the most significant decrease, indicating a notable increase in the likelihood of dropout in the third semester. This suggests that without external resources and assistance, these students may struggle to overcome the limitations imposed by their socioeconomic backgrounds or environments and successfully obtain a degree.

In contrast, economically disadvantaged students who participate in educational support program exhibit a completely different trend regarding dropout. Figure 1 shows that both high-frequency and low-frequency participants in the program tend to experience their first wave of dropout later than students in the previous four categories, and the magnitude of dropout is significantly lower. By the eighth semester, the participation in the improved study assistance program by economically disadvantaged students maintains a retention rate of approximately 95%. Although the participation in the improved study assistance program or application for financial aid measures by economically disadvantaged students does not occur at the baseline, this study considers these variables to some extent as proxy indicators of "student engagement." In this regard, the results above indicate that financial aid measures and the improved study assistance program may indeed provide protection and contribute to the academic success of economically disadvantaged students to a certain degree.

Furthermore, regarding the specific case of the school analyzed in this study, the results highlight a subgroup of students' worthy of attention, namely, general students who apply for financial aid loans. The findings reveal that although the dropout rates for these students are similar to those of non-loan general students in the first two semesters, their dropout rates increase in each subsequent semester as the observation period extends. It is even noticeable that general students who apply for financial aid loans exhibit survival curves similar to those of economically disadvantaged students who did not apply for or participate in any financial aid measures. This indicates that, in the context of educational and academic achievement, attention should be given to factors beyond explicit social class aspects (such as low socioeconomic status and lack of various family resources), as there may be latent or hidden factors or student subgroups that require assistance from the school.

Figure 1 Student Survival Curves Among Different Categories



In addition to examining the students' educational trajectory, the academic performance of economically disadvantaged students during their enrollment period is also a significant aspect of interest. This study measures the learning performance using the class rank of students' semester grades. It investigates the impact of participating in the improved educational assistance program on the academic performance of economically disadvantaged students.

The study presents the estimated values from the pooled regression using ordinary least squares (OLS) in Table 1. In addition to the main variables of interest, which include whether students participated in the improved educational assistance program during each semester, their family income level, and the interaction term between program participation and family income level, the models also control for student characteristics. These control variables include gender, admission method, college of enrollment, previous educational stage graduation status, residential area, total credits earned by students each semester, and the year of admission.

It is important to note that in the models, the dependent variable is the class rank of students' semester grades. If the estimated coefficient is negative, it indicates an improvement in the students' ranking. Conversely, if the estimated coefficient is positive, it suggests a decline in the students' ranking.

The results from Table 1 show that participation in the educational support program significantly negatively affects students' class rankings. This means that compared to students who did not participate in the program, students who participated improved their class rankings by approximately 5 positions. Furthermore, based on the results in the table, among economically disadvantaged students with a baseline annual family income of less than 300,000 New Taiwan Dollars (approximately USD 9,740), students from families with incomes ranging from 300,000 to 400,000 New Taiwan Dollars (approximately \$9,740 to \$12,987), 500,000 to 600,000 New Taiwan Dollars (approximately \$16,234 to \$19,481), and 600,000 to 700,000 New Taiwan Dollars (approximately \$19,481 to \$22,728) had significantly higher class rankings, with rankings increasing as family income rose. This indicates that even within the economically disadvantaged student population, students from relatively more advantaged socioeconomic backgrounds may demonstrate better academic performance.

It is worth noting that when we further examine the interaction effects between students' participation in the educational support program and their family income levels across different semesters, we find that all interaction effects are insignificant. This suggests that after participating in the educational support program, the achievement gap among different family income levels disappears. In other words, the assistance provided through the improvement of the educational support program has helped to mitigate the impact of socioeconomic status on students' academic performance to some extent.

Table 1
Impact of Policy Assistance Measures on the Academic Performance of Economically Disadvantaged Students

	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
Participants in the educational support program	-4.833***	1.928	-2.51	0.012	-8.612	-1.053
Incomelevel (less than 300,000 NTD/year) reference group						
Incomelevel1(300,000 to 400,000 NTD/year)	-1.524*	0.792	-1.92	0.055	-3.077	0.029
Incomelevel2(400,000 to 500,000 NTD/year)	0.830	1.035	0.8	0.423	-1.200	2.859
Incomelevel3(500,000 to 600,000 NTD/year)	-2.419**	1.010	-2.4	0.017	-4.399	-0.440
Incomelevel4(600,000 to 700,000 NTD/year)	-4.159***	1.138	-3.65	0	-6.391	-1.928
Interaction(Participants*less than 300,000 NTD/year) reference group						

	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
Interaction1(Participants*Incomelevel1)	2.232	2.090	1.07	0.286	-1.865	6.329
Interaction2(Participants*Incomelevel2)	-0.524	2.737	-0.19	0.848	-5.890	4.842
Interaction3(Participants*Incomelevel3)	-1.302	2.764	-0.47	0.638	-6.721	4.117
Interaction4(Participants*Incomelevel4)	4.775	3.096	1.54	0.123	-1.295	10.845
N=4,436						
Note: The model has controlled for gender, admission method, college of enrollment, graduation status from the previous educational stage, residential area, the academic year of enrollment, and total credits taken for economically disadvantaged students.						
*p < .1 **p < .05 ***p < .01						

5. CONCLUSION

This study attempts to assess the impact of the implementation of the improved educational assistance program on the dropout risk and academic performance of economically disadvantaged students through longitudinal tracking of these students over multiple years. The study aims to identify the relationship between participation in the improved educational assistance program and academic outcomes. The goal is to provide insights into the effectiveness of the program in appropriately addressing the comprehensive policy initiatives. This paper has two main conclusions:

1.External resources assistance plays a protective role in economically disadvantaged students' academic completion.

This study utilized the Cox proportional hazards model to investigate the impact of the improved educational assistance program on the academic persistence of economically disadvantaged students. The findings indicate that the improved educational assistance program significantly reduces the risk of dropout among economically disadvantaged students. In other words, current policy assistance does indeed provide a level of protection for economically disadvantaged students, helping them overcome the limitations posed by their family socioeconomic backgrounds or environments and successfully obtain their degrees through external resource support.

2.Policy assistance measures help mitigate income disparities among economically disadvantaged students' families.

The research results presented in this study show that even after distinguishing economically disadvantaged students' family situations based on their household income, there are still instances where students from relatively higher-income households exhibit better academic performance. However, the previously mentioned scenarios are no longer significant in the presence of interaction terms between household income and policy assistance measures. This indicates that through policy assistance, there is indeed a contribution to mitigating the impact of income disparities on the academic performance of economically disadvantaged students.

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Seafaring Profession: Edge of Filipino Seafarers

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ABSTRACT

The Philippines is an archipelagic country that depends significantly on its seafarers' toils, sacrifices, and creativity. Filipino seafarers have become the country's pride and source of its wealth. Filipino seafarers are the most preferred seamen because of their many virtues and professionalism that significantly contributed to the Philippines and the global maritime industry. This qualitative phenomenological study was conceived to determine the edge of Filipino seafarers among other nationalities on board. A phenomenological inquiry is an inductive qualitative research method based on the philosophical premise that researchers can obtain significant insight into the structure of how individuals interpret their experiences (Bliss, 2016). The results of this study will examine how Filipino seafarers are compared to other seafarers of the world and how they describe, perceive, and interpret their lived experiences while onboard. Through this phenomenological study, the researchers will be able to categorize the lived experiences of Filipino seafarers in terms of the different concepts, themes, and personal stories that will be derived from their lived experiences. The researchers recruited the seafarers through referral and were qualified on specific criteria, the source of information, and whose narratives were gathered and documented to establish the study's objectives.

KEYWORDS: *Edge, Seafarers, Qualitative Phenomenal Research*

INTRODUCTION OF THE STUDY

A total of 226,900 Filipino seafarers have been deployed last year according to data from the 2007 statistics of the Philippine Overseas Employment Administration (POEA). In report for the Migrant Watch newsletter in June, Fr. Bernardi said Filipino seafarers' number to about 300,000 in international vessels while an estimated 100,000 more are servicing domestic routes and deep-sea fishing industry. They have contributed about US\$2 to US\$3 billion in remittances to the Philippine economy each year, Fr. Bernardi said.

Senator Legarda (2010) supports this saying that "to ensure they comply with the international requirements and maintain their edge over their foreign counterparts, the Filipino seafarers will be given access to affordable and quality educational advancements and training courses to better improve them in their work and maintain such edge."

Filipino seafarers are now perceived by many as among the best in the world, an international maritime official said. Graham Young (2010), International Transport of Workers Federation (ITF) head of Maritime Operations in London said the Filipino mariners, which accounts for 25 per cent (25%) of the entire seafarers manning the merchant shipping fleet of the world, are being looked up because of their professionalism and unparalleled commitment towards work. There is now high regard for Filipino seamen. And with the strong supervision and support from Philippine government, Filipino seafarers will continue to demonstrate competence.

STATEMENT OF THE PROBLEM

This study sought to answer the following questions:

- 1) Do Filipino seafarers have an edge over other nationalities?
- 2) What makes Filipino seafarers better than the other nationalities in terms of communication and work ethic?
- 3) What is the Filipino seafarers' attitude towards work?
- 4) What is the Filipino seafarers' relationship with other seafarers on board?
- 5) What are the views/other observations they have in terms of other Filipino seafarers or seafaring as their profession?

METHODOLOGY

The descriptive qualitative method of research was employed in this investigation. According to Good and Scates (2000), descriptive research involves collecting of data in order to test hypothesis or answer questions concerning the edge of Filipino seafarers against other nationalities.

Descriptive research according to Evans (2009) is concerned with the description of the existing distribution of variables, as opposed to theory building. Or, in plain language, descriptive studies focus on answering the basic W questions: Who, what, when, where. The fifth W, "why" falls outside of the scope of descriptive research, that by definition must not concern itself with the effect that one variable has on another.

Qualitative data is extremely varied in nature. It includes virtually any information that can be captured that is not numerical in nature. In this investigation, in-depth interviews were utilized. This included individual interviews (e.g., one-on-one). The data were recorded utilizing audio recording and written notes. In this interview, the researchers requested some individuals to interview the seafarers who are currently on vacation. The purpose of the interview is to probe the ideas of the interviewees about their edge as Ilonggo seafarers as compared to other seafarers of other nationalities.

Research Respondents

The respondents of this study were the ten (10) seafarers who were purposively chosen for this study. The seafarers were currently on vacation and the researchers had a chance of interviewing them.

Ten (10) respondents were utilized as interviewees in this study. Seven (7) out of the ten (10) seafarers were married and three (3) were single. Their children ranged between none-3 in terms of age. In terms of their number of years on board, two of the respondents had spent more than 25 years. Four were between 5-8 years on board and the rest had 2 years experience. Table 1 contains the respondents' distribution.

Research Instrument

The researchers prepared an interview schedule and started interviewing the seafarers.

Interview - Interviews are among the most challenging and rewarding forms of measurement. They require a personal sensitivity and adaptability as well as the ability to stay within the bounds of the designed protocol set by researchers. In this study, the researchers utilized the following questions during the interview:

- 1) Do you think that Filipino seafarers have an edge against other international seafarers, in terms of communication? Work ethic? Attitude towards work? Relationship with other crew on board?
- 2) What are your views/other observations do you have in terms of other Filipino seafarers or seafaring as your profession?

Table 1: Distribution of the Respondents

Respondent	Civil Status	Number of Children	Number of Years on Board	Vessel
1	M	1	5	International
2	M	2	7	International
3	M	1	2	International
4	S	0	2	International
5	S	0	2	International
6	M	3	30	International
7	M	1	10	International
8	M	2	25	International
9	M	2	8	International
10	S	0	8	International

RESULTS AND DISCUSSION

Edge of Filipino Seafarers with other Seafarers in terms of Communication

When the respondents were asked about their edge in terms of communication, fifty percent (50%) indicated that their edge is their fluency in the English language; 30 percent said that their being good communicators is their edge; and 20 percent said that their spontaneity in communication has become their edge in terms of communication compared to other seafarers of other nationalities. Figure 1 has the data.

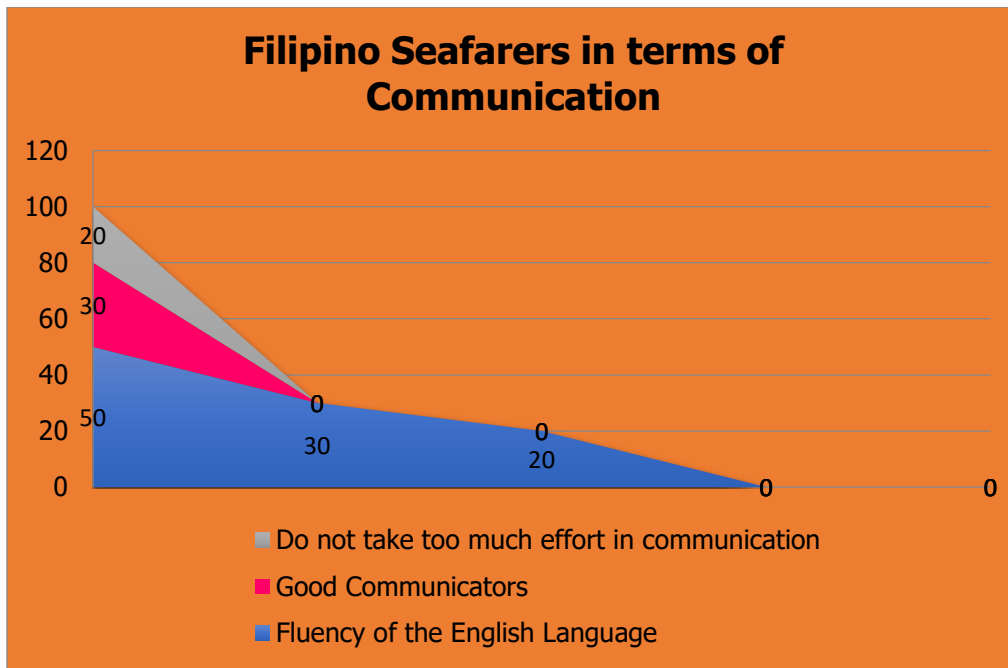


Figure 1: Filipino Seafarers in terms of Communication

Filipino Seafarers in terms of Work Ethic

When the respondents were asked about their edge in terms of work ethic, fifty-five percent (55%) indicated that their edge in their work quality, “clean and concise in work”; 20 percent said that their love for work is evident; 15 percent said that they are diligent and hardworking, and 10 percent said that their creativity and intelligence has become their edge in terms of work ethic compared to other seafarers of other nationalities. Figure 2 has the data.

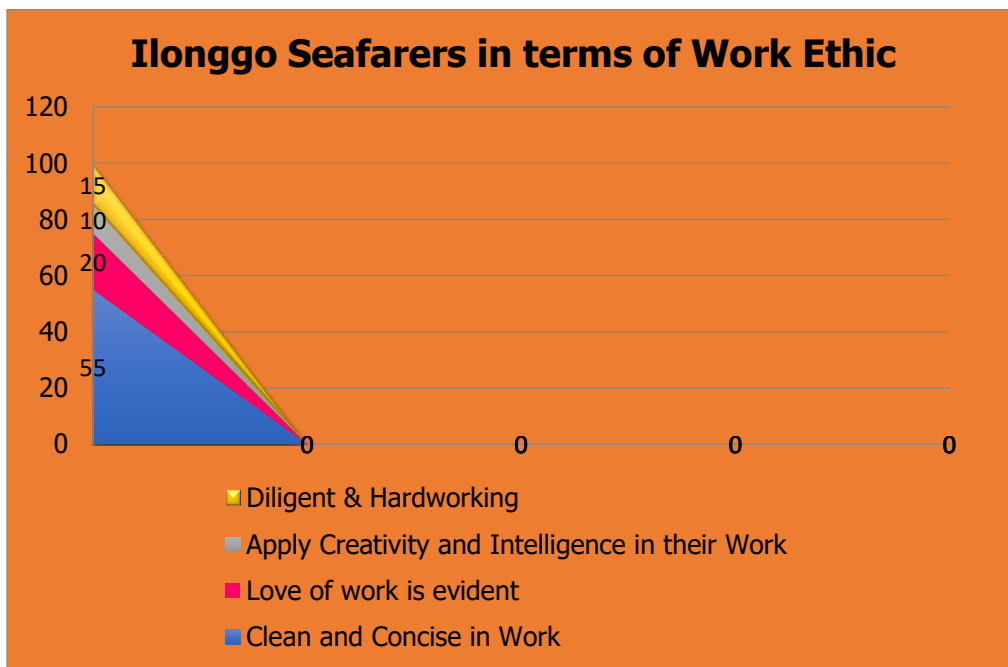


Figure 2: Ilonggo Seafarers in terms of Work Ethic

Filipino Seafarers' Attitude toward Work

When the respondents were asked about their edge in terms of attitude toward work, fifty five percent (55%) indicated that their attitude towards work is edge in their work quality, “clean and concise in work”; 35 percent (35%) said that their love for work is evident; 15 percent (15%) said that they are diligent and hardworking, 10 and 10 percent said that their creativity and intelligence has become their edge in terms of work ethic compared to other seafarers of other nationalities. Figure 3 has the data.

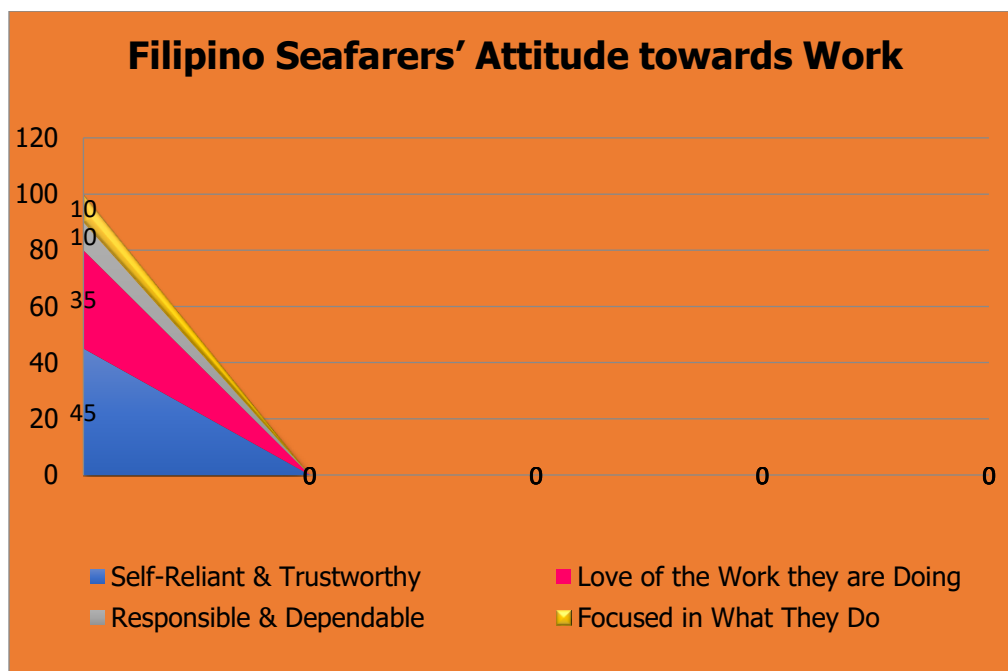


Figure 3: Filipino Seafarers' Attitude toward Work

The Filipino seafarers' attitude towards work is evident in the words of Captain Idemoto (2006) in, “New Oasis in Manila for World’s Seafarers” stating that at least 35,000 Filipino marine officers are needed within the next five to 10 years in the Japanese based seafaring industries based on the report of the Department of Labor and Employment (DOLE). In addition, it was stated that the deployment of Filipino seafarers is growing at an annual rate of 10 percent, according to the DOLE. The department said foreign employers usually prefer Filipino seafarers because of their ability to speak the English language well. Maritime Industry Authority (Marina) regional director Glenn Cabañez said international shipping firms employ Filipinos because of their competence, skills as well as their attitude toward work. Japanese ship owners employ more than 20,000 Filipino seafarers onboard their vessels, seafarers who have made a significant contribution to the development of Japan’s maritime industry.

Young (2010) says that there is now high regard for Filipino seamen. And with the strong supervision and support from (your) government, they will continue to demonstrate competence, professionalism and even bravery as risks and hazards are so inherent in their jobs,” Young told the Bulletin.

Relationship with Other Crew Members

Relationship with other crew on board was perceived by the seafarers as one of their edges compared to other nationalities. When the respondents were asked about their relationship with other crew on board, fifty five percent (45%) indicated that they are “a complete package,” 35 percent said that “they can get easily along with others;” and 20 percent said that they are “loyal in friendship.”

Figure 4 has the data.



Figure 4: Filipino seafarers in terms of relationship with other Crew

One of the seafarers interviewed that their profession is a unique profession that has contributed not only to world trade but has also become a process of making new friends in their interactions with their crew members. Almost 90 percent of the world trade is sea-borne and that staying on board ties them at work for weeks and even months. Thus, developing better relationship with crew mates can offer a better way to eradicate boredom and homesickness.

Views/other Observations of Filipino Seafarers of Seafaring as your Profession

When the seafarers were asked about their views and observations about the seafaring profession, two themes emerged: their love and passion for their work and their belief that seafaring can better their socio-economic situation. Figure 5 contains the verbatim responses of the interviewees.

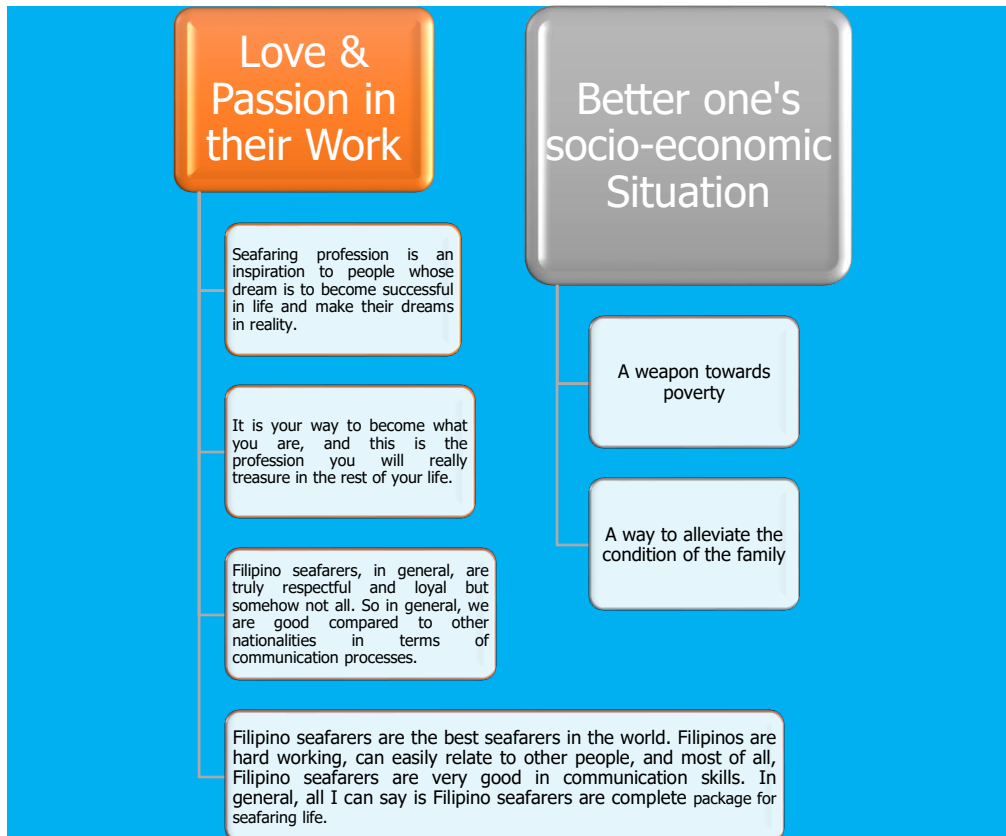


Figure 5: Views and other Observations of Filipino Seafarers of Seafaring as a Profession

CONCLUSION

- 1) The Ilonggo seafarers' edge in terms of communication in terms of being communicators and spontaneity has been a remarkable mark of their better communicators as seafarers.
- 2) In terms of work ethic, their edge in their work quality were their cleanliness and conciseness in work, love for work, diligence and hardwork, and their creativity and intelligence have become their edge in terms of work ethic compared to other seafarers of other nationalities.
- 3) In terms of their relationship with other crew on board, their being "a complete package," "ability to get along well with others," and "loyalty in friendship" were their edge compared to other seafarers.
- 4) Two themes emerged about Ilonggo seafarers' views of their profession. These two were their love and passion for their work and their belief that seafaring can better their socio-economic situation.

RECOMMENDATIONS

Based on the findings advanced in this study, the following are recommended:

- 1) In view of the positive responses derived for the seafarers with regard to their attitude toward work, the result of this study will be made available or will be presented to faculty members at JBLFMU to enhance more the students and their choice of their profession.
- 2) Maritime English will be enhanced especially in the teaching inside the classroom to help students develop a certain level of communicative proficiency to better equip them in their future work.
- 3) More studies on other factors and areas will be considered to further validate the results of this investigation.

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How COVID-19 Changed the English Language

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ABSTRACT

Language experts have observed and documented many coronavirus-related linguistic shifts. COVID-19 provides humanity a glimpse into how language can quickly change in the emergence of unprecedented social and economic disruption. The global COVID-19 has transformed language. Many of those were not part of people's previous vocabulary. Thus, this descriptive study addressed the following: 1) Identify the linguistic additions regarding formation, their etymology, and description. 2) Establish the use of these words in the context of the pandemic. This paper intends to gather new words that evolved during the pandemic. The method of collecting words was through secondary data as social media, newspapers, television programs, radio, and other printed or non-printed materials to generate as much as possible pandemic emerging terms. Results revealed that based on word formation, majority of the terms utilized word stem, compounding, inflectional and blending, acronym, clipping, affixation, idiomatic, eponym, and novel creation. When it comes to etymology, the most number of words were from the pandemic-related usage or slang, US, UK, French, Latin origins, Gk and Middle English, and Australia. Based on etymology, some of these words were already used in the past but were trending during the pandemic. Words in the context of the pandemic surfaced, and most of these words are nouns in terms of their usages. English remains remarkably growing, as proven by linguistic inclusions and the power of social and digital media to proliferate. With the pandemic, 78 new terms have evolved, and thousands more words were contextualized by the pandemic.

KEYWORDS: English language, COVID-19, Linguistic shift, Secondary data

1.0 INTRODUCTION

It has been almost three years since COVID-19 occurred, and until now, the whole world has been “mesmerized” by it. Along with it came different words brought about by its impact. Language experts have observed and documented many coronavirus-related linguistic shifts. It is indeed true that, along with the pandemic, some words have been added to the English language.

COVID-19 also provides humanity a glimpse into how language can quickly change in the emergence of unprecedented social and economic disruption.” Global COVID-19 has transformed our language, and many of those were not part of our previous vocabulary. Alrahaili et al. (2022) assert that the COVID-19 pandemic has had an spectacular impact on the world and has contributed to the evolution of the language, specifically in English.

This investigation focuses on the collection of terms and expressions that have evolved during the pandemic. From Alrahaili et al.’s (2022) perspective, the COVID-19 lexicon is a set of terms used to communicate medical and health-related information at the onset. The data considered in this inquiry was the meanings and extent of pandemic lexemes’ use throughout sampled English variations written and reported in the news, journals, social media, and other information and communication channels. With regard to COVID-19, this study is grounded in several scholars’ frameworks (Aitchison, 2001; Liberman, 2020; Yule, 2006; Alrahaili et al., 2022) that explain why and how a language evolves and develops, especially in times of crises. They add that difficult times like wars or social crises lead to vocabulary innovation. The comprehensive search through the mentioned resources listed hundreds of pandemic words of a high frequency of use on the pandemic lexemes drawn from different sources from January 2020 to December 2022. The current investigation focused on more than a hundred words and their definitions used primarily by linguists, laypeople, and public health professionals.

The researcher believes these terms will have their significance not only during the time of the pandemic but even after the pandemic. The terms and expressions that will be included in this study will significantly impact everyone. They could be transferred from person to person as such phenomenon is unpredictable, and knowledge of these words may facilitate further understanding of these new words and expressions. COVID-19 also provides humanity a look into how language can quickly change in the event of unprecedented social and economic disruption.” Global COVID-19 has transformed our language, and many of those were not part of our previous vocabulary. Alrahaili et al. (2022) assert that the COVID-19 pandemic has had an phenomenal impact on the world and has contributed to the evolution of the language, specifically in English.

2.0 THE PROBLEM

The COVID-19 pandemic has significantly impacted people’s experiences. It has been observed that several of the terms developed during the pandemic may have been difficult for others to understand, especially those not in the health and medical professions. Therefore, this paper's primary intent is to compile the terms and expressions used in communication since the pandemic started. This investigation, therefore, addressed the following questions:

- 1) What are the linguistic additions to the English language emerged during the pandemic in terms of word formation, etymology, and descriptions?
- 2) What are the meanings associated with these linguistic additions?

Methodology and Data Sources

This is a descriptive study. To develop the wordlist for pandemic-related neologisms for this investigation, the researcher compiled COVID_19 inspired words from different information sources such as newspapers, television news stories, social media, radio programs, journals, and even daily conversations. The data

collection may be online or face-to-face (observing protocols). The goal is to generate as much as possible COVID-19 pandemic emerging terms. The words generated will be analyzed regarding their etymology, definition, and linguistic use.

3.0 REVIEW OF LITERATURE

How words evolve: an overview

Christiansen (2022) points out the language phenomenon over time. He emphasizes that languages change continually and in many ways. New words and phrases become visible while others fall into disuse. He adds that words subtly, or less subtly, may shift their meanings or develop new meanings, while speech sounds and intonation change continually. With this, the most fundamental shift in language change is gradual conventionalization: patterns of communication that are flexible initially, but over time, they become increasingly stable, conventionalized, and, in many cases, obligatory. He said this tendency is a spontaneous order in action: starting from an initial jumble, increasingly specific patterns emerge over time.

In this same source, Christiansen describes that a word order gets established in charades and a sequence of gestures that can come in any order. However, when language users use charades to convey who did to whom, some orders, perhaps by chance, become more prominent in these instances.

Take, for instance, a particular order (such as SVO) becomes established, it will tend to stick—after all, if language users violate the expected order, then, other things being equal, they are likely to be misunderstood. Furthermore, historically, languages seem to shift inexorably from so-called free word order patterns to increasingly strict word orders (Christiansen, 2022).

Another interesting new language is the word tweet. In the past, when people said tweet, it meant a sound produced by birds. However, recently it has acquired a new level. It has been used as a social platform known as Twitter.

In 2014, Cook et al. published an article describing a system for automatically identifying new word senses. These researchers compared the 1995 edition of the Concise Oxford English Dictionary with the 2005 edition and collected examples of novel senses by hand. They then analyzed random usages of each lemma in two English corpora, the British National Corpus (containing British English content from the late 20th century). This brings people to the idea that the context of a word is to learn about its meaning. In most cases, even if one does not know the meaning of a term, one can guess if this is used in context.

Language allows people to share their thoughts, ideas, emotions, and experiences with others. In the evolution of language from the National Geographic Collection, it is stipulated that over several years, humans have developed various systems to assign specific meanings to sounds, forming words and systems of grammar to create languages. Many languages developed written forms using symbols to record their meaning visually. Some languages, like American Sign Language (ASL), are visual without vocalizations. Although rules define languages, they are by no means static and evolve. In some situations, some languages are incredibly old and have changed very little over time, such as modern Icelandic, which strongly resembles its parent, Old Norse. Other languages evolve rapidly by incorporating elements of other languages. Still, other languages die out due to political oppression or social assimilation, though many dying languages live on in the vocabularies and dialects of prominent languages worldwide.

The COVID-19 pandemic, which started in the last part of 2019, has paved the way for words to be formed. These words have become innovations in the way people communicate. COVID-19's appearance and spread have dramatically affected the societal norm, resulting in the new normal (Kupolati et al., 2021). Events have resulted in introducing new terminology into the world's languages. The Oxford English

Dictionary has begun documenting innovative and conventional words that have seen semantic extensions during the pandemic. Mweri (2021) discussed coining new words through a word-formation process, such as blending and acronym creating through old words requiring new meaning (semantic shift) or old words gaining currency due to an emerging and trending situation. He mentioned the 21-word formation process as an example of neologisms (new word formation). A study by Hamdan & Al-Salman (2021, in Alrahaili et al. (2022)) looked at the trending role of neologisms during the pandemic and found that the use of neologisms in social media applications has acquired pace and zest. Their lists include email, username, Internet, save, copy, paste, delete, and other newly invented ICTs and social media terminology. Through various word formation processes, words have evolved.

In the pandemic era, the process of coining new words has evolved. With the advent of technology and the Internet, communication has soared to greater heights. Everything has gone online, and people have gotten used to vocabulary that used to be limited in use (e.g., *quarantine* and *pandemic*) or known to few (*coronavirus*, *super-spreader*, personal protective equipment [PPE], or working from home [WFH]). *Self-isolation lockdown* or *social distancing* (which should be better called *physical distancing*) is needed to get through these difficult times (Alrahaili et al. (2022)).

Words are formed through the following:

The derivation is creating words by modifying a root without adding other roots. Often the effect is a change in part of speech.

Affixation is the addition of one or more affixes to a root (prefixation or suffixation). This may be a type of derivation.

Blending is the most common type of word formation. This happens when two words are merged, maybe not on morpheme structure but sound structure (Kemmer, 2022).

Compounding forms a word out of two or more root morphemes. These words are often independent.

Clipping is an abbreviation of a word in which one part is ‘clipped’ off the rest, and the remaining word becomes an essential part of how the whole word is meant.

Acronyms are formed by taking the initial letters of a word or phrase and making a word out of it.

According to Thorne (2020), the present epidemic has created over 1,000 new words, including nonspecialized and technical vocabulary (cited in Roig–Marín, 2021). During the COVID-19 pandemic, many unusual or noncirculating terms emerged in people's daily conversations. Distance learning, perhaps one of the most common phrases for young people, has become the learning platform. WhatsApp groups, Teams, and Zoom programs are the new tools for students.

The creation and spread of COVID-19-related terms have been rapid worldwide, in various disciplines, not only in health but also in tourism, economics, trade, industry, transportation, and psychology, among others. The abbreviations or acronyms for HIV (Human et al.), SARS (Severe Acute Respiratory Syndrome), and MERS (Middle et al.), among others, are examples of lexical innovations linked with health pandemics. In addition, the COVID-19 issue has caused people worldwide to express their fears about the same enemy and, as a result, adopt the same language, uniting them against COVID-19. As a result of the health emergency, there appears to have been a global rapprochement, as evidenced by the widespread use of coronavirus terminology (Alrahaili et al. (2022)).

4.0 METHODOLOGY AND DATA SOURCES

This research mainly focuses on compiling words and expressions from various sources that emerged during the COVID-19 pandemic to generate as much as possible pandemic emerging terms, specifically between December of 2021 to December of 2022. The method of collecting words was through secondary data. The study collected data from different sources about language use in the realities of the COVID-19 pandemic. The list contains many English words and phrases used during the pandemic with their equivalent meaning. These words and phrases were gathered from television news, radio programs, social media, daily newspapers, journals, and everyday conversations.

5.0 RESULTS AND DISCUSSION

Linguistic Additions in terms of word formation, etymology, and description

Based on the terms and phrases generated for this purpose, there was a total of 78 words compiled. However, only 53 randomly chosen words were included in this presentation. Table 1 reflects these additions to the English Language.

In Table 1 are the terms collated with their word formation, etymology, and description. Based on word formation, the majority of the terms compiled utilized word stem with 12 (21%), compounding 10 (19%), followed by inflectional and blending, both with 9 (16%), acronym with 6 (11%), clipping with 4(7%), affixation with 3 (5%) and idiomatic, eponym, and novel creation with 1 (2%) each. When it comes to etymology, the most number of words were from the pandemic-related usage or slang with 16 (29%), followed by terms with US etymology with 12 (21%), UK with 8 (14%), French with 7 (12%), Latin origins with 6 (11%), Gk and Middle English with 4 (7%), and Australia with 1 (2%). It has to be noted, however, that based on etymology. Some of these words were already used in the past but were put into trending use during the pandemic. All the collated terms became significant at the time of the pandemic, for they are either used having contributed to their original use or are given a new perspective during the COVID-19 pandemic. Table 1 reflects the data.

Table 1: Linguistic Additions in terms of formation, etymology, and description

Term/Phrases	Word- formation	Etymology	Description
airborne	compounding	1640s, Gk <i>aer</i>	air+borne disease transmitted by free-floating aerosols, being off the ground
aerosol	compounding-clipping	Gk, 1919, aer, Latin ‘sol’ for solution	air+solution, gas or solid suspended in the air
Asymptomatic	affixation	Gk, not/without 1930s	presenting no symptom/s
Blursday	Compounding	UK, US slang 2020	Blur+S+Day difficulty in determining what day of the week it is
CDC	Acronym	from MCWA(Malaria Control in War Areas) to CDC	Centers for Disease Control
CFR	Acronym	US. epidemiology	Case Fatality Rate, people who die from a specified disease
C-PAP	Acronym	1980s by Australian Doctor Colin Sullivan	Continuous positive airway pressure, device for treating sleep apnea disorders.

Term/Phrases	Word- formation	Etymology	Description
cohort study	Word Stem	Fr, <i>cohorte</i> , 15 th century	<i>a type of observational study that follows a group of participants over a period of time</i>
Contact Tracing	Inflectional	UK, 1930s to track syphilis	to halt the spread of a disease that is transmitted person-to-person, in which people who have come in close proximity to.
Comorbidity	Inflectional	1970 La. co (together) + morbus (sickness)	existing simultaneously with and usually independently of another medical condition
Community spread	Inflectional/ Word Stem	1903, UK	the spread of a contagious disease within a community
community transmission	Inflectional	1903, UK	process of an infectious disease spreading through a large group of people where the cause may be unknown
containment zone	Inflectional word stem	the term was originally a geopolitical strategic foreign policy pursued by USA during the Cold War to prevent the spread of communism	an area around which people are kept inside and those outside are kept outside, in order to prevent the spread of an infectious pathogenic agent.
coronavirus	compounding	Latin 'corona' crown 1968 June Almeida & David Tyrell to designate a new family of viruses	group of related RNA viruses that cause diseases in mammals and birds.
Coronials	Blending	Corona+Millenials Dr Fitzgerald in Berkeley, 4/2020	a baby conceived or born during the COVID-19 pandemic, especially during a lockdown
COVID-19	Acronym	Eng, 2020 coronavirus disease 2019	originated at Wuhan City, China, Dec 2019, rapidly become widespread.
Covidiot	Blending	Eng. 2020 Covid+idiot 2020, UK	someone who behaves in a stupid way risking the spread of the COVID-19 virus.
Covidient	Blending	Eng. 2020 Covid+obedient UK	opposite of covidiot, one who follows public health
cytokine storm	word stem	Gk 'cyto' & 'kino' James Ferrara in 1993 in a study <i>graft vs host disease</i> syndrome, 1992 Time traveller, UK	acute overproduction and uncontrolled release of pro-inflammatory markers, both COVID-19 locally and systemically.
Doom Scrolling	Compounding/ Affixation	1970s phenomenon, Mean World Syndrome, Doom+Scroll+Ing US Uni of Florida, 2018	is the act of spending an excessive amount of time reading large quantities of negative news online (Leskin, 2021)
elbow bump	Word Stem	1980s basketball players expressed camaraderie in court, US Obama	a friendly greeting in which you touch someone's elbow
Facemask	Compounding	Eng. 1530s, Fr. 'masque'	<i>a mask or protective covering for the face or part of the face.</i>
Flatten the curve	Idiomatic	2007 CDC published paper	making the rate of change slower for something.

Term/Phrases	Word- formation	Etymology	Description
Frontliner	Compounding	1800s to soldiers fighting on the frontline, Gk	health care personnel, law enforcement personnel in the quarantine checkpoints, those directly attending to the public, vulnerable to being infected by highly transmissible disease.
Herd Immunity	Inflectional/ phrasal	1923 <i>Journal of Hygiene</i> by GS Wilson, US	Form of indirect protection that applies only to contagious diseases, a sufficient percentage of a population immune to an infection.
Host cell	word stem	Latin ‘ <i>hospitem</i> ’ ‘ <i>hospes</i> ’ and ‘ <i>cella</i> ’	A host cell is a living cell that serves as a shelter and a food source to the foreign organism.
incubation period	inflectional/ phrasal	Latin <i>incubare, incubatio</i> , 17 th century	number of days between infection and display of symptoms
Infodemic	Blending	David Rothkopf, foreign policy expert on May 11, 2023. Information+Epidemic	too much information that includes false or misleading information in digital and physical environments during a disease outbreak.
Iso	Clipping	Fr <i>isole</i> , mid 19 th century	remaining apart from others
Kawasaki	Eponyms	1967, Tomisaku Kawasaki	an acute febrile illness of unknown cause that primarily affects younger than 5 years of age (CDC)
Lockdown	Compounding	19 th century Old English ‘ <i>loc</i> ’	Security measure to prevent people from leaving/entering a building in an emergency event.
Lockstalgia	Blending	UK, Citywire, 2020	a feeling of nostalgia during the lockdown period
Maskne	Blending	2020, Mask+Acne, US News	acne and other rashes in the skin attributed to mask wearing
New normal	word stem/phrasal	1918 Henry A. Wise Wood posted in <i>dilemma</i> 2008, financial crisis, US	emerging behavior, situations, and minimum public standards institutionalized in common or routine practices (IATF).
N95 mask	word stem	1972, 3D face-piece respirator for dusts	N95 mask filter was invented by <i>Taiwanese-American Peter Tsai</i> and his team, and received its U.S. patent in 1995
personal protective equipment (PPE)	Acronym	World War 1 to prevent contamination from chemical warfare. Leonardo Da Vinci invented respirator 16 th century	equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses.
Plateau	word stem/ Semantic Shift	Fr. mid 18 th century ‘ <i>plat</i> ’	The stage in training or skill acquisition when progress occurs at a very slow or flat rate in comparison with earlier phases.
quaranteam	Blending	2020, La. quarantine	<i>a group of people who create a social circle during the COVID-19 pandemic, prohibiting interaction with others</i>
Rona	Clipping	short for coronavirus	Some people say Rona instead of

Term/Phrases	Word- formation	Etymology	Description
			corona. (Slang)
Self-quarantine	Compounding	14 th century to protect coastal cities from epidemics	avoiding contact with others
shelter in place	phrasal	Middle English ' <i>sheltron</i> ,' ' <i>sheldtrume</i> '	a safe location indoors
social distancing	inflectional	1963, Edward Hall, anthropologist on proxemics	Strategy to curb the spread of COVID-19.
smizing	Blending	Tyra Banks, 21 st century	Smile with the eyes
spike protein	word stem	Middle English <i>spīkr</i> akin to spike	A region at the “crown” of the spike protein (etymology for the name “coronavirus”) as the receptor binding domain with a critical role in infecting host cells.
superspreader	Blending	Superior+Spreader	those who spew huge amounts of virus into the air.
Symptomatic	inflectional	Fr. <i>symptomatique</i> , Gk <i>sumptōmatikós</i> , Latin <i>symptōmaticus</i>	Having the symptom of a disease
Triage	word stem	Fr. <i>trier</i> separate out or sort	To break in three pieces, sorting of patients
voluntary isolation	inflectional	Olf Fr, & La	not ordered self-isolation, avoiding contact with people
WFH	Acronym	1980s work done at home Work from Home	work from home, making one's livable space into a workable space too.
Zoombombing	Compounding/ Affixation	2020, Zoom+Bomb+Affixation	unwanted, disruptive intrusion while video conferencing
Zooze	slang	2020 slang	Drinking with friends over zoom
Zumping	Blending	2020 slang portmanteau	Dumping someone over Zoom

According to Becker (2020), Texas Medical Centre has prepared a glossary of terminology to help people understand the coronavirus pandemic. The difficulties and implications of COVID-19 have necessitated the invention of new vocabulary to characterize the virus's mutations and how various sectors will adapt to related changes in life. Being familiar with these terms will help people understand communication situations in the context of the pandemic.

Words in the context of the pandemic

Table 2 reflects the collated words and how these were utilized in the context of the pandemic. It is observed that the predominant language of the pandemic is English (Lab, 2023). Moreover, it adds that major events like natural disasters and wars have proven to have a significant impact on language. Along with this, the COVID-19 pandemic has significantly impacted language and how people communicate. The words lockdown and pandemic were crowned “Word of the Year 2020” after it was shown that they were the most highly searched for on the Cambridge Dictionary (Lab, 2023).

Along this line, the words generated are mainly related to the naming and describing the coronavirus. Table 2 reflects the words in the context of the pandemic, and most of these words are nouns along with their usages in the context of the pandemic. These are *airborne*, *aerosol*, *comorbidity*, *containment*, *co vidiot*, *convenient*, and *Tuesday*, among others. A few words are used as adjectives, such as *asymptomatic*,

symptomatic, superspreader, etc. Terms like flatten the curve, herd immunity, Tuesday, and new normal also occupied the conversations. Most words were used as nouns in the context of COVID-19.

Table 2: Words in the context of the pandemic

Term/Phrases	Part of Speech	Use in the Context of the Pandemic
airborne	noun	Studies show that the COVID-19 pandemic has shown that airborne transmission is a major mode of transmission for this disease, and is likely to be significant for many respiratory infectious diseases.
aerosol	noun	“...aerosol and fomite transmission of SARS-CoV-2 is plausible, since the virus can remain viable and infectious in aerosols for hours and on surfaces up to days.”
Asymptomatic	adjective	asymptomatic transmission refers to transmission of the virus from a person who did not develop disease symptoms.
Blursday	noun	The COVID-19 pandemic has created a blursday to people who do not remember what day it is.
CDC	noun	CDC is a US Federal government agency whose mission is to protect public health by preventing and controlling diseases, injury, and disability.
CFR	noun	Case Fatality Rate is an index that shows the fatality of the disease and includes only the ratio of deaths to patients identified.
CPAP	noun	The CPAP therapy is an initial treatment for respiratory failure in some people with COVID-19.
cohort study	noun	A retrospective cohort study of 238,000 COVID-19 hospitalizations and deaths cohort study conducted in Brazil (Sobral et al., 2022).
Contact Tracing	noun	
Comorbidity	noun	People with comorbidities such as hypertension or diabetes mellitus are more likely to develop a more severe course and progression of the disease
Community spread	noun	During community spread, the spread of an illness within a particular location can probably happen.
community transmission	noun	The Centers for Disease Control and Prevention on Wednesday confirmed the first possible “community transmission” of the coronavirus in the U.S.
contact tracing	noun	Health authorities in all these places are working hard to find the original source, or “ <u>patient zero</u> ,” using what’s called contact tracing, or finding all the people the patients were in contact with In a highly mobile world, that’s increasingly difficult. <i>The Salt Lake Tribune</i>
containment	noun	Containment can reduce the spread of COVID-19 .
containment zone	noun	Containment zones serve as strategies to prevent further spread of the virus.
coronavirus	noun	This is a family of related viruses.
Coronials	noun	Cohort of babies that were born during the pandemic are coronials.
COVID-19	noun	This is the disease caused by the new corona virus marked by symptoms like fever, dry cough, and shortness of breath.
Covidiot	noun	Tell the covidiot to stop what they are doing.
Covidient	noun	We are covidients during the time of the pandemic.
cytokine storm	noun	Cytokine storm is activated by COVID-19. This embraces a

Term/Phrases	Part of Speech	Use in the Context of the Pandemic
		variety of events that may ultimately result in multi organ failure.
Doom Scrolling	verb	Doomscrolling is a kind of phenomenon of elevated negative feeling after viewing pandemic-related content.
elbow bump	noun	Instead of handshakes, elbow bumps are done to avoid the spread of the disease.
facemask	noun	A personal protective equipment to prevent the spread of the corona virus.
Flatten the curve	verb phrase	To flatten the curve means control of the new cases of COVID-19.
Frontliner	noun	Frontliners are more prone to contact the disease than those who are not.
Herd Immunity	adjective phrase	Herd immunity was said to contain the spread of the COVID-19
Host cell	noun phrase	Findings of a particular study suggest that the coronavirus has evolved to take advantage of the host cell.
incubation period	nounphrase	This refers to the time it takes for someone with an infection to show symptoms.
Infodemic	noun	Too much information that is false and misleading is critical to some people during the pandemic.
Iso	noun	Iso (short for isolation) Staying at home may provoke depression to some people.
Kawasaki	noun	A cohort study shows the incidence of Kawasaki disease during the COVID-19 pandemic.
Lockdown	noun	A lockdown may be beneficial to contain the spread of the disease.
Lockstalgia	noun	There are people who are in lockstalgia during the lockdown.
Maskne	noun	Acne that pops out due to wearing of masks.
New normal	noun phrase	How COVID-19 transformed human life.
N95 mask	noun phrase	This is a kind of mask designed to achieve a kind of comfort to some users.
personal protective equipment (PPE)	noun	Frontliners are encouraged to use PPEs to protect themselves from any form of contamination.
Plateau	noun/adjective	Plateau is used to describe the epidemiological indicators such as the COVID-19 pandemic.
quaranteam	noun	The quaranteam is the group your friends or kids are quarantining with.
Rona	noun	Slang for corona. Young people say “Miss Rona,” to mean coronavirus.
Self-quarantine	noun	Sometimes, this is called self-isolation. People <i>self-quarantine to curb the spread of infection</i> .
shelter in place	noun phrase	This is an order for people to stay where they are and not leave for their own protection.
social distancing	noun	May be termed as physical distancing, to slow down the spread of an infection.
smizing	noun	Smizing is common during the pandemic.
spike protein	adjective phrase	this is a glycoprotein that protrudes from the envelop of some viruses such as the coronavirus.
superspreader	adjective	A highly contagious individual capable of transmitting a communicable disease.
Symptomatic	adjective	A person who exhibits signs of illness in COVID-19 for instance, cough, fever or shortness of breath are symptoms.
Triage	noun	The patients are sorted and allocated treatment in the time of the

Term/Phrases	Part of Speech	Use in the Context of the Pandemic
		pandemic.
voluntary isolation	adjective phrase	The health officer requested the person to enter a confinement center and the person gladly complied.
WFH	Noun	Employees work from home during the pandemic.
Zoombombing	noun	An unwanted, disruptive intrusion during a video conferencing.
Zooze	noun	Young people love drinking with their friends over zoom.
Zumping	verb	Many people were zumped during the COVID-19 pandemic.

6.0 CONCLUSION

The primary purpose of this study is to collate the words brought about by the pandemic. This collection presented these linguistic contributions to the English language regarding word formation, etymology, and descriptions (RQ1) and the meanings associated with these linguistic additions (RQ2). The selection of these words included some terms that existed long before this pandemic and have become more common now and some medical terms that have become part of everyday speech.

This present study the impact of the pandemic as evidenced by the lexical innovations introduced into the language (Gustilo et al., 2021). Because of the pandemic, new terms were formed. This corona lexicon reflects the political, medical, economic, and psychosocial realities of the war against the coronavirus. People created this specialized discourse as a coping strategy to communicate effectively during these trying times (Gustilo et al., 2021).

English remains remarkably growing, as proven by the linguistic inclusions and the power of social and digital media to proliferate. With the pandemic, 78 new terms have evolved, and thousands more words contextualized by the pandemic.

7.0 STUDY'S LIMITATIONS AND RECOMMENDATIONS FOR FUTURE STUDY

This humble study is a little contribution to the existing body of knowledge. One of its limitations is the inability of the researchers to secure strategies such as seeking more experts to validate the collected terminologies. The researchers, as a language expert and a social scientist respectively, took careful consideration in the selection of these terminologies only in the context of the COVID-19 pandemic. Further study may be conducted to establish the validity of the meaning and interpretations of these terms.

8.0 EDUCATIONAL IMPLICATIONS

According to Becker (2020), a glossary of terminology helps people understand the coronavirus pandemic. This means that the difficulties and implications of COVID-19 have necessitated the invention of new vocabulary to characterize the virus's mutations and how various sectors will adapt to related changes in life. Words generated in this study will benefit students so they will be able to understand lectures and will have added information to the ever-changing lexicon they need to learn during the pandemic and the rest of the life-changing situations in the future. This paper will serve as additional baseline data for policymakers, curriculum designers, students, and teachers, teaching and learning, and understanding these terms has become the language of every day.

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The Late Deafened: Adjusting to a New World

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ABSTRACT

The ability of the person ability to carry out daily activities is affected by their hearing abilities. To learn how to accept and cope with hearing loss has become a herculean task that late-deafened people need to battle daily. This qualitative study, specifically autoethnography, seeks to describe and systematically analyze the personal experiences of the writer using Milner's (2007) framework. This paper also shares the struggles and adjustments, specifically the late deafened's personal, social, emotional, and professional life. This paper can offer insights into how people can understand the adjustments faced by deafened individuals and how they can provide assistance, communication accommodation, and other services that may be needed by those who are late-deafened.

KEYWORDS: autoethnography, late deafened, deafness, adjustments

1.0 BACKGROUND OF THE STUDY

On August 22, 2022, I woke up unable to hear the birds twitting on my window. The weather was not good that day. Before that, I observed that I had slept soundly in the last few weeks, and I told my husband that he was no longer snoring. That day, I realized I had started to become partially deaf. One by one, friends kept telling me that I had not responded to them several times, which was validated by an audiological test a few weeks later. I became socially, psychologically, and physically insecure. I stopped talking to people, and my work as a tertiary teacher suddenly challenged me.

Being late deafened or deafened happens when one acquires a profound hearing loss. The problem is when this occurs to one who does not know sign language, and without assistance from any device, communication becomes a problem. Because of this, those who have become deaf encounter problems and need adjustments in their personal, social, and professional lives. Barlow et al. (2007) assert that becoming deafened is a devastating experience for many people who experience severe psychological, social, and employment consequences. Along with this, they no longer felt they belonged in the hearing world or the prelingually deaf world. Thus, the onset of deafness left them in a twilight zone between worlds and robbed them of their identity. This holds in my experience. Being late deafened, my psychosocial experiences imply more need for support and commitment from family members and co-employees.

2.0 THE METHOD

This paper used the qualitative research method, specifically autoethnography. This research method is derived from autobiography and ethnography. When a researcher does autoethnography, they use the method of qualitative inquiry that unites autobiography (the telling of one's life) and ethnography (studying culture) in their utilization of their lived experiences as evidence with which to explore the cultural phenomena (Harrison, 2022). Researchers in autoethnography become storytellers and narrators without restrictions in expressing emotions, experiences, and day-to-day activities. It helps authors reveal their true identities through reflections (Khair et al., 2022).

When writing an *autobiography*, an author retrospectively selects their past experiences. In most cases, the author does not live through these experiences solely to make them part of a published document; instead, such experiences are assembled using hindsight (Bruner, 1993; Denzin, 1989; Freeman, 2004; Ellis, 2011). In writing, the author may also interview others or consult with texts like photographs, journals, and recordings to help with recall (Delany, 2004; Didion, 2005; Goodall, 2006; Herrmann, 2005; Ellis, 2011).

Researchers also conduct ethnographic studies to study a particular culture's relational practices, common values and beliefs, and shared experiences to help cultural members and strangers better understand the culture (Maso, 2001; Ellis, 2011). Researchers do autoethnography when they do retrospection and selection of the 'epiphanies' through their personal experiences to illustrate aspects of cultural experience, thereby making characteristics of a culture familiar to insiders and outsiders.

To support my reflection and investigation of the different adjustments I must make with being late-deafened, I employed Milner's (2007) framework borrowed from Dull (2021). Since my inquiry focused on different aspects of my identity of being late-deafened, including myself as a researcher, this framework is appropriate, as Milner "rejects practices in which researchers detach themselves from the research process, particularly when they reject their racialized and cultural positionality in the research process" (p. 388). He argues (Dull, 2021) that researchers need to reflect on their identity and positionality, especially when engaging in research in communities where they are outsiders and when racial and cultural differences impact power and privilege. Once they can identify them, researchers can address them to prevent them from negatively impacting the community. To support this, Milner (2007) segments his framework into four parts, for which he provides sample guiding questions and suggestions for ways to focus those

reflections: 1) researching the self, 2) researching the self concerning others, 3) engaged reflection and representation 4) and shifting from self to system.

I used Milner’s framework (2007) in this paper, courtesy of Dull (2021). I included it in the rationale for the autoethnography and as a lens through which I created my research questions. I responded to each of the guiding questions in the four components of the framework, providing as much detail as possible and, in some cases, expanding beyond those questions to address other connected issues I felt were relevant to my developing positionality. Milner’s “researching the self in relation to others” and “engaged reflection and representation” led to inputs into my developing positionality.

Table 1 reflects the process of the autoethnographic research.

Phase	Resources & Action	Guiding Questions	Product/Result
Discovery	Read and Reflect	What can I learn from this phenomenon? Why is it important to reflect on my positionality?	Intent of the ethnography
Planning	Apply Milner’s Framework	What data will I collect? How will I analyze the data?	Research plan/outline
Researching	Reflect using Milner’s Framework ✓ researching the self ✓ responding to the guide questions ✓ engaging in reflection ✓ shifting from self to the system	What are the seen and unseen challenges with regard to my positionality? What aspect of my identity might affect my research? What can I do to adjust my positionality on the community?	Data set (lived experiences)
Analysis	Analyze data using thematic analysis	How does the data show? Have I accounted for my subjectivity?	Thematic results
Reporting	Draft report of the findings. Reflect on the report	What are the appropriate venues to share my findings?	Report of autoethnography

As an autoethnographer in this investigation, I find it appropriate to rely on this framework to address the intent that I have advanced. My engagement in this theory is novice but because I read it for several times, the framework gave me an opportunity to examine and reflect my positionality through this autoethnographic study. Since this study also focused on my own circumstances, my experience and as the researcher, Milner’s framework provided the support in which this investigation can be positioned.

In this framework, I have the opportunity to evaluate myself in relation to how I deal with others because of my hearing loss. Then, I get to reflect to make sense of my interactions and collaborations with others such as my family members and co-employees.

3.0 THEORETICAL GROUNDING

The five stages of grief was introduced by Swiss-American psychiatrist Elisabeth Kübler-Ross in her 1969 book *On Death and Dying* inspired by her work with patients who are terminally ill. She stated that those experiencing grief go through a series of five emotions: denial, anger, bargaining, depression, and acceptance.

In Denial, this is considered a temporary defense. The person may have a tendency to isolate themselves avoiding others who may have accepted what is happening. For the late deafened, this is evident as in other personal circumstances. Having experienced deafness for the first time, the transition from the pre-deafened stage to the deafened stage is difficult to accept. Thus, the tendency to deny it is a common situation.

In the Anger stage, the individual realizes that denial cannot continue and becomes irritated, frustrated especially to people around them. For the late-deafened, this stage takes place considering that this stage of deafness is a desperate stage in one's life. Being angry about the situation, anger is projected as an escape to acceptance.

Comes the Bargaining stage, in here the individual can avoid a cause of grief. Negotiation happens. For instance, asking God for a second chance at life. In the context of late deafness, this stage is the feeling where the late deafened bargains with the absence of the sense of existing in the hearing world.

Depression is the fourth stage which happens when the individual despairs at the recognition or realization of mortality. In late deafness, this is imminent because being isolated with oneself ushers sadness. There is a tendency for the late deafened to feel being left alone and withdrawing from the world of hearing. Having lost one's hearing is comparable to having lost a loved one.

Acceptance stage is where individuals embrace the inevitability of the tragic moment. This is a calm, retrospective and stable condition of the individual's emotions. Acceptance of being late deafened means that one is okay with the idea that they have lost a significant part of them. They have come to terms with the hearing loss, just like losing a loved one, the late deafened experiences the new reality that has occurred in their lives. Figure 1 reflects the theoretical grounding of this paper.

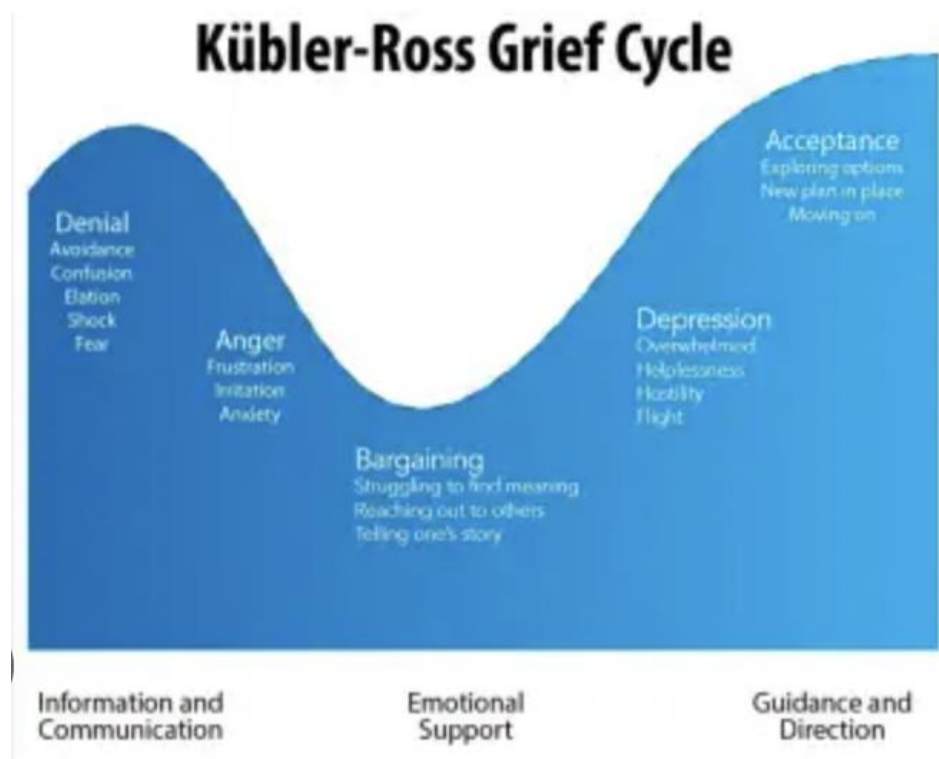


Figure 1. The Cycle of Grief
Source: <https://www.psycom.net/stages-of-grief>

4.0 RESULTS AND DISCUSSION

This section shares the struggles and adjustments specifically in the late deafened's personal, social, emotional, and professional life. This section also offers insights on how people can understand the adjustments faced by deafened individuals and how they will be able to provide assistance, communication accommodation, and other services that may be needed by those who are late deafened. Milner's (2007) framework is segmented into four parts: Personal Struggle/Adjustment, Social Struggle/ Adjustment, Emotional Struggle/Adjustment, and Professional Struggle/Adjustment as reflected in the matrix below.

Personal Struggle/Adjustment	Social Struggle/Adjustment	Emotional Struggle/Adjustment	Professional Struggle/Adjustment
•diminishing self-esteem •avoidance •denial •less motivation	•struggling to be with others •hiding from other people •inability to communicate with friends	•change in communication patterns •learning other communication strategies like lip reading •diverting oneself to work related deliverables	•openness to colleagues •readiness to take criticisms and "bullying" at certain times •accommodating communication difficulties

Figure 2. Themes reflective of Milner's Framework (2007)

Struggles and Adjustments

Being deaf is depressing. Learning to cope with deafness is difficult. In my experience, the first thing that I need to do is to accept that I have severe hearing loss. Coping with this loss is a complex process. Every aspect of life was affected. In my personal experience, almost every aspect of my being has been affected. The first aspect was my diminishing self-esteem, eliminating my educational activities, avoiding people in my employment, social life, leisure-time activities, and family relationships. Denial is in me. The experience of deafness becomes something that occupies my whole being from the moment I wake up to the time I close my eyes.

In 1969, Elizabeth Kubler-Ross introduced a grief model with five stages: denial, anger, bargaining, depression, and acceptance. This model was developed to describe individuals' reactions to terminal illnesses. However, it may be applied to loss of hearing, according to Larew (2019)—a person who becomes deaf experiences all of these stages to some extent. I must say that it occurred to me. Denying that I have hearing loss is a reality. Sometimes saying that I am not paying attention because I am thinking of something else. Hearing loss is easy to deny as a person can pretend to be distracted, blame outside noise, or blame the speaker as reasons for not understanding.

As a deafened individual, I cannot help but be angry about why I developed such a disability. This stage may not be experienced by some people undergoing this stage. However, it is a reasonably good bet that deafened people have said prayers or considered making extreme promises if their hearing were returned (Larew, 2019). Undeniably, I have that feeling of depression attributed to hearing loss and now the feelings of isolation and the inability to communicate as in the past. There is this feeling of confusion as to accept it or deny it. Losing my hearing is more difficult to accept than losing a friend. Furthermore, now the ordeal is real. To be or not to be is a question of being one with others or shutting oneself in a corner.

Personal Struggles/Adjustments

It was indeed a heartbreaking experience to have hearing loss. Major personal adjustments must have to be considered in almost all phases of my life. The partial loss of receptive communication has had a significant impact on me. Imagine that I can no longer hear fully those usual things I used to hear, like my husband's snoring. Sometimes, listening to music can no longer be appreciated by me wherein. I used to listen to beautiful music, especially when doing paperwork and a lot more. With the onset of deafness, the only person I communicated with most effectively was myself.

In Larew (2019), it was highlighted that deafened adults initially view deafness as a temporary condition that can be cured by medication or surgery. As observed, they may dream of waking up and being able to hear on the telephone and understand what people are saying to them. Since deafness is viewed as temporary, people prefer to hide it rather than admit it. The individual may display more anger-related emotions as it becomes evident that deafness is not temporary. In my case, some personal adjustments I had to undergo were my *diminishing self-esteem, avoidance of other people, denial of what I was going through*, and *less motivation to work*.

Larew (2019) supports this, stating that deafened adults realize there are numerous things they can no longer do, and their self-esteem plummets, often leading to depression and guilt. Many questions are out there for me to address. Why? What have I done? Do I deserve this? Larew (2019) also adds that there is a tendency for people to ask themselves many questions people after something traumatic occurs. This situation also occurred to me.

Social Struggles/Adjustments

This is the second theme that I have generated from my reflective exercise. According to Larew (2019), deafness is invisible and easy to hide from other people. It is common for people who recently have lost their hearing not to inform their peers of the hearing loss. Nevertheless, this is different for me. I felt the

imperative need to inform others of what I am going through. Among the adjustments I have here is *struggling to be with others*. I feel like going away from the crowd all the time. Thus, I *hide from other people*. I only report to school if I find the reason for doing so. I also experienced the *inability to communicate with friends*. Larew (2019) asserts that the inability to communicate with family and friends results in isolation. When one cannot communicate effectively in social or employment settings as before, it is not easy to feel comfortable in those environments.

This tendency has become a struggle for me. As a late-deafened adult, I struggle internally as I attempt to identify social activities that are comfortable for me. Most of the time, I sulked at home. Listening to beautiful music is no longer an activity that I sought to do. I now prefer sitting in the garden alone and reading rather than going out with friends.

Emotional Struggles/Adjustments

The third theme that made sense in my lived experiences as a late-deafened individual is my emotional struggles or adjustments. If one thing is impacted all the more, it will be the family. Along with this theme, I have three sub-themes: *change in communication patterns*, *learning other communication strategies like lip reading*, and *diverting oneself to work-related deliverables*. Larew (2019) observes that the onset of deafness can affect not only the deafened individual but also parents, spouses, siblings, children, and significant others. This means having a deafened person in the family will disrupt the established communication patterns and routines. In this case, family relationships may be disrupted as communication becomes more labor intensive. I am better off with texting or chatting. Thus, I have created a GC for the family. It facilitated communication in a more manageable manner. Despite having a background in sign language, having to learn it at a later age makes it easier to administer. Studies show strategies like writing notes, speaking slowly to facilitate lipreading, and learning sign language are needed to develop effective communication among family members.

In this case, I also strategize to help my family communicate with me, although I can observe a little difficulty on their part. Thus, I will remind them to give me a chat instead if they cannot come near me. Communication has become difficult between me and my family. However, we are still deciding. Making a little sacrifice and accommodation improves life for a late-deafened adult like me.

Professional Life Adjustments/Communication Options

The last theme is professional life adjustments or communication options that help me thrive in the workplace. *Openness to colleagues*, *readiness to take criticisms* even up to the point of bullying, and *accommodating communication difficulties are some struggles that I have experienced*. My ability to deliver my craft of lecturing as a resource speaker continues, but I have to grope with my hearing disability. It is not easy when an open forum comes, and participants ask questions. My relief is enabling the closed caption feature of Zoom. Communication was better when I started using hearing aids. But despite the hearing aids, there are times when I can feel that my ears are complete, and the sound bumps before I hear them.

Larew (2019) states that when a person acquires profound hearing loss, a hearing aid is more likely to assist with hearing environmental cues than understanding speech. Often, deafened adults seeking the "cure" will experience frustration and anger when the hearing aid does not meet their expectations. With advanced technology nowadays, other late-deafened individuals get cochlear implants as a "cure." However, studies show that implants may or may not be effective. Although, experts say that lipreading or speechreading may be regarded as a "cure." Deafened individuals believe the myth that "all deaf people can lipread" and become frustrated when they cannot develop this skill. In my case, I cannot also do lipreading, no matter how hard I try.

With this communication option, other deafened individuals resort to sign language. Deafened individuals may be reluctant to develop this skill as it will make them "different." There is often limited opportunity for deafened adults to learn and practice sign language as they need to learn from others who use it. The ability to use sign language is to get exposure to it. This means that I can do sign language if I get to communicate with people who also use it whenever they communicate.

Understanding Deafness and Accommodations

Losing my hearing is stressful. It has made life more difficult. Understanding deafness is a process that requires varying amounts of time. In most cases, it takes an individual two to three years to integrate deafness into their lifestyle (Larew, 2019). This does not mean the individual cannot function before this time, but that understanding and accepting deafness is a long process.

5.0 CONCLUSION

The struggles and adjustments experienced in this autoethnographic study reflected the personal, psychosocial, emotional, and professional life struggles and adjustments experienced by the late deafened. Insights on how people can offer an understanding of the adjustments faced by deafened individuals and how they can provide assistance, communication accommodation, and other services that may be needed by those who are late-deafened.

6.0 RECOMMENDATIONS

Based on the findings, the following recommendations were advanced:

- 1) There is a need for the 'hearing' people to be aware of the struggles faced by the late deafened. This study will likewise show how such struggles in communication could be improved in favor of people with partial or profound hearing impairment.
- 2) The government is encouraged to create programs and advocacies to support people who are deaf through the use of communication alternatives that individuals are more comfortable with and avoid imposing the hearing world's preferences.
- 3) There is a need for the government to create mandates where parents with children who are deaf timely receive communication programs matching their children's hearing impairment conditions.
- 4) That related institutions design communication programs for the hearing public to understand and provide ways of communicating with individuals who are deaf for them to live generally in a 'hearing' world.
- 5) Further studies on the late-deafened be conducted to identify communication strategies that work best with the late-deafened and those with profound deafness in particular.

7.0 STUDY'S LIMITATIONS AND RECOMMENDATIONS FOR FUTURE STUDY

The contribution of this study to the more extensive body of knowledge on the topic of late deafness or deafness is dependent on future studies that may arise from it. Despite the simplicity of data obtained from this study, it has provided a foundation for the reality that late deafness exists and that awareness is paramount. One limitation of this study was its focus on this researcher's lived experience alone. This investigation was supposed to be a duoethnographic study, but my partner declined in the last hour.

In the context of the educational realm, this study has value because of the evolution of deafness. This necessitates a more sensitive academic community considering the presence of deafness and how the growing deaf community can be accommodated in the teaching-learning process. The overall prevalence of moderate or worse hearing loss in the Philippines is 15% (2,275 adults and children were studied). The prevalence was 7.5% in children and 14.7% in adults between 18 and 65, and 49% in adults aged 65 years or older (UST, 2011).

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A Study of Student Teachers' Personalities at an Unlimited Admission University in Thailand

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ABSTRACT

The purposes of this research were 1) to study student teachers' personalities at an open university in Thailand and 2) to study a concordance between student teachers' personalities and teacher personality. The participants in this study were 403 students currently studying in the undergraduate program in the final year 2022 at the Faculty of Education at the open university in Thailand. The participants were selected through purposive sampling. The research instrument was Myers-Briggs Type Indicator (MBTI). The research results found that the participants' personality included 16 types: ESFJ, ISFJ, ISFJ, ESFP, ENFP, INFJ, INFP, ISTJ, ESTJ, ISTP, ESTP, ENTP, INTJ, ENTJ, and INTP. Moreover, the study on concordance between student teachers' personalities and teacher personality showed that most of the participants had a teacher personality.

KEYWORDS: Personality, The Myers-Briggs Type Indicator, Teacher personality, Student teacher

INTRODUCTION

In contemporary society, personal profile holds significant importance due to its desirability by educational institutions, agencies, and organizations for admission or employment. It can be asserted that personal profile is a crucial psychological component that influences success in learning and career choices. Moreover, it is widely accepted and admired by individuals in general. Personal profile exhibits diverse characteristics unique to each individual (Thiabrithi, 1996).

In the 21st century, as countries transition towards a knowledge-based economy and innovation, the development of individuals with global-level knowledge, abilities, competence, and competitiveness becomes crucial. To accomplish this, an effective and high-quality education management system with clear plans and objectives at each educational level is essential. Among the key factors in achieving these goals, "teachers" play a significant role as they provide guidance, training, and create learning processes that foster intellectual and emotional growth, enabling students to develop into knowledgeable, skilled, and capable adults. Hence, it is imperative for competent and effective teachers to possess a comprehensive and appropriate personal profile. Consequently, it is desirable for universities that produce teachers (i.e., teacher education institutes) to evaluate the personal profile of their education major students prior to graduation. The evaluation of personal profile can take various forms, and one particularly relevant method that can assess and relate to the teaching profession is the Myers-Briggs Type Indicator (MBTI) personality assessment.

The MBTI is a personality assessment tool developed based on Carl Jung's psychological types theory, which categorizes personality types (Quenk, 2009). It provides descriptions that link personality traits to suitable professions. By employing the MBTI assessment, the personal profile of final-year education major students can be examined. This allows students to engage in self-reflection and self-improvement, while instructors can analyze their strengths and areas for development, with the aim of nurturing their personal profile as effective teachers in the future.

Therefore, the primary objective of this research is to explore the personal profile of education major students who are nearing graduation, utilizing the MBTI as an appropriate tool. This assessment aligns with the personal profile requirements for teachers in educational institutions and can serve as a screening mechanism for individuals who will assume teaching roles in the future.

LITERATURE REVIEW

The Professional Profile of Teachers

Gordon (1963) states that a good professional profile of teachers encompasses four dimensions:

1. **Power and Influence:** This dimension includes behaviors characterized by self-confidence, influential speech or commands, adaptability, decisiveness, and independent decision-making with reliability.
2. **Responsibility:** This dimension involves behaviors characterized by diligence, perseverance, successful completion of assigned tasks, dedication to work that inspires trust, and genuine accountability.
3. **Emotional Stability:** This dimension includes behaviors characterized by appropriate emotions, emotional resilience, calmness, contentment, and the ability to work independently without excessive anxiety.
4. **Sociability:** This dimension encompasses the ability to engage in meaningful conversations and interesting interactions with others, demonstrating good social participation.

Why Use the Myers-Briggs Type Indicator (MBTI) Personality Assessment?

The Myers-Briggs Type Indicator (MBTI) is a personality assessment tool developed based on Carl Jung's Psychological Types theory, which categorizes personality types (Quenk, 2009). The notable feature of the MBTI assessment is its ability to study different aspects of an individual's personality, divided into four dimensions. These dimensions (See Figure 1) are as follows:

Mind : This aspect shows how we interact with our surroundings; I Introverted Introverted individuals prefer solitary activities and get exhausted by social interaction. They tend to be quite sensitive to external stimulation (e.g. sound, sight or smell) in general. E Extraverted Extraverted individuals prefer group activities and get energized by social interaction. They tend to be more enthusiastic and more easily excited than Introverts.	Energy : The second aspect determines how we see the world and process information; S Observant Observant individuals are highly practical, pragmatic and down-to-earth. They tend to have strong habits and focus on what is happening or has already happened. N Intuitive Intuitive individuals are very imaginative, open-minded and curious. They prefer novelty over stability and focus on hidden meanings and future possibilities.
Nature : This aspect determines how we make decisions and cope with emotions; T Thinking Thinking individuals focus on objectivity and rationality, prioritizing logic over emotions. They tend to hide their feelings and see efficiency as more important than cooperation. F Feeling Feeling individuals are sensitive and emotionally expressive. They are more empathic and less competitive than Thinking types, and focus on social harmony and cooperation.	Tactics : This aspect reflects our approach to work, planning and decision-making; J Judging Judging individuals are decisive, thorough and highly organized. They value clarity, predictability and closure, preferring structure and planning to spontaneity. P Prospecting Prospecting individuals are very good at improvising and spotting opportunities. They tend to be flexible, relaxed nonconformists who prefer keeping their options open.

Figure 1: MBTI Personality Type Key

Furthermore, these dimensions of personal profile are blended together, resulting in a total of 16 personality codes. These codes include ESTJ, ISFJ, ESFP, ISFP, ENTP, ENFJ, ENFP, INFP and INFJ with specific personal profile characteristics that are relevant to the teaching profession (Table 1).

Table 1: MTBI related to the Teaching Profession

MBTI Types	Personality	Suitable career characteristics
ESFJ	ESFJs are conscientious helpers, sensitive to the needs of others and energetically dedicated to their responsibilities. They are highly attuned to their emotional environment and attentive to both the	wedding planner, social worker, pediatrician, public health employee, kindergarten teacher , business consultant, nurse, human resources manager, office manager, executive assistant, public relations specialist, medical employee, human resources, office worker, social services,

MBTI Types	Personality	Suitable career characteristics
	feelings of others and the perception others have of them.	child care worker
ISFJ	ISFJs are industrious caretakers, loyal to traditions and organizations. They are practical, compassionate, and caring, and are motivated to provide for others and protect them from the perils of life.	homemaker, stay at home parent, office worker, health care worker, personal assistant, school teacher , administrative assistant, child care worker, clerical employee, receptionist, library assistant, dietitian, health educator, librarian
ESFP	ESFPs are vivacious entertainers who charm and engage those around them. They are spontaneous, energetic, and fun-loving, and take pleasure in the things around them: food, clothes, nature, animals, and especially people.	public relations manager, school teacher , radio DJ, customer service, EMT, hair stylist, event coordinator, pediatric nurse, child care worker, makeup artist, personal trainer, public relations, human resources, travel agent, massage therapist, physical therapist, interior decorator
ISFP	ISFPs are gentle caretakers who live in the present moment and enjoy their surroundings with cheerful, low-key enthusiasm. They are flexible and spontaneous, and like to go with the flow to enjoy what life has to offer.	sports management, pediatrician, school teacher , carpenter, veterinary technician, singer, health educator, stay at home parent, hospitality worker, pastor, athlete, physician assistant, photographer, health care worker, shop assistant, stylist, website designer
ENTP	ENTPs are inspired innovators, motivated to find new solutions to intellectually challenging problems. They are curious and clever, and seek to comprehend the people, systems, and principles that surround them.	dictator, computer consultant, international spy, TV producer, philosopher, comedian, music performer, IT consultant, fighter pilot, politician, diplomat, entertainer, game designer, bar owner, freelance writer, creative director, strategist, news anchor, professional skateboarder, airline pilot, comic book artist, college professor, private detective, mechanical engineer, lecturer , ambassador, astronomer, research scientist, judge, web developer, scholar, FBI agent, CIA agent, electrical engineer, assassin
ENFJ	ENFJs are idealist organizers, driven to implement their vision of what is best for humanity. They often act as catalysts for human growth because of their ability to see potential in other people and their charisma in persuading others to their ideas.	casting directory, film critic, wedding planner, work in the performing arts, teacher (art, preschool, elementary) , actor, fashion designer, news anchor, fashion merchandiser, school psychologist, broadcaster, stylist, interior designer, event coordinator, restaurant owner, childcare worker, hair stylist, film director, counselor, dancer
ENFP	ENFPs are people-centered creators with a focus on possibilities and a contagious enthusiasm for new ideas, people and activities. Energetic, warm, and passionate, ENFPs love to help other people explore their creative potential.	performer, actor, entertainer, songwriter, musician, filmmaker, comedian, radio broadcaster/DJ, some job related to theater/drama, poet, music journalist, work in fashion industry, singer, movie producer, playwright, bartender, comic book author, work in television, dancer, artist, record store owner, model, freelance artist, teacher (art, drama, music) , writer, painter, massage therapist, costume designer, choreographer, make-up artist
INFP	INFPs are imaginative idealists,	poet, painter, freelance artist, musician, writer, art

MBTI Types	Personality	Suitable career characteristics
	guided by their own core values and beliefs. To a Healer, possibilities are paramount; the reality of the moment is only of passing concern. They see potential for a better future, and pursue truth and meaning with their own flair.	therapist, teacher (art, music, drama) , songwriter, art historian, library assistant, composer, work in the performing arts, art curator, playwright, bookseller, cartoonist, video editor, photographer, philosopher, record store owner, digital artist, cinematographer, costume designer, film producer, philosophy professor, librarian, music therapist, environmentalist, movie director, activist, bookstore owner, filmmaker
INFJ	INFJs are creative nurturers with a strong sense of personal integrity and a drive to help others realize their potential. Creative and dedicated, they have a talent for helping others with original solutions to their personal challenges.	psychotherapist, artist, art curator, bookstore owner, freelance writer, poet, teacher (art, drama, English) , library assistant, professor of English, painter, novelist, book editor, copywriter, philosopher, environmentalist, bookseller, museum curator, opera singer, magazine editor, archivist, music therapist, screenwriter, film director, creative director, librarian, social services worker, art historian, sign language interpreter, photo journalist, makeup artist, photo journalist, homemaker

METHODOLOGY

This research study is a pilot study that utilizes a descriptive research framework to investigate the personal profile data of students in their final semester. The aim is to utilize the collected data for the development of supplementary activities for teacher training and to enhance the students' personal profile in alignment with their future teaching profession. The research procedures are detailed as follows:

Target Group:

The target group consists of 403 students enrolled in the Bachelor of Education program, majoring in Teaching Profession, during their final semester. The students belong to the following academic disciplines:

B.Ed. (Early Childhood Education)	135
B.Ed. (Elementary Education)	56
B.Ed. (Thai)	83
B.Ed. (English Language)	5
B.Ed. (Chinese)	8
B.Ed. (Social Studies)	34
B.Ed. (Mathematics)	30
B.Ed. (Science)	31
B.Ed. (Art Education)	17
B.Ed. (Computer Education)	4

Research Instrument:

The research employed a measurement instrument based on the Myers-Briggs concept, studying theoretical definitions, relevant literature, and research studies to guide the development of a personality profile assessment based on the Myers-Briggs concept. The instrument was adapted from <https://www.16personalities.com/> and designed to have easily comprehensible questions without unnecessary complexity. The instrument consists of 58 questions, with each question consisting of 7 options to choose only one option from. It took approximately 12 minutes to complete. The developed personality profile assessment based on the Myers-Briggs concept was reviewed by three experts to ensure content

validity, yielding an IOC value of 1.00. The assessment was then piloted with a similar group to the target group and further refined for subsequent use.

Data Collection:

Data collection involved administering the Myers-Briggs Type Indicator (MBTI) questionnaire to students in their final semester of the Faculty of Education at an Unlimited Admission University. The data were collected after the students' professional teaching practicum experience and registration for the teacher training seminar.

Data Analysis:

Data analysis for the target group involved frequency and percentage calculations to classify personality profile data based on the analysis of the Myers-Briggs Type Indicator (MBTI). The analysis was conducted in two steps:

1. The researcher analyzed the students' personality profile data using frequency distribution and percentages.
2. The researcher examined the alignment between the target group's personality profile and the teacher's personality profiles through a descriptive analysis.

RESULTS

Table 2: Personality profiles of students in their final semester encompassing four dimensions.

Four-dimension Personalities (N=403)			
E-Extraversion	256	S- Observant	263
I-Introversion	147	N-Intuition	140
T-Thinking	35	J-Judging	261
F-Feeling	368	P-Perceiving	142

Based on the study of the characteristics of personality in four dimensions (Table 2), it was found that among the target group of students, their personality profiles can be described as follows:

1. In the first dimension, Extroversion, there were 256 individuals, indicating a greater inclination towards an expressive (E) personality profile compared to Introversion (I) and an inward-focused personality (I).
2. In the second dimension, Observant, there were 263 individuals, indicating a greater tendency towards perceiving information through observe experiences (S) rather than relying on intuition (I).
3. In the third dimension, Feeling, there were 368 individuals, indicating a greater preference for decision-making based on emotions and personal values (F) rather than relying on logical reasoning (T).
4. In the fourth dimension, Judgment, there were 261 individuals, indicating a greater inclination towards structured and planned work approaches (J) rather than a more flexible and adaptable approach (P).

Table 3: The number of students in each of the 16 personality types in a descending order

Personalities	Frequency (Persons)	Percentage
ESFJ	123	30.52
ENFJ	47	11.66
ISFJ	44	10.92
ESFP	41	10.17
ISFP	33	8.19

Personalities	Frequency (Persons)	Percentage
ENFP	29	7.20
INFJ	27	6.70
INFP	24	5.96
ISTJ	8	1.99
ISTP	5	1.24
ESTJ	5	1.24
INTJ	4	0.99
ESTP	4	0.99
ENTP	4	0.99
ENTJ	3	0.74
INTP	2	0.5
Total	403	100

Based on the study of personality traits, it was found that among the target group of students, all 16 types were represented (Table 3). The ESFJ type was the most prevalent, with a total of 123 individuals, accounting for 30.52 percent. Following that, the ENFJ type ranked second with 47 individuals, comprising 11.66 percent. Finally, the least represented type was INTP, with only 2 individuals, accounting for 0.5 percent.

Table 4: The alignment between the personality profiles of student teachers in their final semester and those of professional teachers

Personalities	Frequency (Person)	Percentage
ESFJ	123	33.00
ISFJ	44	11.82
ESFP	41	11.00
ISFP	33	9.64
ENTP	4	1.07
ENFJ	47	12.63
ENFP	29	7.79
INFP	24	6.45
INFJ	27	7.25
Total	372	100

From the study of the alignment between the personality profiles that are consistent with those of teachers, as described in the relevant literature, it was found that there are 9 personality types that align with the aforementioned profession. These types are as follows:

The investigation of the alignment between the personality profiles of student teachers (N=403) enrolled in their final semester and those of teachers revealed that there were 372 student teachers who exhibited compatible personality profiles, accounting for 92.30%. Additionally, it was observed that 31 student teachers, representing 7.70%, had personality profiles that were not aligned with the profession.

Upon examining the personal profiles of teachers, it was found that students in the target group exhibited certain personality traits such as ESTJ, ISTJ, ESTP, ISTP, ENTJ, INTJ and INTP

For the targeted group of students who exhibited incongruent personality traits (n=31), the researchers found that the personal profiles of these students are as follows:

1. ESTJ (n=5): ESTJs are hardworking traditionalists, eager to take charge in organizing projects and people. Orderly, rule-abiding, and conscientious, ESTJs like to get things done, and tend to go about projects in a systematic, methodical way.
2. ISTJ (n=8): ISTJs are responsible organizers who are driven to establish and maintain order within systems and institutions. They possess a meticulous and methodical nature, both externally and internally, and tend to have a structured approach to all their activities.
3. ESTP (n=4): ESTPs are energetic thrill-seekers who thrive when faced with challenges, whether they are tangible or abstract. They bring a dynamic and lively energy to their interactions with others and the world around them.
4. ISTP (n=5): ISTPs are observant artisans with an understanding of mechanics and an interest in troubleshooting. They approach their environments with a flexible logic, looking for practical solutions to the problems at hand.
5. ENTJ (n=3): ENTJs are strategic leaders, motivated to organize change. They are quick to see inefficiency and conceptualize new solutions, and enjoy developing long-range plans to accomplish their vision. They excel at logical reasoning and are usually articulate and quick-witted.
6. INTJ (n=4): INTJs are analytical problem-solvers, eager to improve systems and processes with their innovative ideas. They have a talent for seeing possibilities for improvement, whether at work, at home, or in themselves.
7. INTP (n=2): INTPs are philosophical innovators who are captivated by logical analysis, systems, and design. They are deeply engrossed in theoretical concepts and tirelessly seek the underlying principles that govern everything they encounter. Their quest is to comprehend the intricate patterns that permeate life in all its complexity.

DISCUSSION AND CONCLUSION

From the research, there are 16 types of target groups, corresponding to 9 types of teacher professions, including such occupations as kindergarten teachers, school teachers, lecturers, and teachers (art, preschool, elementary, drama, music, English).

Most of the student teachers had their personalities consistent with their professional personality. Due to the fact that during the time that student's study at the university, there are activities to enhance the teacher. There are 41 credits of courses related to the teaching profession according to the teacher production structure set by the Professional Federation. Teacher competency for every curriculum with teacher production proceeds in accordance with teacher production standards.

The prevailing inclination of student teachers towards the congruence between their self-image and the professional image of teachers stems from the concerted initiatives undertaken during their university tenure, which encompass supplementary pedagogical activities tailored to cultivate the identity of teachers. This is underscored by a curriculum that imparts pertinent subject matter related to the pedagogical profession, totaling up to 41 credits, in accordance with the teacher education framework delineated by the Professional Standards Council (2021). The Council mandates the embodiment of pedagogical competencies in all teacher education curricula, thereby enforcing compliance with the prescribed teacher education standards, necessitating the integration of supplementary activities fostering teacher identity throughout each academic year for students in the Faculty of Education at an unlimited admission university in Thailand. This mandate seeks to fortify the embodiment of teacher attributes and inculcate robust civic qualities, requiring no fewer than two annual extracurricular undertakings, as stipulated by the Faculty of Education in the proclamation concerning the specification of the teacher identity-enhancing activity framework for all Bachelor of Education programs. This proclamation, issued by the Faculty of Education at this unlimited admission university on February 25, 2021, aligns congruently with the proposition by Punthasueb et al. (2022), who presented a model of developmental activities aimed at augmenting the

attributes of students, endowing them with the distinctive qualities and professional persona befitting educational practitioners. The proposed activities also emphasize the cultivation of students' altruistic disposition towards societal utility, exemplified through endeavors like initiatives in altruism and community service, as well as the fostering of leadership awareness. These efforts further extend to projects centered on moral and intellectual advancement, enhancement of the educator persona, training in social participation, and engagement in national-level academic conferences.

The prevalence of ENFJ (n = 123) and ESFJ (n = 47) personalities among teaching professional students was higher than that of other personalities. As an Early Childhood Education student, the total number of students is 135. It shows that Early Childhood Education can truly develop the personality of students of the branch to become early childhood teachers. There are activities that allow students to practice the teaching profession of Early Childhood Education during their studies in a systematic way, thus making the personality test of students consistent with the professional personality of the teacher and the occupation of preschool teacher (ENFJ) and kindergarten teacher (ESFJ).

Furthermore, the teacher education curriculum includes a direct one-year practicum experience in primary-level educational settings, facilitating comprehensive practical training and the cultivation of the teacher persona during the period of practical experience in authentic educational environments. The imperative to advance both the teacher persona and the pedagogical competencies tailored to the specific academic disciplines of the students cannot be understated. In this endeavor to augment and refine the professional competencies of prospective teachers, the emphasis should be directed towards nurturing and fortifying the students at the Competent stage, wherein the development of their abilities remains paramount. In doing so, they are capable of assimilating and interconnecting the acquired knowledge resulting from their procedural engagement to contexts that are pertinent.

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An Analysis of the Impact of Personal Background and Learning Experiences on Cognitive Outcomes of University Students in a Non-Face-to-Face Learning Environment

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ABSTRACT

The COVID-19 pandemic has forced higher education institutions to rapidly transition to contactless online education, resulting in significant changes to traditional teaching methods and campus organization. Despite these challenges, universities must prioritize students' educational experiences, changes, and development, as these are key factors in verifying their effectiveness and improving teaching and learning. To this end, this study analyzed data from the National Assessment of Student Engagement in Learning (NASEL) to investigate the impact of personal background and learning experiences on the cognitive outcomes of 2,177 university students in a non-face-to-face educational environment. The study found that major, year, classroom behavior, challenging learning experiences, interaction with professors, and interaction with campus community members had significant effects on knowledge acquisition, while major, gender, active class participation, classroom behavior, thinking activities, challenging learning, interaction with students from different backgrounds, and interaction with campus community members had significant effects on cognitive capacity. These results highlight the need for universities to identify effective teaching and learning activities in a non-face-to-face education environment and implement appropriate improvement plans.

KEYWORDS: Non-face-to-face learning environment, Cognitive outcomes, Learning experiences

RESEARCH BACKGROUND

Previous studies on the effectiveness of higher education have shown that students' experiences of various educational activities and active interactions with others have a significant effect on academic continuity and learning outcomes (Astin, 1993; Pace, 1987; Tinto, 1990). In particular, quality interactions between students and professors, cooperation with peers, and active learning attitudes of students are major learning experience factors that affect higher education outcomes, including knowledge development and motivation to participate in learning (Chickering & Gamson, 1987). However, due to the spread of COVID-19, most university education has been converted to non-face-to-face distance education without sufficient preparation, and the face-to-face learning experience has to be transformed in the context of non-face-to-face distance education. Korean universities, professors, and students had to go through trial and error to adapt to a non-face-to-face educational environment, and many of the traditional face-to-face teaching and learning activities could not be carried out (Kwon, 2020; Kim, 2020; Min, 2020; Bae, 2020).

These changes suggest that research on university students' learning experiences and outcomes, which have been mainly discussed in traditional face-to-face educational environments, should be analyzed in non-face-to-face educational contexts, as it is still important for universities to be concerned with students' educational experiences, changes, and growth and development. This study aims to examine the factors that affect students' cognitive learning outcomes in terms of personal background and learning experiences in the context of Korean higher education, where non-face-to-face distance education has been promoted due to the pandemic, and to obtain practical implications for improving teaching and learning.

REVIEW OF LITERATURE

COVID-19 and non-face-to-face learning

With the advent of the COVID-19 pandemic in 2019, the global education landscape has undergone unprecedented changes, not the least of which is the expansion of distance learning, which has forced everyone in the university community to adapt to the utilization of online learning systems. The transition from traditional face-to-face education to distance learning has been a disparate experience for both learners and instructors, and the education system and instructors in particular have had to adapt to utilizing various online platforms in a relatively short period of time to conduct "education in emergency" (Pokhrel & Chhetri, 2021). Adedoyin and Soykan (2020) argued that while it is important for online education to be planned and developed based on relevant and appropriate theories and models, the transition to online education in the wake of the pandemic may have omitted these steps or occurred gradually after the start of online education, which may have affected learning outcomes under this method. Similarly, the process of converting previously face-to-face lectures to online classes had design difficulties and limitations due to redesigning the class structure, low preparation of instructors and learners for online classes, inadequacy of existing teaching and learning methods, and limited support from the university (Do, 2020). In terms of students' social engagement in the university, the physical separation between professors and students led to an overall decrease in interaction with other students and professor-student interaction (Bae et al., 2021). On the other hand, non-face-to-face learning has also played a role in bringing out the best of university education. Oliveira et al. (2021) found that professors can secure more time and communication channels for student questions and comments, allowing students to receive better and faster feedback and engage in more productive educational activities. In addition, due to the nature of non-face-to-face education conducted through online platforms such as Zoom or LMS, it is free from the risk of exposure to infectious diseases and limitation of time and place, and students can utilize online teaching tools for repetitive learning or search and explore materials on their own (Park, 2020). Depending on the student, this has the benefit of motivating them to study and increasing the likelihood of meaningful learning (Bae et al., 2021).

Personal background and learning experiences of university students

College learning outcomes are affected by students' different experiences with the university, professors, and students. Previous research has demonstrated the effect of different factors regarding college students' personal background and learning experiences on different types of learning outcomes they achieve. For instance, such students' personal background factors include gender, race, socioeconomic background, learning motivation, academic preparation level before entering college, and college and major selection, family education background, and financial aid, (Kuh et al., 2006; Choi & Lee, 2009), and Kuh et al.(2006) argued that such factors interact in a complex manner and bring out various learning outcomes. Another study stated among the individual-level variables of university students, students' majors showed a statistically weak but significant difference in the ability to collect, analyze, and utilize information corresponding to the cognitive capacity, and among the admission types, students who took the college entrance exam showed higher perceptions of information collection, analysis, utilization, and alternative suggestion and problem-solving ability (Park, 2020). By examining and understanding the effect of personal background on students' learning outcomes, universities can provide educational programs and services for student success that may apply regardless of learning context students are faced with such as in a non-face-to-face learning environment.

Learning experiences refer to academic experiences within the curriculum and social experiences outside the curriculum that are theoretically or empirically linked to university learning outcomes including cognitive, emotional, and psychological growth (Astin, 1993; Choi & Lee, 2009). This can be divided into two categories, student academic engagement and social engagement, and it is closely related to the amount of time students spend on learning and on-campus educational activities and how the university structures its curriculum, education programs, and student support services to make efficient use of its resources (Kuh et al. 2006).

Student academic engagement, including active class participation and learning, and thinking activities during the learning experience, is a major factor that affects university learning outcomes and has been discussed in detail. Hong and Ryu (2020) categorized student academic engagement factors that affect learning outcomes in face-to-face and non-face-to-face educational environments divided by COVID-19 into meaningful learning, self-directed learning, and collaborative learning, and presented research results that meaningful learning, which involves active thinking and utilization of what is learned. This has the greatest effect on learning outcomes such as communication skills, specific major competence, and core competence. Moreover, various studies have shown that cognitive performance increases when students are given the opportunity to perform challenging tasks in class that develop critical thinking, apply what they have learned, or engage in active or collaborative learning (Mayhew et al., 2016). While the types of academic engagement that affect learning outcomes in face-to-face and virtual learning environments vary, one can learn which academic engagement factors to emphasize or complement in students and teaching and learning in universities.

Another learning experience factor is students' social engagement in colleges, which includes interactions with other students, club activities, and student-professor interactions. Pascarella and Terenzini (2005) found that students' social engagement, such as participating in group studies and extracurricular activities, extends the academic knowledge acquired in class by interacting with other students and provides opportunities to encounter different values, interests, and cultures, resulting in cognitive outcomes such as critical thinking and analytical skills. Moreover, student-professor interactions have been widely discussed in relation to learning outcomes. It has been shown that these interactions that include discussion of topics and collection of feedback directly or indirectly affect students' learning processes and academic achievements such as cognitive performance and knowledge development (Kuh et al., 2006; Pascarella & Terenzini, 2005; Choi & Shin, 2010). It is worth noting the difference of the effect of such social engagement on learning outcome in different learning settings as interaction between peers and professors was relatively hindered during the pandemic.

Cognitive outcome of university students (Knowledge acquisition, cognitive capacity)

Learning outcomes in university education are generally divided into cognitive and non-cognitive domains, and due to a growing awareness of underdevelopment of higher-order cognitive skills among university students and to help the students develop the cognitive skills needed to deal with the diverse issues, domestic and foreign universities have been conducting various studies to identify effective factors based on student learning outcomes and develop the direction of university and teaching and learning accordingly (Mayhew et al., 2016). Cognitive performance can be categorized into high order thinking skills, which include knowledge in specific majors and liberal arts, logical and critical thinking skills, problem-solving skills, analytical skills, and communication skills. Professors' motivation in class, effective lectures that provide sufficient learning materials, students' active participation in classes, cooperative learning, and interaction with campus community members are positively associated with cognitive performance (Choi & Lee, 2009; Seo, 2003).

Acquisition of knowledge in majors and liberal arts is considered one of important cognitive outcomes, and in particular, Ko et al. (2011) referred to knowledge acquisition as "knowledge growth" and stated that it is an increase in knowledge about specific majors, social issues, and liberal arts. Such knowledge is acquired with various on-campus learning experiences that students engage in, and studies have shown that in-class and out-of-class interactions with professors as well as students' active classroom participation and in-class activities such as knowledge comprehension, application of knowledge, and problem solving, have a positive effect on the increase in major and liberal arts knowledge (Koh et al., 2011; Choi & Shin, 2010).

Cognitive capacity is another cognitive learning outcome that is recognized as crucial. Kuh et al (2006) argued that the development of cognitive competence, which is the logical and critical reflection of an individual's thinking activities through independent judgment, is one of the most important elements of higher education outcomes. The extent of cognitive development is determined by the quality of effort students put in their individual learning experiences and their psychological and social engagement within the university including active participation in intellectual and cultural activities, and creating a culture that emphasizes learning in various settings at the university level has been shown to be beneficial to the development of general cognitive competence (Astin, 1984; Pascarella & Terenzini, 1991, Yu, 2014). Each study utilized various factors for learning outcomes, and this study focused on knowledge acquisition and cognitive competence among cognitive outcomes as dependent variables to study the impact of learning experiences on them in a non-face-to-face classroom environment during the COVID-19 crisis.

METHODS

Sampling and Data Collection

In conjunction with the National Assessment of Student Engagement in Learning (NASEL) survey, which is conducted annually by the Korea Educational Development Institute (KEDI) to support policies to improve the quality of education in South Korea's higher education system and at the university level. This study uses a sample of a large private university in Seoul (*A University*) that participated in the 2021 survey. The survey was conducted over a six-week period from June 14 to July 30, 2021, through an online system provided by the Korea Educational Development Institute, and 2,246 responses from *A University* were used for the analysis, of which 2,177 were identified by college and department. In terms of respondents' characteristics, 863 (39.6%) were male and 1,314 (60.4%) were female, and 558 (25.6%) were first-year students, 437 (20.1%) were second-years, 565 (26.0%) were third-years, 548 (25.2%) were fourth-years, and 69 (3.2%) were graduate students. By major, 726 (33.3%) were engineering majors, followed by 615 (28.2%) in social sciences, 304 (14.0%) in natural sciences, 259 (11.9%) in humanities, 157 (7.2%) in arts and physical education, 78 (3.6%) in education, and 38 (1.7%) in medicine.

Measurement Tools

Dependent Variable

The main dependent variables in this study are knowledge acquisition and cognitive capacity, which are the outcomes of student learning in universities. Knowledge acquisition refers to the knowledge and skills necessary for the major and the world of work that students are expected to acquire through undergraduate education and is measured by a single question. Cognitive capacity was measured by the mean of four items including critical thinking, creativity/integration, problem solving, and liberal arts knowledge. (Cronbach's $\alpha = .826$). All items were measured on a 4-point Likert scale.

Independent Variables

Personal background factors included gender (male=0, female=1), major (engineering (reference group), humanities, social sciences, education, natural sciences, arts and physical education, medicine), and year (first year=1 to fifth year and above=5), and learning experience was divided into academic engagement and social engagement variables. In the academic engagement variable group, active class participation refers to participation in answering questions, asking questions, and participating in discussions (3 items, Cronbach's $\alpha = .735$), class behavior refers to falling asleep or being distracted in class (2 items (reverse scored items), Cronbach's $\alpha = .857$), cooperative learning experience refers to discussing class content with peers, helping with test preparation (3 items, Cronbach's $\alpha = .848$), thinking activities includes connecting concepts learned in other classes and doing critical reviews (3 items, Cronbach's $\alpha = .870$), active learning experiences includes exploring new ideas and seeking feedback (5 items, Cronbach's $\alpha = .840$), and challenging learning experiences includes applying class material to real-world situations, including diverse perspectives, and understanding the opinions of others (13 items, Cronbach's $\alpha = .904$). Social engagement variables include interacting with students from diverse backgrounds (6 items, Cronbach's $\alpha = .860$), being involved in club activities (4 items, Cronbach's $\alpha = .703$), participating in group study activities (3 items, Cronbach's $\alpha = .847$), interacting with professors (6 items, Cronbach's $\alpha = .874$), and interacting with campus community members (4 items, Cronbach's $\alpha = .838$).

Analysis method

In this study, a hierarchical regression analysis was conducted to explore the factors affecting knowledge acquisition and cognitive capacity of university students in a non-face-to-face educational environment in terms of personal background and learning experience. In this study, learning experience was divided into academic engagement and social engagement variables. Personal background variables, academic engagement variables, and social engagement variables were entered into each regression model with knowledge acquisition and cognitive capacity as the dependent variables in a stepwise regression. In this process, the Durbin-Watson statistic was checked to determine whether the residuals were independent, and the closer the Durbin-Watson statistic is to 2, the more likely it is that the assumption of independence of the residuals is satisfied and there is no autocorrelation.

Model 1: constant, personal background variable

Model 2: constant, personal background variable, academic engagement variable

Model 3: constant, personal background variable, academic engagement variable, social engagement variable

RESULTS

Descriptive statistics

Based on the data collected from 2,177 participants, the descriptive statistics of the variables in this study are shown in Table 1.

Table 1: Descriptive statistics

Variable	Mean	Standard deviation	Skewness	Kurtosis	Notes
Gender	0.604	0.489	-0.424	-1.822	male 0, female 1
Year	2.602	1.203	0.026	-1.216	Year 1-5 or higher (in the case of department of medicine or others)
Major	3.433	1.666	0.350	-0.572	1=humanities, 2=social science, 3=engineering, 4=natural science, 5=medicine, 6=arts and physical education
Active class participation	2.236	0.806	0.243	-0.690	Likert four-point scale
Classroom behavior	2.781	0.813	-0.436	-0.384	Likert four-point scale, reversed score item
Cooperative learning	2.190	0.885	0.329	-0.841	Likert four-point scale
Thinking activities	2.582	0.757	0.009	-0.466	Likert four-point scale
Active learning	2.467	0.724	0.132	-0.450	Likert four-point scale
Challenging learning	2.615	0.596	-0.078	-0.028	Likert four-point scale
Interaction with students from different backgrounds	2.083	0.753	0.407	-0.463	Likert four-point scale
Club activities	1.663	0.678	1.095	0.799	Likert four-point scale
Group study activities	1.730	0.791	0.973	0.170	Likert four-point scale
Student-faculty interaction	1.575	0.588	1.382	2.143	Likert four-point scale
Student-campus community member interaction	1.989	0.803	0.310	-0.844	Likert four-point scale
Knowledge acquisition	2.720	0.878	-0.196	-0.682	Likert four-point scale
Cognitive capacity	2.833	0.528	-0.253	0.918	Likert four-point scale

Regression Analysis on knowledge acquisition

The hierarchical regression model with knowledge acquisition as the dependent variable was statistically significant for all three models. The explanatory power of the regression model was low at 0.042 (R^2) when the personal background variable was included in Model 1, but the change in R^2 was 0.157 when the academic engagement variable was included in Model 2, and the change in R^2 was 0.012 when the social engagement variable was included in Model 3. The independent variables in the final model were estimated to explain approximately 21% of the variance in knowledge acquisition as a learning outcome.

Table 2: Summary of hierarchical regression analysis model on knowledge acquisition

Model	R	R^2	Adjusted R^2	R^2 change	F change
1	.206	0.042	0.039	0.042	12.011***
2	.446	0.199	0.194	0.157	70.458***

3	.459	0.211	0.204	0.012	6.425***

*Durbin-Watson = 2.049, ** $p < .01$, *** $p < .001$*

To summarize the results of the regression analysis with knowledge acquisition as the dependent variable, in the final Model 3, the perceived knowledge acquisition of humanities major was lower than that of engineering major, while that of medicine and arts and physical education major was higher. In addition, higher year, positive class attitudes, and challenging learning experiences had a positive effect on knowledge acquisition, and interactions with professors as well as interactions with other members of the campus community had a positive effect on learners' knowledge acquisition. On the other hand, when the learning experience variables were introduced and personal background was controlled, the effects of major and year variables on learners' knowledge acquisition were significant. The variable with the largest relative impact on learners' knowledge acquisition was challenging learning experience ($\beta = .231$).

Table 3: Results of hierarchical regression analysis model on knowledge acquisition

Independent variable	Model 1		Model 2		Model 3	
	<i>b</i>	β	<i>b</i>	β	<i>b</i>	β
(constant)	2.388		0.706		0.587	
Humanities	-0.167	-0.062**	-0.242	-0.089***	-0.250	-0.092***
Social Sciences	0.049	0.025	0.052	0.026	0.047	0.024
Education	0.038	0.008	-0.016	-0.003	-0.016	-0.003
Natural Sciences	0.031	0.012	0.010	0.004	-0.007	-0.003
Medicine	0.380	0.057**	0.297	0.044*	0.319	0.048*
Arts and physical education	0.262	0.077***	0.193	0.057**	0.172	0.051*
Gender	-0.005	-0.003	0.026	0.015	0.037	0.021
Year	0.119	0.163***	0.111	0.152***	0.108	0.149***
Active class participation			0.034	0.032	0.015	0.014
Classroom behavior			0.093	0.086***	0.088	0.081***
Cooperative learning			0.050	0.050*	0.003	0.003
Thinking activities			0.061	0.053	0.064	0.055
Active learning			0.065	0.054	0.050	0.041
Challenging learning			0.360	0.244***	0.340	0.231***
Interaction with students from different backgrounds					0.049	0.042
Club activities					-0.026	-0.020
Group study activities					-0.015	-0.013
Student-faculty interaction					0.127	0.085***
Student-campus community member interaction					0.068	0.062*

* $p < .05$. ** $p < .01$, *** $p < .001$

Regression Analysis on cognitive capacity

All three hierarchical regression models with cognitive capacity as the dependent variable were statistically significant. The explanatory power of the regression model was very low at 0.017 (R^2) when the personal background variable was included in Model 1, but the R^2 change increased to 0.251 when the academic engagement variable was included in Model 2, and the R^2 change increased to 0.031 when the social engagement variable was included in Model 3. The independent variables included in the final model were estimated to explain approximately 30% of the variance in learning outcomes.

Table 4: Summary of hierarchical regression analysis model on cognitive capacity

Model	R	R^2	Adjusted R^2	R^2 change	F change
1	.130	0.017	0.013	0.017	4.659***
2	.518	0.268	0.264	0.251	123.779***
3	.547	0.299	0.293	0.031	18.873***

Durbin-Watson = 2.003, *** $p < .001$

To summarize the results of the regression analysis with cognitive capacity as the dependent variable, Model 3 shows that students in engineering major have higher perceived cognitive capacity than students in medicine, arts and physical education majors have higher perceived cognitive capacity than engineering majors, and male students have higher perceived cognitive capacity than female students, and that active class participation, classroom behavior, thinking activities, challenging learning experiences, interaction with students from different backgrounds, and interaction with campus community members have a positive effect on cognitive capacity. On the other hand, cooperative learning experiences were found to have a negative effect on students' perceived cognitive capacity. Meanwhile, when the learning experience variables were introduced and personal background was controlled, the effects of major and gender variables on students' perceived cognitive capacity were significant. The variable with the largest relative impact on students' perceived cognitive capacity was challenging learning experiences ($\beta = .276$).

Table 5: Results of hierarchical regression analysis model on cognitive capacity

Independent variable	Model 1		Model 2		Model 3	
	b	β	b	β	b	β
(constant)	2.812		1.572		1.452	
Humanities	0.154	0.094***	0.073	0.045*	0.050	0.031
Social Sciences	0.034	0.029	0.019	0.016	0.015	0.013
Education	0.019	0.007	-0.032	-0.011	-0.027	-0.009
Natural sciences	0.005	0.004	-0.008	-0.005	-0.025	-0.016
Medicine	-0.155	-0.038	-0.188	-0.047*	-0.169	-0.042*
Arts and physical education	0.179	0.088***	0.112	0.055**	0.112	0.055**
Gender	-0.076	-0.070***	-0.046	-0.043*	-0.049	-0.046*
Year	0.011	0.024	0.004	0.009	-0.002	-0.006
Active class participation			0.055	0.084***	0.042	0.064**
Classroom behavior			0.049	0.075***	0.048	0.074***
Cooperative learning			-0.003	-0.006	-0.054	-0.090***

Thinking activities			0.082	0.118***	0.083	0.119***
Active learning			0.029	0.040	0.024	0.033
Challenging learning			0.278	0.313***	0.245	0.276***
Interaction with students from different backgrounds					0.081	0.116***
Club activities					0.025	0.032
Group study activities					0.005	0.007
Student-faculty interaction					0.027	0.030
Student-campus community member interaction					0.060	0.092***

* $p < .05$. ** $p < .01$, *** $p < .001$

DISCUSSION AND CONCLUSION

This study aimed to explore the factors affecting college students' cognitive performance (knowledge acquisition, cognitive capacity) in terms of personal background and learning experience in a non-face-to-face educational environment due to the closure of higher education institutions in midst of the coronavirus pandemic. The inevitable changes caused by the pandemic have forced universities to go through trial and error to adapt to the non-face-to-face educational environment, and this study is significant in that it is still important for universities to focus on students' educational experiences, changes, and growth and development in these circumstances.

According to the results of this study, the personal background variables affecting knowledge acquisition were major and year, where students in engineering major had a higher level of knowledge acquisition than humanities major, and medicine majors and arts and physical education major had a higher level of knowledge acquisition than engineering majors, and the higher the year, the higher the perceived level of knowledge acquisition. In terms of learning experience, positive classroom behavior, active and challenging learning experiences, interaction with professors, and interaction with classmates were found to have a positive effect on learners' knowledge acquisition. In terms of cognitive capacity, engineering majors tended to have higher cognitive capacity than medical majors, arts majors tended to have higher cognitive capacity than engineering majors, and male students tended to have higher cognitive capacity. In terms of learning experience, active class participation, positive class behavior, thinking activities, challenging learning experiences, interaction with students from different backgrounds, and interaction with campus community members were found to have a static effect on learners' cognitive capacity. On the other hand, collaborative learning experiences in the classroom had a negative effect on cognitive capacity.

These results suggest that universities need to explore methods and strategies to support students' educational experience, change, and growth and development as distance education has become a reality in higher education. In particular, needs for institutional support can be found in terms of effect of majors and the importance of learning experiences in a non-face-to-face context.

First, differences were found between majors in knowledge acquisition and cognitive performance, which can be linked to differences in learning experiences provided by different curricula of majors. This suggests that it is necessary to improve the cognitive performance of students by improving the composition of the curriculum in each major and the organization and operation of courses. However, this study did not analyze the differences in cognitive performance due to curriculum differences between majors, so we suggest the need for follow-up studies.

Second, as challenging learning experiences have the greatest effect on college students' knowledge acquisition and retention than other factors, this study suggests that instructors should provide challenging tasks that foster critical thinking related to the content of the course and allow students to present their results in class. In the case of tasks or educational activities that are difficult to perform alone, instructors should provide appropriate cooperative learning opportunities that are closely related to the content of the course, so that challenging learning experiences can be conducted in the context of cooperative learning.

However, it is worth noting that this study showed that cooperative learning has an adverse effect on cognitive capacity, which is contrary to the result of some previous studies (Park, 2007; Yu, 2014; Lee, 2013) that suggest that cooperative learning itself can foster communication, leadership, interpersonal skills, critical thinking, creative thinking, and problem-solving skills. This needs to be considered in the context of non-face-to-face learning due to COVID-19, where it was difficult to fully bring out the benefits of online learning without sufficient preparation (Jung et al., 2020; Hong & Ryu, 2020; Garriss. & Fleck, 2020), and it is possible that learners' collaborative self-efficacy may have lacked in this process, that quality collaborative learning experiences may not have been available in class, or that free-riding problems in the collaborative learning process may have led to different results from previous studies. However, as cooperative learning itself has a net function of enhancing college students' cooperative self-efficacy and ultimately increasing learning effectiveness (Park & Ko, 2016), it is necessary to explore new ways to enhance the effectiveness of academic-level cooperative learning experiences in a non-face-to-face context. For example, when using non-face-to-face educational media such as Zoom, it is possible to utilize the breakout room function to conduct group activities, and at the same time, use programs that can be accessed by a large number of people, such as Google Jamboard, to prevent free riding in the collaborative learning process. In other words, various teaching and learning methods that increase the cognitive performance of learners by expanding personal and collaborative challenging learning experiences in class need to be explored in the non-face-to-face context.

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Improving the Student's Oral Communication Performance through Technology-Based Tasks

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ABSTRACT

Technology has served well its purpose to education and continues to spark creativity and authenticity even in the oral language pedagogy. This study adopts the two-group pretest-posttest experimental design that aims to examine the effectiveness of technology-based tasks in improving the students' oral communication performance. The participants are two groups of 30 11th grade students in which three technology-based speaking tasks were administered to the experimental group and three traditional speaking tasks were given to the control group. The data needed for this investigation were gathered using two materials: the in-person question and answer (Q & A) activity from the Intermediate Speaking Test of Exams Reform Teacher Support Project (2005) and the Rubric for Assessing Oral Communication Skills (2016). To proceed then with the findings, mean, mean gain, Mann Whitney U Test, and Wilcoxon Signed Rank Test were employed.

KEYWORDS: Technology-based tasks, Oral communication performance, Oral language pedagogy

INTRODUCTION

A part of language learning is the acquisition of not only the writing skills but also the effective oral production using the target language. Despite its importance as also one of the 21st century skills, the students' oral communication was noted to have weakened especially in the secondary level. In an investigation conducted at the Temple University in 2018-2019 academic year, 46.2% of the course instructors rated their students "inconsistent" on their oral communication while the remaining lower percentages were credited to the other proficiency levels (Sapia et. al., 2020). This coincides to the case study conducted locally by Pontillas (2020) where it was revealed that 29% of the samples taken in Camarines Sur Polytechnic Colleges have "developing" level of oral proficiency, the highest percentage among the other levels. Despite of these findings which can be alarming, only few studies have explored the use of technology-based tasks as a potential tool in developing the students' oral communication skills and most of them are qualitative in design and some even rely more on the students' perception as a method of investigation (Levy & Gertler, 2015; Elmiana, 2019; & Andiappan et al., 2022).

STATEMENT OF THE PROBLEM

With the growing statistical reports on the poor oral communication performance of students especially in the secondary level in the recent years, the few literature addressing it, and the lack of authentic opportunities for speaking practice brought by some factors identified across studies such as the continuity of adopting the traditional teaching strategies (ex. memorized dialogues and drill-based tasks that are exam-structured), the limited interaction time, the large class size, and the students' anxiety (Meriem, 2013; Russell & Curtis, 2013; Yang & Chen, 2007; & Zhang & Akiman, 2007), the researchers aim to test the effectiveness of technology-based tasks in improving the students' oral communication performance. This study can address these gaps by suggesting some technology-based tasks that teachers may use to help improve the students' oral skills, and describing the merits and further potentials of technology as a creative and relevant means to expose students to authentic communication situations especially during this time of the Information Age. Consequently, teachers and other education stakeholders would be enlightened for future considerations.

RESEARCH QUESTIONS

This study aims to examine the effectiveness of technology-based tasks in improving the oral communication performance of the students. Specifically, it seeks to answer the following questions:

- 1) Is there a significant difference in the oral communication performance of the experimental group prior to and after accomplishing the technology-based tasks?
- 2) Is there a significant difference in the oral communication performance of the control group prior to and after accomplishing the traditional speaking tasks?
- 3) Is there a significant difference between the mean gain of the experimental group and the control group?
- 4) Which area of the oral communication performance responds most to the completion of the technology-based tasks?

FRAMEWORK OF THE STUDY

Basically, the notions on the process acquiring the second language skills are credited to Krashen's Theory of Second Language Acquisition (SLA). He explained that acquiring a second language requires a natural and meaningful interaction in the target language which happens with careful monitoring and correction, and that it must be done in a natural order in low anxiety situations (Schutz, 2019). This language learning theory together with the other interconnected theories on student-centered approaches and active learning such as Kolb's (1984) experiential learning theory, Vygotsky's (1980) sociocultural learning and social

constructivism, Dewey's (1997) discovery learning, and Rogers' (1969) humanistic education, paved the way on the demands to modify the learning experience including the environment, the way instructions are delivered, and the instructional tasks. And along these is the revolutionary development of modern technology and its potentials to satisfy those demands. According to Ouyang and Stanley (2014) in fact, this influenced the idea and the implementation of educational technology in the later years that results to the pioneering of the use of educational games, multimedia, and dynamic online interactions. Moreover, it entails the incorporation of the multimedia elements like text, graphics, audios, and videos to the method of instruction or task experience as a technique to actualize the so called "learning by doing" (Pavlicek & Nevrvivova, 2007). With this, an important contribution to the use of educational technology was made when Hughes (2000) was able to create the Replacement, Amplification, Transformation (RAT) framework, a recognized model for technology integration in the classroom (Read, 2022). In this study, technology is used for transformation since technology is integrated in the instructional tasks that also enables the recreation on the aspects of the instruction or learning in new and inventive ways.

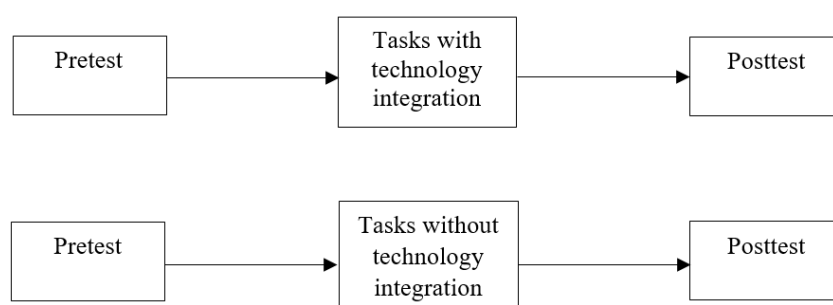


Figure 1: Framework of the Study

METHODOLOGY

Participants

The participants of the study are the two groups of 30 11th grade students of the University of San Agustin attending the Oral Communication class. Out of the many, two classes were selected as sample groups through the lottery technique and by tossing a coin, one of the two classes picked was considered as Class X (experimental group) and the other one was Class Z (control group). Students from the experimental group performed a series technology-based speaking tasks, whereas, students from the control group did a series of traditional speaking tasks. Participant selection of 30 students from each group was done through convenience sampling since only 30 students from each group were able to accomplish completely all the tasks in the entire experiment.

Table 1: Number of participants per group

Group	N
Class X (experimental)	30
Class Z (control)	30

Instruments and Data Analysis

The pretest and posttest used to assess the oral communication performance were in the form of an in-person question and answer (Q & A). There was a set of 20 general questions (ex. Which is your favorite place at home and why; Could you tell me about the job you would like to have in the future?) prepared which was adapted from the Intermediate Speaking Test of Exams Reform Teacher Support Project (2005).

The set of questions used in the pretest differed from the posttest but both sets were similarly structured and were constructed for the intermediate level of difficulty. Then to assess their oral communication performance through their answers on the question picked for each test, the Rubric for Assessing Oral Communication Skills (2016) was used. The researcher saw it as an appropriate tool for scoring due to its standardization and validity—the inclusion of the subskills or areas on oral communication that learners must actualize or achieve and the specificity of the performance descriptors for each level of achievement with zero being the lowest and three being the highest for each of the three criteria (subskills or area). To ensure objective and reliable scoring, two raters with at least four years in teaching Oral Communication were requested to evaluate all speaking performances.

Class X as the experimental group were assigned to perform technology-based speaking activities (vlog, video podcast, and talk show) throughout the quarter as a strategy to help improve their oral communication performance. Before doing each of the technology-based tasks, however, participants were given an orientation by the teacher on how to come up with the particular output. The definition, characteristic features/elements, formats, roles, suggested editing tools, etc. were included. The tasks also allowed them to demonstrate their creativity and talent in digital design and their learnings from “Media & Information Literacy” and “Empowerment Technologies” subjects as they manipulated tools for recording and integrated original or stock images, animations, music, and footages to the raw clips. Class Z as the control group were given the traditional speaking tasks (drills on exchanging dialogues, memorized speech, and character impersonation). Each task completed by both groups was evaluated using rubrics to monitor student progress. A feedback session was conducted from time-to-time to communicate the strengths and weaknesses demonstrated on the specific task and provide suggestions for improvement.

The scores gathered in the pretest and posttest of the experimental group and the control group were considered as the data that were analyzed using the following statistical treatments:

Mean. This determines the average scores in the pretest and posttest of the experimental group and control group for description of score results.

Mean gain. This identifies how much mean score is gained by the group in the posttest compare to the pretest.

Mann Whitney U Test. This is a non-parametric test to determine if there is a significant difference on the two independent samples and if they are equal or not.

Wilcoxon Signed Rank Test. This non-parametric test compares the difference between two samples which are correlated or dependent.

RESULTS

Table 2: Difference in the oral communication performance of the experimental group prior to and after accomplishing the technology-based tasks

		N	Mean Rank	Z	p-value	Interpretation
PostAveE PreAveEx	- Negative Ranks	0 ^a	.00	-4.814	.000	Significant
	Positive Ranks	30 ^b	15.50			
	Ties	0 ^c				
	Total	30				

Table 2 shows that there is significant difference in the oral communication performance of the experimental group prior to and after immersing in the technology-based tasks ($Z=-4.814$, $p=0.000$). The probabilities of 0.000 is lesser than the level of significance which is 0.05. Therefore, the null hypothesis must be rejected. The oral communication performance of the students significantly improved after accomplishing the technology-based tasks.

Table 3: Difference in the oral communication performance of the control group prior to and after accomplishing the traditional speaking tasks

		N	Mean Rank	Z	p-value	Interpretation
PostAveE	- Negative Ranks	7 ^a	8.00	-1.807	.071	Not significant
PreAveEx	Positive Ranks	10 ^b	11.78			
	Ties	13 ^c				
	Total	30				

Table 3 indicates that there is no significant difference in the oral communication performance of the control group prior to and after accomplishing the traditional speaking tasks ($Z=-1.807$, $p=0.071$). The probabilities of 0.071 is greater than the level of significance which is 0.05. Therefore, the null hypothesis must not be rejected. The oral communication performance of the students did not improve significantly after completing the traditional speaking tasks.

Table 4: Difference between the mean gain of the experimental group and the control group

	Group	N	Mean Rank	U	p-value	Interpretation
Mean Gain	Experimental	30	37.95	226.500	.001	Significant
	Control	30	23.05			
	Total	60				

Table 4 shows that there is significant difference between the mean gain of the experimental group and the control group ($U=226.500$, $P=0.001$). The probabilities of 0.001 is lesser than the level of significance which is 0.05. Therefore, the null hypothesis must be rejected. The mean gain between the experimental group and the control group prior to and after accomplishing the speaking tasks significantly varies in favor to the experimental group.

Table 5: Descriptive values on the areas of oral communication performance prior to after completing the technology-based tasks (experimental group)

Area	Pretest Mean	Descriptive Equivalent	Posttest Mean	Descriptive Equivalent	Mean Gain
Fluency	1.72		2.48		0.76
Clarity	1.58		2.27		0.69
Sensitivity	2.60		2.78		0.18
Overall Performance Score	5.90	Very Good	7.53	Excellent	1.63
0-1.8 - Poor 1.81- 3.6- Fair 3.61 – 5.4- Good 5.41 – 7.2- Very Good 7.21 -9 – Excellent					

Table 5 shows that fluency has the highest mean gain of 0.76 among other areas (0.69, 0.18). Hence, the area of oral communication performance that responds most to the completion of the technology-based tasks is fluency.

DISCUSSIONS

First, a meaningful improvement was observed in the students' oral communication performance in the target language after they immersed in technology-based speaking tasks. This coincides to the few similar studies done in the recent years. On the investigation of Lord (2008) for instance, a collaborative podcasting project on a foreign language was created by undergraduate students and it was identified that both attitude and pronunciation improved compared to their performance before the project. One benefit seen is the completion of such instructional activity which allowed the students to create speech recordings in which students can review them for monitoring and thus apply corrections for improvement repeatedly until they think certain competencies such as correct intonations and pronunciations are achieved. On the other hand, in a study of Elmiana (2019) on the use of radio talk show program as an intervention to improve the speaking skills, it was found out the mean scores of the learners from the first to the third phase rose significantly. However, their skills in grammar, vocabulary, accent have slight difference rather than fluency and comprehension that inclined significantly. Such integration of technology to the tasks as a strategy to aid the oral communication practice can be traced back to a combination of early theories on language learning and educational psychology such as the second language acquisition, experiential learning, discovery learning, social constructivism and humanistic education until Hughes' (2000) were able to establish a model on how to effectively integrate technology to the pedagogy and its assessment if the integration is successful or not.

Second, this study revealed that unlike the former group, no significant improvement was observed in the oral communication performance of those students who completed the traditional speaking tasks. In fact, only very few of them had their performance improved during the posttest and many either showed no changes or got lower scores. Despite the similar results seen in the investigation done by Kallinikou & Nicolaidou (2019), traditional speaking tasks such as drill on exchanging dialogues, memorized speech, and character impersonation are still considered meaningful and are identified to give students avenues to enhance aspects of verbal delivery such as pronunciation, intonation, and voice modulation. This strategy of language skills development is a part of the audio-lingual method of teaching and is based on the concepts of the behavioral theory where oral language improvement is done through imitation and practice (Hulit et al., 2011).

Third, it was observed that the oral communication performance of the experimental group varies significantly compared to the control group, that is, a notable improvement was seen in the mean gain of the former than the latter. Similar studies agree that many considerations have to be looked into as to why some students are adept in communicating and others are not. According to Pangket (2019), the teaching strategies used especially during the student's formative years can affect their performance in oral language. The significant improvement identified in the experimental group can be linked to the role of technology in learning. Corpuz and Lucido (2015) explained that technology integration is the use of technology to introduce, reinforce, supplement, and extend skills. In language skills enhancement for instance, technology integration can be used as an instructional strategy by allowing the learners to accomplish instructional tasks that require them to practice the target skills while applying their creativity and pre-existing knowledge on manipulating the multimedia tools. During the completion of the tasks, they are able to reconstruct their knowledge as they learn new things on their own especially during the preparation and practice stages. Furthermore, Thao (2003) in his study, claimed that technology integration in the speaking practice is one of the changes on how languages are taught in schools which centers on the use of language communication rather than just passing the examination. Similarly, Dikilitas and Duvenci (2009) agreed that educators have tended to resort to the multimedia materials as an agent for activating the oral skills that

may be inactive in mind because of the limited topics to be talked about and the discovery of other student potentials for holistic development such as creativity and innovativeness. For instance, Kallinikou & Nicolaidou (2019) used digital storytelling as an avenue to let students practice their speaking skills and results show that higher scores were noted on the post-intervention of the experimental group than of the control group though the latter also improved but not as high as the former. Positive attitudes were also documented from the experimental group and may be attributed to the activities targeted to practicing their oral speech and the learning experience that was personalized and self-directed.

Lastly, a closer look on this study reveals that fluency has the biggest improvement or is the most responsive to the completion of the technology-based tasks among all other areas. Fluency, a subskill in oral communication, encompasses the use of clear and engaging language (grammar and vocabulary) and smooth delivery (verbal and nonverbal) of the message. Clarity, meanwhile refers to the accurate and ease transmission and reception of the idea being communicated. It comprises an understanding of the communication purpose and a presentation of a clearly organized set of ideas. Sensitivity, on the other hand is the awareness of the target audience's background manifested through the inclusion of appropriate ethical communication strategies. The assessment of the oral communication performance in terms of these areas is based on Holbrook's (1983) criteria on oral language competence. According to him, oral language competence is fundamentally acquired through a natural process but the development of the subskills depends on the exposure to the target language with the guidance of an expert.

With this comes the instructional activities that can elicit such exposure to the target language. Technology-based speaking activities are basically the answers to the demand to make the communication experience more meaningful and relevant especially that communication and technology are highly demanded skills in the 21st century. With the technology-based tasks as used in this study, students can talk freely about relevant topics and because of human creativity, the art of vlogging for example, keeps innovating as it can feature games, personal life dramas, pranks, social experiments, and travel experiences or could be informational or educational too like cooking sessions and do-it-yourself tutorials. An advantage of such activities if adapted to the classroom is the richness of expressing their ideas by using varied nonverbal cues along with oral production. They can be in their true self when explaining things without referring to note cards and this lessens their attempt to memorize lines. This might explain why fluency is noted to have the biggest improvement compared to clarity since the nature of vlog making has less emphasis on manuscript. According to Nurviyanti & Rahayu (2018), vlogging gives students opportunity to develop more their verbal and nonverbal skills in expressing their personal ideas or even in storytelling using the target language. On the other hand, video podcast activity likewise serves an opportunity for the students to immerse in a real world communication situation where they can showcase their skills in asking and responding to questions, vocabulary, and verbal (intonations, pronunciations, etc.) and nonverbal (posture, facial expressions, etc.) delivery. Several scholars like Rosell-Aguilar (2007), Chan et al. (2011), and Jain and Hashmi (2013) pointed out that podcast activity for secondary language learning is highly interactive and collaborative among students. Additionally, this type of task favors the development of their social function as it raises self-representation, information exchange, and social networking. As another learning activity on the other hand, a recorded talk show also enables the students to become fluent in oral production but it is more on combining skills in listening, speaking, reading, writing, and role-playing, a good task to promote holistic development. Participants get to write and read collaboratively the cues during the preparation stage; listen and talk a lot with consciousness on comprehension and delivery components as they feed one another a lot of questions, facts, and opinions; participate evenly according to their portrayed roles; and be interested in speaking especially if the topic is relatable, and therefore, there would be an urge for contribution. Accordingly, this would allow students to enhance their organization skills and awareness to the topics being discussed. Another benefit of administering this task is to help students impart their insights or perspectives to certain societal issues like in the environment, health, education, economics, governance, and law, thus, raising their awareness and sensitivity to these matters. This way the teacher can help the students understand their cultural roles and functions as part of the society (Nafisya, 2017). This could be

a basis for the improvement seen on sensitivity as an area of the oral communication performance in which students were able to tackle the topics with the inclusion of appropriate ethical verbal and nonverbal strategies in consideration to the sensitive issues and the background of the audience.

CONCLUSIONS AND RECOMMENDATIONS

The following are the conclusions drawn from the study:

- 1) Oral communication is undeniably a life skill set and is deemed essential to cope with the fast-changing world. For this reason, education and language scholars have become so emphatic on the necessity of developing the oral skills and since communication and technology goes together and both are undeniably the highly demanded skills in the 21st century, attempts were made to modify the learning experience that involve the application of both skills.
- 2) As an example of technology integration in the classroom, technology-based speaking tasks could be used not only as a replacement to the usual activities done in the classroom but as a transformative tool that would allow the learners to have relevant opportunities for oral communication practice while learning new things along the way, thus, modifying or correcting their existing knowledge as they complete the tasks with the guidance of the teacher.
- 3) Technology-based tasks such as vlog, video podcast, and talk show help improve the oral communication performance of the learners.
- 4) Fluency is identified to have the biggest improvement among the other subskills or areas (clarity and sensitivity) after the learners immersed in the technology-based tasks.
- 5) Though traditional speaking tasks is seen to elicit less improvement on the oral communication performance compare to the technology-based activities, it is regarded to be still relevant for the development of other areas such as voice projection, intonation, and pronunciation.

The following are the recommendations of the researchers:

- 1) Language teachers need to put emphasis on communication since it is an essential skill set during this time of the Information Age. This is to be done by determining gaps first through conducting speaking tests on the learners and also personal interviews or surveys on the potential factors that can affect their oral language proficiency. They are suggested as well to re-examine the teaching strategies they are using and try exploring the use of technology-based activities since technology is now a part of the 21st century culture. Such tasks favor the experience on real communication contexts while being inclusive despite the social and cultural diversities and encourages self-involvement on the relevant societal issues. Furthermore, it would likewise help if the teachers will also take time to conduct further literature review on the integration of technology to language teaching and learning for a consideration of other strategies and techniques to better assist the students in addressing their communication deficiencies.
- 2) School administrators are highly recommended to recheck the facilities of the classrooms, and speech and computer laboratories which also include the equipment necessary for language instruction and communication skills practice. They should consider likewise conducting performance evaluations on language teachers and organize trainings and workshops on the use of technology and its integration in the language classrooms.
- 3) Language curriculum writers may regard this study as one of the bases to assess the current language curriculum and evaluate materials such as textbooks, study guides, and modules.
- 4) Since learning extends beyond the four walls of the classroom, as the “second teacher”, parents are suggested to provide a safe and conducive environment for learning at home and support their child by providing, if possible, some tools and resources such as computer or mobile device, Internet access, headset, and microphone to better assist oral language learning and skills practice.

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The Development of Problem Solving and Creative Skills of Science Education Graduate Students using STEM Education Approach in Flooding Warning Unit

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ABSTRACT

The purpose of this research was to enhance the problem-solving promote and promote the creative skills of science education graduate program students. Practical action research was conducted with 10 participants who were science education graduate students and teachers in schools. The research followed a spiral procedure consisting of four steps: planning, acting, observing, and reflecting. The research instruments used in this study included a STEM education lesson plan on the topic of flooding, a self-evaluation form for problem-solving and creative skills, and an assessment form for problem-solving and creative skills specifically related to the creation of flood warning systems. the Index of Content Validity for the lesson plan, a self-evaluation form for problem-solving and creative skills and an assessment form for problem-solving and creative skills specifically related to the creation of flood warning systems, validating that it surpasses the threshold of 0.60. Both qualitative and quantitative data collection methods were employed. The results, the participants' self -assessment shown they uncertainty regarding their problem-solving skills suggests that they were not confident in their abilities to effectively tackle problem-solving tasks and unsure about their confidence in creating a flood warning system model. They relied on a manual or other external resources for guidance during the development. Flood warning system creation model for problem solving and creativity skills assessment after class, they had the potential to foster highly conceptual and meaningful learning experiences for developing Flood warning system creation model. Additionally, they successfully applied the STEM education approach to other situations, such as earthquake and storm warning.

KEYWORDS: STEM education, Problem solving and Creative skills

INTRODUCTION

Thailand has long had a commitment to promote the development of its science, technology, engineering, and mathematics (STEM) education sector as a fundamental element of national economic development strategies. STEM education in Thailand has been adopted in the schools since 2013. (Suriyabutr and Williams, 2021) The Ministry of Education launched a comprehensive STEM curriculum in 2016 to ensure that all students, from primary school through to university, receive an adequate education in science, technology, engineering, and mathematics. The Thai government is investing heavily in STEM education in order to equip teachers with the necessary capabilities to equip their students with the necessary skills to prepare them for the future. (Office of the Education Council in Thailand, 2017) It has developed a comprehensive curriculum that covers the core concepts of science, technology, engineering, and math (STEM). However, Thai teachers are often not adequately prepared to teach STEM. Teaching science, technology, engineering, and math requires a deep understanding of the infrastructure, methodology, and concepts involved. Most teachers are largely unfamiliar with the content, lack the resources to effectively teach it, and may have difficulty engaging students in the topics. Furthermore, the curriculum is often not properly aligned with society's economic needs, which limits the effectiveness of STEM learning. Additionally, many teachers may not have the technical knowledge needed to teach STEM topics, as well as the interpersonal skills needed to build meaningful collaborations between students and instructors. As a result, they may not be confident in their abilities to teach the topics and be limited in their knowledge about contemporary advancements in STEM. Additionally, there is a need for more professional development opportunities and training. Therefore, we should prepare teachers for teaching STEM. This can be done by providing them with the knowledge and skills needed to teach all aspects of STEM so that they can create interest and enthusiasm in the topics and develop their students' skills. Teachers should also be able to use technology, such as simulations, online materials, and interactive activities, to help students better understand and apply STEM principles. Furthermore, teachers should be able to help their students collaborate and work in teams to solve complex problems, as well as think creatively and innovatively. By doing this, in-service teachers can help create an environment in which their students can develop the necessary skills to prepare them for the future.

Enhancing students' problem-solving skills and critical thinking while tackling real-life problems remains a critical aspect of problem-based STEM education. (Topsakal, et. al. 2022). Topsakal Yalcin and Cakir (2022) investigated the impact of problem-based STEM activities on the development of critical thinking tendencies and problem-solving skill perceptions among middle school students in Turkey and their findings indicated that the problem-based STEM activities yielded a favorable impact on the perceptions concerning their problem-solving skills.

KidBright is a tool used to teach and promote STEM education in the classroom. It is an open source, block-based coding platform used to teach kids about STEM in a fun and interactive environment. It is a visual coding language, allowing students to create their own projects. Additionally, with its great educational content, it can help kids understand more complex coding concepts and develop problem solving skills. KidBright is also designed for multiple grade levels, from elementary school up to high school, which makes it a great tool to teach coding in a variety of settings. Furthermore, it can be used to bridge the gap between coding and real-world applications, such as flooding warnings, which can help students understand the importance of coding in our society. For example, students can program a weather station to sound an alarm whenever a flooding alert is issued. Additionally, students can use KidBright to program a robotic water level monitor to measure changes in water levels and display information about these changes in real time. By utilizing projects like this, students can learn coding concepts while also understanding the role of data and technology in flooding warnings.

From the above reason, we developed the STEM Education Approach in Flooding Warning Unit activities to enhance students' problem-solving skills and creativity skills in flooding prevention.

OBJECTIVES

1. To compare pre and post the problem-solving skills of science education graduate program students in Flooding Warning Unit activities.
2. To promote the creative skills of science education graduate program students in Flooding Warning Unit activities.

RESEARCH METHOD AND INSTRUMENT

Research method

The purposive sampling used in this practical action research. 10 participants who were in-service science teachers and science education graduate students. All participants were in the study with their consent. The procedure was a spiral following four steps 1) planning 2) acting 3) observing and 4) reflecting:

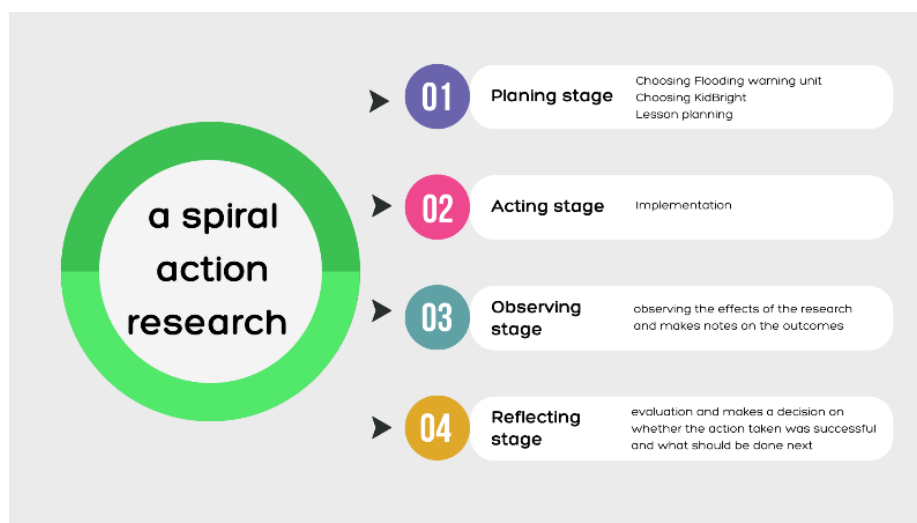


Figure 1: a spiral action research of this study

1) Planning stage

- Identify and limiting the topic.
 - Define the scope: Clearly define the specific aspect of flooding content.
 - Set learning objectives: Determine the educational goals of flooding lesson plan.
 - Determine content depth: Decide on the depth of flooding content and flooding warning system for designing the lesson plan.
- Developing flooding warning lesson plans, a self-evaluation form for problem-solving and creative skills and a Flood warning system creation model assessment form

The researchers were responsible for developing the lesson plan, problem-solving and creativity evaluation form. The expertise of faculty members specializing in science education and computing science (2 science educators and 1 computing science) teachers was utilized to ensure the content validity. They conducted assessments of the Index of Content Validity for the lesson plan, a self-evaluation form for problem-solving and creative skills and a flood warning system creation model assessment form, validating that it surpasses the threshold of 0.60.

Flooding Warning Unit activities Lesson Plan

Session	Activities	STEM discipline
Session 1: Pre-test and Introduction (60 minutes)	- 20 minutes for pre-test - Flooding situation and statistic in Thailand *Inquiry (Exploring flooding situation) *Discussion	Science: Flooding problems Technology: Using internet to explore flooding situation and statistic. Math: Information organization
Session 2: Flooding (120 minutes)	- Definition of Flooding - Type of Flooding - The factors that contribute to flooding *Winding application for forecasting - The effect of flooding on the environment and human life *Critical review of daily life	Science: Flooding information Technology: Using winding application for forecasting Math: Evaluation
Session 3: Flooding warning (180 minutes)	- How to use KidBright *Demonstration and practice - A virtual flood warning system by KidBright *Demonstration and practice	Science: Scientific method Technology: Using KidBright and KidBright application, Line application Math: Calculation Engineering: Designing and building A virtual flood warning system
Session 4: Post-test (120 minutes)	- Flood warning system creation problem solving and creative skills assessment	Science: Flooding information and Scientific method Technology: Using KidBright and KidBright application Math: Calculation Engineering: Designing and building A virtual flood warning system

- Preparing the equipment for a class (Windy application, KidBright and sensor monitoring).



Figure 2: Preparing the equipment for a class

2) Acting stage

The acting stage involves implementing planned interventions or actions based on the insights gained from the previous stages. During this stage, researchers actively apply the proposed strategies or changes to address the identified problem or improve the situation. We monitor the effects of participant actions in problem-solving and creative thinking, gather data, and assess the outcomes to inform further iterations of the action research process. This stage emphasizes taking proactive steps to bring about desired changes and evaluating the effectiveness of the implemented actions.



Figure 3 – 4: Implementation

3) Observing stage

The observing stage of action research entails actively gathering data and systematically observing the phenomena or processes under investigation. It involves careful and objective observation of events, behaviors, or occurrences related to the research question or problem.



Figure 5: Observation

4) Reflecting stage

The reflecting stage of action research involves reviewing and analyzing the data collected, as well as reflecting on the outcomes and experiences of the research process.

Instruments

- 1) Flooding warning lesson plans
- 2) A self-evaluation form for problem-solving and creative skills
- 3) Flood warning system creation model assessment form

RESULTS

The 9 participants (one of our initial 10 participants has decided to withdraw from this study). 8 participants were female and 1 participant was male. They were in-service science teachers but they not familiar with KidBright or any coding program, which hindered their ability to create a flood warning system model prior to the class.

Table 1: Problem-solving skills self-assessment

Indicators	5 points Rating scale			
	Before activities		After activities	
	Mean	SD	Mean	SD
1. Refining the ability to define and comprehend the problem is crucial to develop flood warning system model	2.11	1.27	3.56	0.88
2. The capacity to establish clear and achievable goals to develop flood warning system model	2.00	1.32	3.56	0.88
3. The Capacity to generating a variety of potential solutions to develop flood warning system model	1.56	1.24	3.44	0.73
4. Action planning to develop flood warning system model	1.22	1.09	2.00	0.87
5. Implement and monitoring for flood warning system model	1.22	1.09	2.00	0.87
6. Reflection for flood warning system model	1.11	1.05	2.00	0.87

The results indicated that the participants' uncertainty regarding their problem-solving skills suggests that they were not confident in their abilities to effectively tackle problem-solving tasks. They thought that their ability to define and comprehend problems to develop a flood warning system model after the class (mean = 3.56, SD = 0.88) was higher than before the class (mean = 2.11, SD = 1.27). The capacity to establish clear and achievable goals to develop flood warning system model after the class (mean = 3.56, SD = 0.88) was higher than before the class (mean = 2.00, SD = 1.32). And the Capacity to generating a variety of potential solutions to develop flood warning system model after the class (mean = 3.44, SD = 0.73) was higher than before the class (mean = 1.56, SD = 1.24).

Table 2: Creativity skills self-assessment

Indicators	5 points Rating scale			
	Before activities		After activities	
	Mean	SD	Mean	SD
1. Originality	0.33	0.71	3.33	0.71
2. Fluency	0.22	0.67	3.22	0.67
3. Flexibility	0.22	0.67	3.22	0.67
4. Elaboration	0.11	0.33	3.11	0.93
5. Transformation	0.00	0.00	3.00	1.22
6. Collaboration and adaptability	0.00	0.00	3.00	1.22

The results shown that participants were unsure about their confidence in creating a flood warning system model. They relied on a manual or other external resources for guidance during the development.

Table 3: Flood warning system creation model for problem solving assessment after class.

Indicators	Total 5 scores		Define
	Mean	SD	
1. Refining the ability to define and comprehend the problem is crucial	4.11	0.60	The proficiency of participants in defining and comprehending the problem is critical for achieving a high level of effectiveness.
2. The capacity to establish clear and achievable goals	4.17	0.56	Participants possesses the capacity to establish clear and attainable goals at a high level.
3. The Capacity to generating a variety of potential solutions.	4.11	0.55	Participants possesses a diverse range of solutions for planning.
4. Action planning	3.83	0.66	They are capable of executing certain actions through memorization or by following instructions provided by instructors.
5. Implement and monitoring	3.83	0.71	They were able to develop a flood warning system model; however, they relied on a manual or other external resources for guidance during the process.
6. Reflection	3.67	0.50	4 participants were able to reflect on their mistakes but someone may not know the reasons behind their mistakes. Someone may struggle with self-reflection and the ability to analyze their own mistakes.

Table 4: Flood warning system creation model for creativity skills assessment after class.

Indicators	Total 5 scores		Define
	Mean	SD	
1. Originality	4.17	0.71	They were capable of generating innovative ideas and solutions during the planning phase.
2. Fluency	4.22	0.62	They demonstrated fluency in their creative thinking skills while developing the model.
3. Flexibility	4.17	0.50	They exhibited flexibility in their approach to developing the model.
4. Elaboration	3.94	0.53	They showcased elaboration in their thinking skills while developing the model,

Indicators	Total 5 scores		Define
	Mean	SD	
			demonstrating the ability to expand and refine their ideas.
5. Transformation	3.89	0.60	They were able to apply their knowledge and skills (Identify problem, identify objective and planning) to develop a flood warning system creation model. however, they relied on a manual (coding keys).
6. Collaboration and adaptability	3.78	0.67	4 participants adopted this method and demonstrated the ability to plan for their classes. 2 participants decided to directly use this method in their class without making any modifications. On the other hand, three participants chose to integrate this method into other topics for their classes.

CONCLUSION

It was concluded that difference between pre and post-test of problem-solving skills. They have the ability to identify problems and conduct research for problem-solving. They can plan for flood prevention using KIDBRIGHT and have shown progress in coding with KIDBRIGHT. They used sensor devices to Kidbright and operated them successfully. They have tested simulated flooding scenarios to observe the outcomes of code writing and the connection of sensor devices with Kidbright. However, they still lack confidence in developing methods that differ from what teachers instructed, especially in terms of connecting devices. Therefore, they were proficient in following instructions well but shown relatively low creativity in independent creation.

DISCUSSION

Since 2013, STEM education has been introduced and promoted in Thai schools with the goal of fostering interest among young people in STEM disciplines and encouraging further studies in these areas. However, the implementation of integrated STEM education in Thailand has encountered challenges, particularly with regards to teachers who face difficulties in effectively teaching integrated STEM concepts. (Suriyabutr, & Williams, 2021)

The main reason Thai teachers struggle with integrating STEM concepts into their classes is their lack of technology skills. Participants were in-service teachers who were unable to use KidBright or any other coding program, thus resulting in their inability to integrate it into their lessons. Methods of contextual learning and problem-solving have the potential to foster highly conceptual and meaningful learning experiences that center around real-world problems. (Shahbazloo, & Abdullah Mirzaie, 2021). 4 Participants have planning to expand the application of the STEM education approach to other situations, including earthquake and storm warning. Moreover, the emphasis is on STEM education to develop students into real-life problem solvers by creating a student-centered environment. However, when it comes to adapting these methods to develop original projects, certain challenges may arise. In the case of our

participants, they may still rely on repeating the same lesson, such as adjusting the water level for a warning, rather than independently applying the concepts taught to them.

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English Teachers' Out-of-Field Teaching in Higher Education Institutions: Practices and Initiatives

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ABSTRACT

This study aimed to determine the out-of-field teaching practices among English language teachers in select Higher Education Institutions (HEIs) of Iloilo City as perceived by the administrators, teachers, and students along the following dimensions, namely: (1) organization; (2) content knowledge and relevance; (3) presentation; (4) instructor-student interaction; (5) teaching strategies; and (6) assessment. Further, it explored how these participants regarded out-of-field teaching and what initiatives they had undertaken in the out-of-field teaching context. Participants were chosen using convenience and purposive sampling. Data were gathered using a validated modified—adopted questionnaire and interview protocols. This study used appropriate statistical tools to determine the teaching practices of out-of-field English language teachers. At the same time, inductive thematic analysis was employed to explore and generate themes from the interview. Results showed that the teaching practices were “highly practiced” in five dimensions, except for teaching strategies perceived by the administrators as “moderately practiced.” From the interview, different themes emerged from how the participants regard out-of-field teaching and from the initiatives undertaken by the participants of this study. Out of the results and findings, this study created a monograph as an educational resource that would serve as a reference for researchers and educators interested in studying the context of out-of-field teaching.

KEYWORDS: Out-of-field teaching, English teachers, Practices and initiatives, Administrators, Students

THE RATIONALE OF THE STUDY

Teaching in one's field entails expertise. It means a person can think and handle problems more effectively. Glaser and Chi (1988) describe expertise as ownership of an orderly form of theoretical and practical knowledge that can be readily remembered and used with advanced metacognitive ability. Likewise, by perceiving teachers as experts in the advancement of learning, it would be realistic that they are expected to have expertise in other areas and have acquired broader and integrated knowledge that reflects profound understanding and allows an easier recovery of relevant information (Bransford et al., 2000). Expertise thus requires relevant knowledge, skills, and attitudes.

Along with constant educational reforms and changes in subject areas, teachers are obliged to teach subjects without necessary qualifications or subject mastery (Du Plessis, 2017). One of the most affected is the English language teachers. For some reason, they are teaching out-of-field subjects where expertise can be a big question, especially a vast number of kinds of literature conducted on the global educational system's dilemma.

Out-of-field teaching is not delimited to selected subjects and is not eventually considered a deviation. For instance, the STEM-subject areas of Science, Technology, Engineering, and Mathematics impact all subject areas and year levels (Du Plessis, 2017). Because they are not qualified, these teachers might need more subject matter mastery and teaching skills (Kola & Sunday, 2015).

In the Philippines, out-of-field teaching is significant but the long unrecognized situation in schools and education in general. This phenomenon adversely affects their quest for quality education and could be primarily attributed to the significant number of skilled or specialized teachers. Several teachers are employed to teach, not their field of expertise (Caylao, 2015).

Nevertheless, it is vital to note that this study was conducted among English language teachers in Higher Education Institutions (HEIs). Related literature and studies collected in HEIs were minimal since most studies on out-of-field were mainly conducted among primary and secondary schools.

Thus, this study intended to explore the out-of-field teaching practices among English language teachers in the selected Higher Education Institutions of Iloilo City. These teachers are given loads outside their expertise due to the limited number of English subjects offered. Some of them are teaching, Panfil, Art appreciation, ICT, Understanding the Self, Psychology, Professional Education, and other subjects mismatched with their specialization. Further, this study determined how the participants regarded out-of-field teaching and their initiatives in this phenomenon.

THEORETICAL-CONCEPTUAL BACKGROUND

This study was anchored on the social-constructivist theory of Vygotsky (1978) to discuss the development of complex learning and teaching environment due to out-of-field teaching. This theory emphasizes the impact of "more knowledgeable others" (MKO) in the classroom and how a knowledgeable adult can lead and instruct knowledge building. This knowledgeable adult successfully links previous and new ideas known as the "zone of proximal development" (ZPD). Based on this theory, this study seeks answers to queries about the learning impact among out-of-field teachers. Moreover, it recognizes the importance of understanding out-of-field teaching practices as teachers are expected to be the "more knowledgeable other" in the classroom.

Vygotsky's theory highlighted the expert teacher's role, guiding students through new knowledge construction, prior and new knowledge scaffolding, and internalizing new and unfamiliar knowledge. Vygotsky's theory emphasizes the significance and needs to comprehend the effects of unknowledgeable

and unskilled teachers in providing delicate and skillful assistance (Du Plessis, 2013). Likewise, this theory gives this study devices in fulfilling the crucial need to enhance comprehensive knowledge in out-of-field teaching in the process of learning.

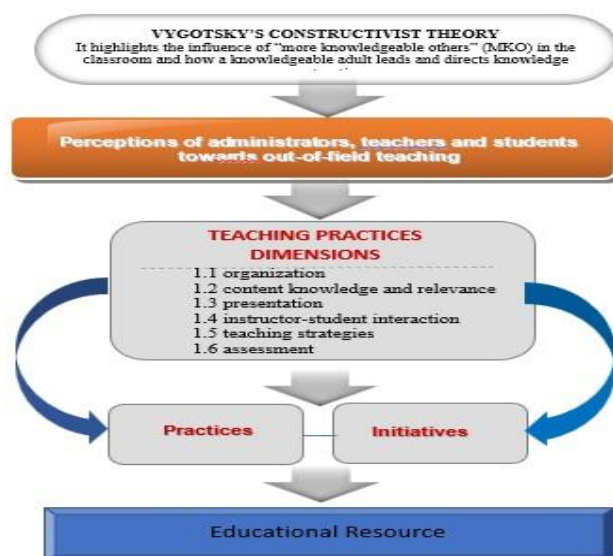


Figure 1: A Schematic Presentation of the Theoretical and Conceptual Framework of the Study

STATEMENT OF THE PROBLEM

The study aimed to explore the out-of-field teaching practices among English language teachers in selected Higher Education Institutions (HEIs) of Iloilo City.

Specifically, this study sought answers to the following questions:

1. As perceived by the administrators, teachers, and students, what are the teaching practices along the following dimensions:
 - 1.1 organization;
 - 1.2 content knowledge and relevance;
 - 1.3 presentation;
 - 1.4 instructor-student interaction;
 - 1.5 teaching strategies; and
 - 1.6 assessment?
2. How do the administrators, teachers, and students regard out-of-field teaching?
3. What initiatives have been undertaken by them?
4. What educational resource may be created?

METHODOLOGY

Research Design

This investigation utilized the mixed method research design that determined and described the out-of-field teaching practices among English language teachers in Higher Education Institutions (HEIs) of Iloilo City. Further, this research explored how the participants regard out-of-field teaching and their initiatives on this phenomenon.

Research Environment

In this study, there were four institutions, two (2) public and two (2) private Higher Education Institutions (HEIs) of Iloilo City, served as the venues for this study. The selected Higher Education Institutions, the College of Education from the two public schools and the College of Business and College of Maritime Education, and the College of Liberal Arts and Sciences from the private schools were the specific colleges this study was conducted.

Research Participants

In this study, participants were purposively selected from the two public and two private Higher Educational Institutions (HEIs) of Iloilo City. The participants of this study were further categorized as administrators, teachers, and students. The table below shows the participants' distribution.

Table 1: Distribution of Participants

Variable	Categories	Frequency	%
Respondent	Student	253	95.47
	Teacher	8	3.02
	Head	4	1.51
School	Private	151	56.98
	Public	114	43.02
Total		265	100.00

Data-gathering Procedure

Upon securing permission from the Research Ethics Committee (REC) at Cebu Normal University, this study also secured permission from the selected Higher Education Institutions (HEIs) to administer the questionnaire among the study participants. After securing the consent among the presidents and administrators of the institutions, questionnaires were distributed using an online Google form. Results were then tabulated and analyzed using appropriate statistical tools.

Data Analysis

This study processed obtained data for interpretation utilizing Statistical Package for Social Sciences (SPSS) software. *Frequency* count was used to determine the distribution of the participants. In this study, administrators, teachers, and students were classified according to the type of school, whether public or private Higher Education Institutions (HEIs) served as the study participants. *Mean* was used to obtain out-of-field English language teachers' teaching practices regarding their organization, content knowledge and relevance, presentation, instructor-student interaction, teaching strategies, and assessment. *Rank* was used to determine the sequence of teaching practice dimensions and their corresponding indicators: highly practiced, moderately practiced, less practiced, and not practiced.

Thematic analysis was used for qualitative data analysis. The thematic analysis identifies, analyzes, and writes the patterned themes extracted from the data (Braun & Clarke, 2006).

Ethical Considerations

This study ensured that ethical standards and considerations were adequately observed, such as (1) Informed Consent and Voluntary Participation, (2) Assent and Vulnerability, (3) Recruitment, (4) Ethical Approval and Access to Participants, (5) Risks and Benefits, and (6) Incentives or Compensation.

Research Instrument

For quantitative data, an adapted modified classroom observation evaluation from John B. Lacson Foundation Maritime University-Molo, Inc. was used as the questionnaire for this study. This research instrument underwent reliability testing and was conducted among the group of participants of this study. Moreover, a Likert-type survey used was used for this study with the following scale and description:

Scale	Description
3.25 - 4.00	Highly Practiced
2.50 – 3.24	Moderately Practiced
1.75 – 2.49	Less Practiced
1.00 – 1.74	Not Practiced at All

For qualitative data, interview protocols were used in the study. The interview guide includes open-ended questions to capture the participants' responses. Interview guides were used to achieve optimum time and provide meaningful intentions in investigating the number of participants in a more organized and comprehensive approach while maintaining the interview's focus on its desired goals (DiCicco-Bloom B, Crabtree, 2006).

RESULTS FROM QUANTITATIVE DATA ANALYSIS

Perceptions of the Administrators, Teachers, and Students Towards Out-of-Field English Language Teachers' Teaching Practices in Various Dimensions

Table 2: Teaching Practices as Perceived by the Administrators

TEACHING PRACTICES	WEIGHTED MEAN	INTERPRETATION	RANK
I. Organization <i>The instructor ...</i>	3.50	Highly Practiced	2
1. makes clear the learning outcomes the students must demonstrate at the end of the lesson.	3.50	Highly Practiced	3
2. reviews prior class lessons and related them to the current lesson.	3.00	Moderately Practiced	7
3. aligns the ILOs with the Teaching Learning Activities (TLAs).	3.75	Highly Practiced	1
4. aligns the ILOs with the Assessment Tasks (ATS).	3.75	Highly Practiced	1
5. discusses again the ILOs at the end of the class.	3.50	Highly Practiced	3
6. summarizes important points at the end of the class.	3.50	Highly Practiced	3
7. asks students to demonstrate the outcomes.	3.50	Highly Practiced	3
II. Content Knowledge and Relevance <i>The instructor ...</i>	3.50	Highly Practiced	2
1. presents the contents of the lesson very clearly.	3.50	Highly Practiced	2
2. presents materials relevant to the content of the lesson.	3.50	Highly Practiced	2
3. relates the current lesson with prior knowledge.	3.25	Highly Practiced	6
4. demonstrates mastery of the subject matter.	3.50	Highly Practiced	2
5. selects examples relevant to students' experiences and course content.	3.50	Highly Practiced	2
6. makes the course content relevant with references to 'real world' applications.	3.25	Highly Practiced	6
7. explains difficult terms, concepts, or problems in	4.0	Highly Practiced	1

TEACHING PRACTICES	WEIGHTED MEAN	INTERPRETATION	RANK
more than one way.			
III. Presentation	3.50	Highly Practiced	2
<i>The instructor...</i>			
1. presents teaching and learning activities (TLAs) relevant to the ILOs of the course.	3.75	Highly Practiced	1
2. establishes and maintained eye contact with students.	3.50	Highly Practiced	3
3. presents examples to clarify points.	3.50	Highly Practiced	3
4. relates new ideas to familiar concepts.	3.50	Highly Practiced	3
5. uses varied explanations for complex and difficult concepts.	3.50	Highly Practiced	3
6. selects teaching methods appropriate for the content.	3.75	Highly Practiced	1
7. communicates a sense of enthusiasm and excitement toward the content.	3.25	Highly Practiced	7
IV. Instructor-Student Interactions	3.25	Highly Practiced	5
<i>The instructor ...</i>			
1. motivates learners in order to achieve high standards of performance.	3.25	Highly Practiced	3
2. encourages students to engage in discussion and interaction.	3.25	Highly Practiced	3
3. asks questions to monitor students' progress.	3.25	Highly Practiced	3
4. encourages students to answer higher-order questions by providing cues.	3.50	Highly Practiced	1
5. asks probing questions when the student's answer is incomplete.	3.50	Highly Practiced	1
6. provides corrective feedback when needed.	3.00	Moderately Practiced	6
7. promotes cooperation and teamwork among students.	3.00	Moderately Practiced	6
V. Teaching Strategies	3.07	Moderately Practiced	6
<i>The instructor ...</i>			
1. demonstrates effective teaching strategies for the given content.	3.00	Moderately Practiced	4
2. aligns the TLAs with ILOs.	3.25	Highly Practiced	1
3. uses a variety of classroom activities directed towards achievement of the desired outcomes.	3.00	Moderately Practiced	4
4. uses "wait-time" when asking higher-order thinking questions to class.	3.25	Highly Practiced	1
5. provides demonstration/examples of the given content, information, theories, or issues.	3.25	Highly Practiced	1
6. connects content to the previous and upcoming class session.	2.75	Moderately Practiced	7
7. designs activities, assignments, materials, and groupings of students to support challenging instructional outcomes.	3.00	Moderately Practiced	4
V. Assessment	3.63	Highly Practiced	1
<i>The instructor...</i>			
1. prepares assessments aligned with instructional materials.	3.25	Highly Practiced	6

TEACHING PRACTICES	WEIGHTED MEAN	INTERPRETATION	RANK
2. prepares variety of performance opportunities for students.	3.75	Highly Practiced	2
3. modifies assessments available for individual students as needed.	3.50	Highly Practiced	4
4. discusses clearly the rubrics to be used with each corresponding descriptor.	4.00	Highly Practiced	1
5. involves students in establishing the assessment criteria and provide high-quality feedback from a variety of sources.	3.50	Highly Practiced	4
6. informs students regularly regarding their progress and achievements.	3.75	Highly Practiced	2
Overall Weighted Mean	3.41	Highly Practiced	

Table 2 shows the results of administrators' perceptions of the teaching practices of out-of-field English language teachers on the six dimensions. Results showed that the administrators perceived five dimensions as "highly practiced" teaching practices of the out-of-English language teachers, namely: 1) Organization; 2) Content Knowledge and Relevance; 3) Presentation; 4) Instructor-Student Interaction; and 5) Assessment were "highly practiced." In this case, the Teaching Strategies dimension was only perceived as "moderately practiced."

Table 3: Teaching Practices as Perceived by the Teachers

Teaching Practices	Weighted Means	Interpretation	RANK
I. Content Knowledge and Relevance <i>The instructor...</i>	3.54	Highly Practiced	5
1. presents the contents of the lesson very clearly.	3.50	Highly Practiced	4
2. presents materials relevant to the content of the lesson.	3.63	Highly Practiced	2
3. relates the current lesson with prior knowledge.	3.38	Highly Practiced	6
4. demonstrates mastery of the subject matter.	3.38	Highly Practiced	6
5. selects examples relevant to students' experiences and course content.	3.50	Highly Practiced	4
6. makes the course content relevant with references to 'real world' applications.	3.63	Highly Practiced	2
7. explains difficult terms, concepts, or problems in more than one way.	3.75	Highly Practiced	1
II. Presentation <i>The instructor...</i>	3.66	Highly Practiced	2
1. presents teaching and learning activities (TLAs) relevant to the ILOs of the course.	3.50	Highly Practiced	6
2. establishes and maintained eye contact with students.	3.63	Highly Practiced	3
3. presents examples to clarify points.	3.63	Highly Practiced	3
4. relates new ideas to familiar concepts.	3.50	Highly Practiced	6
5. uses varied explanations for complex and difficult concepts.	3.75	Highly Practiced	2
6. selects teaching methods appropriate for the content.	4.00	Highly Practiced	1
7. communicates a sense of enthusiasm and excitement toward the content.	3.63	Highly Practiced	3

Teaching Practices	Weighted Means	Interpretation	RANK
III. Instructor-Student Interactions	3.63	Highly Practiced	4
<i>The instructor...</i>			
1. motivates learners in order to achieve high standards of performance.	3.63	Highly Practiced	3
2. encourages students to engage in discussion and interaction.	3.50	Highly Practiced	6
3. asks questions to monitor students' progress.	3.75	Highly Practiced	2
4. encourages students to answer higher-order questions by providing cues.	3.88	Highly Practiced	1
5. asks probing questions when the student's answer is incomplete.	3.63	Highly Practiced	3
6. provides corrective feedback when needed.	3.63	Highly Practiced	3
7. promotes cooperation and teamwork among students.	3.38	Highly Practiced	7
IV. Teaching Strategies	3.64	Highly Practiced	3
<i>The instructor...</i>			
1. demonstrates effective teaching strategies for the given content.	3.38	Highly Practiced	7
2. aligns the TLAs with ILOs.	3.63	Highly Practiced	5
3. uses a variety of classroom activities directed towards achievement of the desired outcomes.	3.75	Highly Practiced	1
4. uses "wait-time" when asking higher-order thinking questions to class.	3.75	Highly Practiced	1
5. provides demonstration/examples of given content, information, theories or issues.	3.75	Highly Practiced	1
6. connects content to previous and upcoming class sessions.	3.50	Highly Practiced	6
7. designs activities, assignments, materials, and groupings of students to support challenging instructional outcomes.	3.75	Highly Practiced	1
V. Assessment	3.76	Highly Practiced	1
<i>The instructor...</i>			
1. prepares assessments aligned with instructional materials.	3.63	Highly Practiced	4
2. prepares a variety of performance opportunities for students.	3.88	Highly Practiced	1
3. modifies assessments available for individual students as needed.	3.88	Highly Practiced	1
4. discusses clearly the rubrics to be used with each corresponding descriptor.	3.63	Highly Practiced	4
5. involves students in establishing the assessment criteria and provide high-quality feedback from a variety of sources.	3.63	Highly Practiced	4
6. informs students regularly regarding their progress and achievements.	3.88	Highly Practiced	1
Overall Weighted Mean	3.65	Highly Practiced	

Table 3 presents the perceptions of English language teachers teaching out-of-field subjects in five identified dimensions. Based on the results, the perceptions of English language teachers teaching out-of-field subjects in five dimensions, namely: 1) Content Knowledge and Relevance; 2) Presentation; 3) Instructor-Student Interaction; 4) Teaching Strategies, and 5) Assessment along with their respective indicators were "highly practiced."

Table 4: Teaching Practices as Perceived by the Students

TEACHING PRACTICES	WEIGHTED MEANS	INTERPRETATION	RANK
I. Content Knowledge and Relevance	3.43	Highly Practiced	1
1. The instructor presents the contents of the lesson very clearly.	3.45	Highly Practiced	1
2. The instructor presents materials relevant to the content of the lesson.	3.43	Highly Practiced	4
3. The instructor relates the current lesson with prior knowledge.	3.44	Highly Practiced	2
4. The instructor demonstrates mastery of the subject matter.	3.41	Highly Practiced	6
5. The instructor selects examples relevant to students' experiences and course content.	3.43	Highly Practiced	4
6. The instructor makes the course content relevant with references to 'real world' applications.	3.42	Highly Practiced	5
7. The instructor explains difficult terms, concepts, or problems in more than one way.	3.41	Highly Practiced	6
II. Presentation	3.38	Highly Practiced	3
1. The instructor establishes and maintains eye contact with students.	3.31	Highly Practiced	5
2. The instructor presents examples to clarify points.	3.47	Highly Practiced	1
3. The instructor relates new ideas to familiar concepts.	3.37	Highly Practiced	3
4. The instructor uses varied explanations for complex and difficult concepts.	3.35	Highly Practiced	4
5. The instructor communicates a sense of enthusiasm and excitement toward the content.	3.39	Highly Practiced	2
III. Instructor-Student Interactions	3.42	Highly Practiced	2
1. The instructor motivates learners in order to achieve high standards of performance.	3.37	Highly Practiced	5
2. The instructor encourages students to engage in discussion and interaction.	3.45	Highly Practiced	3
3. The instructor asks questions to monitor students' progress.	3.46	Highly Practiced	2
4. The instructor encourages students to answer higher-order questions by providing cues.	3.37	Highly Practiced	5
5. The instructor asks probing questions when students' answer is incomplete.	3.37	Highly Practiced	5
6. The instructor provides corrective feedback when needed.	3.42	Highly Practiced	4
7. The instructor promotes cooperation and teamwork among students.	3.49	Highly Practiced	1
Overall Weighted Mean	3.41	Highly Practiced	

Table 4 shows students' perceptions towards the teaching practices of their out-of-field English language teachers and Content-knowledge and Relevance; Presentation; and Instructor-Student Interactions, together with all the teaching practices indicators, were "highly practiced."

Table 5: Summary of Teaching Practices as Perceived by the Administrators, Teachers, and Students

DIMENSION	Weighted Mean (Overall)				Interpretation	Rank
	Administrators	Teachers	Students	Average		
I. Organization	(3.50)				Highly Practiced	
II. Content Knowledge and Relevance	3.50	3.54	3.43	3.49	Highly Practiced	2
III. Presentation	3.50	3.66	3.38	3.51	Highly Practiced	1

DIMENSION	Weighted Mean (Overall)				Interpretation	Rank
	Administrators	Teachers	Students	Average		
IV. Instructor-Student Interactions	3.25	3.63	3.42	3.43	Highly Practiced	3
V. Teaching Strategies	(3.07)	(3.64)			Moderately Practiced	
					Highly Practiced	
VI. Assessment	(3.63)	(3.76)			Highly Practiced	
Overall Weighted Mean	3.42	3.61	3.41	3.48	Highly Practiced	

Table 5 summarizes the teaching practices the administrators, teachers, and students perceive according to the identified dimensions applicable to specific participants. For the administrators, overall dimensions were perceived as "highly practiced." However, the "teaching strategies" dimension was moderately practiced with a weighted mean of 3.07. The rest of the dimensions were perceived as "highly practiced." This means that the administrators have observed areas to consider for improvement in the teaching practices of out-of-field English language teachers.

The out-of-field English language teachers claimed that they performed excellently based on the results of this study. All the dimensions were perceived as "highly practiced," with an overall weighted mean of 3.61. Independently, each dimension showed "highly practiced" teaching practices, and assessment ranked the highest with a mean score of 3.76, and content knowledge and relevance had the least mean score of 3.54.

RESULTS FROM QUALITATIVE DATA ANALYSIS

For the administrators, out-of-field teaching can be 1) *An Existing Phenomenon*, 2) *A Challenge to Embrace*, and 3) *Multidisciplinary Teaching in the New Era*. Administrators regarded out-of-field teaching as an existing occurrence that has been practiced until now. Though it is a challenge, especially on the part of the teachers, it should be something to accept and embrace. They also believed that out-of-field teaching is seen as a multidisciplinary kind of teaching in the new era wherein teachers are capable of handling different subjects simultaneously regardless of whether the subjects handled are out-of-field or not. The multidisciplinary method represents the most productive way of managing knowledge allowing the practice and evaluation of students' technical and non-technical skills (Tramonti et al., 2019).

There are central themes on the initiatives done by the heads of Higher Education Institutions (HEIs) to address out-of-field teaching practices, and these are: (1) *Let's Talk It Over* discusses the initiatives of administrators through consultation; (2) *Teach Me, and I Will Learn* presents other ways done by the administrator through team teaching 3) *Active Support Works* discusses the ways on how these administrators show support to their out-of-field English language teachers.

From teachers, themes extracted are (1) *Truly A Challenge*; 2) *You Cannot Give What You Do Not Have*; 3) *Left with No Other Choice*; 4) *Open Doors for Opportunity*; and 5) *Something to Look Into*. Out-of-field English language teachers regarded it as an enormous challenge on their part to double an exerted effort to learn and deliver the out-of-field subjects. Most have found difficulty in the same manner. They knew how struggling subjects they had not been in intensive training nor specialized in those subjects. However, with the educational transformation, just like the implementation of the K-12 curriculum and for other circumstances to consider, they were left with no choice but to accept the loads. Out-of-field was not all about negativity when teachers claimed this challenge was an opportunity to learn something new. Nevertheless, the institutions should consider this phenomenon that teachers still need professional development and administrative support for better teaching. Effective teachers produce better-performing students (Akiri, 2013).

Teachers also have the initiative to cope with subjects outside of their specialization. The themes deduced from their responses are: (1) *Learn to Master Your Subject* describes the efforts exerted and initiatives of the out-of-field English language teachers to be prepared and master the subjects; (2) *Engage Students into Varied Activities* enumerates the different teaching strategies used by English language teachers in her out-of-field subjects, and (3) *Seek Help from the Experts* describes how teachers collaborate with other teachers who are expert in the fields. This conforms to the investigative results of Tickle et al. (2015), which revealed the role of administrative support as the teachers' job satisfaction's most significant predictor contributing to excellent teaching experience.

Finally, from the students' responses, out-of-field teaching is regarded as the following: a) *It is About My Teacher*; b) *What A Meaningful Experience*; and c) *It is Fine, Not a Big Deal at All*. For students, they regarded out-of-field teaching based on their English language teachers' attitude, and they described them as passionate and dedicated teachers who are doing their best to deliver their lessons in their classroom effectively. Likewise, students had meaningful experiences with their out-of-field English language teachers, so being out-of-field was not a big deal or problem. They did not have unpleasant issues with these teachers. As long as teachers could deliver their lessons well, it was okay for them. This conforms to the study conducted by Cruz et al. (2017) that findings revealed satisfactory evaluation of most students towards their teachers' science strategies and lectures despite teaching outside of their expertise. Having an out-of-field teacher is not a problem. Teachers' teaching skills matter more than how they deliver and elaborate their lessons well.

Two (2) significant themes are noted from the students' initiatives. These are: (1) *Right Study Habits* presents students' initiatives in maintaining their academic performance despite having out-of-field English language teachers, and (2) *I Do It Myself* discusses the self-learning techniques of students to cope with their lessons.

Since gathered data revealed that the participants perceived out-of-field teaching practices of English language teachers as "highly practiced," a monograph for this study was created as an educational resource that will serve as a reference for researchers and educators interested in studying the context of out-of-field teaching. This, however, shows the less impact of out-of-field teaching among the participants, contrary to the massive amount of literature on out-of-field teaching's detrimental effects.

CONCLUSION

From the quantitative results, this study shows that the teaching profession always has room for improvement for better delivery and quality teaching, especially the Teaching Strategies perceived as "moderately practiced" among dimensions. However, most dimensions such as Presentation, Content Knowledge and Relevance, and Instructor-Student Interaction can be attributed to the teachers' excellent performances in the classroom, as observed by the participants of this study that despite teaching out-of-field subjects, do not hinder them from delivering their lessons among their students confidently.

On the other hand, the qualitative results of this study show both the advantages and disadvantages of out-of-field teaching to the study participants. As mentioned in the previous chapter, many research literature and studies claimed undesirable effects of out-of-field teaching. However, contrary to previous literature that revealed undesirable impacts among teachers and students in elementary and secondary, this situation may be different nowadays based on the present study's findings conducted among college students in Higher Education Institutions (HEIs).

IMPLICATION ON ENGLISH LANGUAGE TEACHING (ELT)

English language teachers become multidisciplinary educators who have surpassed the challenges in the educational reforms. Considering that they are given out-of-field subjects, these teachers have shown

passion and determination to be competent in other areas. They likewise keep the spirit of excellence and open-mindedness along with the changes in the educational system. This investigation shows the significant role of English language teachers in the classroom. It shows that out-of-field English language teachers can demonstrate their teaching practices excellently despite having out-of-field subjects. These teachers can eventually acquire a master's in out-of-field subjects with proper training and support from the institutions. Thus, policies on the teaching development of these teachers can significantly help them in mastering their subjects.

Moreover, English language teachers widen their opportunities by teaching other fields. They can distinguish their strengths and weaknesses as out-of-field teachers beneficial to English language teaching as a continuous learning process. From the English language teaching, they can also apply their practices and initiatives to other subjects yet achieve the same goal: to make students learn and even excel in their subjects.

A monograph is created as an educational resource for this study to serve as one of the many references or tools for both educators and researchers who are into research and interested in conducting studies aligned with the context of out-of-field teaching. Furthermore, this work will serve as a humble contribution to the field of research that seeks eternal truth through accurate and scientific investigation.

RECOMMENDATIONS

This study's selected Higher Educational Institutions (HEIs) may sustain the highly practiced teaching practices of out-of-field English language teachers who are highly commendable for exceeding students' expectations and with a strong competency level. Moreover, by knowing the challenges posed by this phenomenon, the school administration may investigate other effective ways to address the sentiments and challenges encountered by some participants. Lastly, researchers and educators may also use the monograph created as an educational resource for this study which will serve as a reference for future studies, especially when it concerns the context of out-of-field teaching.

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Inquiry Based Teaching of Fraction Division: A Case Study of Primary School Mathematics Teachers

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ABSTRACT

This study aims to explore the inquiry-based teaching of fraction division among primary mathematics teachers and to understand the reasoning behind their teaching methods. This paper presents a case study of an experienced teacher, Mr. Ali (pseudonym) who teaches standard six students and employs inquiry-based teaching when teaching fraction division. This study applies a case study design, and the teacher was chosen using the purposive sampling method. Research data was collected through lesson observation, interviews, and document analysis to answer the research questions. The collected data was then qualitatively interpreted and analyzed. The study reveals that the teacher used an inquiry-based method in teaching division of fractions which is anchored on stimulation, hands-on activities, and making conclusions. This approach is heavily influenced by Mr. Ali's understanding and beliefs in inquiry-based teaching. He believed that hands-on activities and learning by doing promote fun learning and enhance students' memorization of procedure for fraction division. Additionally, the teacher also believed that inquiry-based teaching is appropriate to be used in teaching the concept of fraction division because it develops higher-order thinking skills among students. Based on these findings, it is recommended that future studies explore the use of inquiry-based teaching of other concepts of fractions to gain a more comprehensive understanding of its application in teaching mathematics.

KEYWORDS: Inquiry-Based Teaching, Division of Fractions, Fractions, Case Study.

INTRODUCTION

Fractions has been widely used in everyday lives and is regarded as one of the important topics in mathematics' curriculum. A deep understanding of the concept of fractions may help students to solve problems in daily activities. In the primary school mathematics curriculum (KSSR), the basic concept of fractions is introduced since Standard One. In Standard Six, students are required to learn fraction division, which is often considered as a challenging topic to learn. Although the procedure for dividing fractions is simple, this topic is conceptually complex and can be challenging for students (Lamon, 2020). They demonstrate a poor grasp of fraction division, and it is still difficult for math teachers to assist that understanding (Ervin, 2017).

Traditionally, fraction division has been taught using algorithm methods such as inverse multiplication to solve fraction division (Ervin, 2017). Students have been taught to solve fraction division without knowing the meaning and the reason behind the inverse multiplication method. Nevertheless, difficulty arises when they are faced with word problems in which fraction division is put into a context to be solved. In such a situation, understanding the meaning behind the concept of fraction division can accelerate students' ability to solve the given problems. It is reflected here that an inappropriate pedagogical teaching method makes it difficult for students to learn and understand the concept of fraction divisions (Lortie-Forgues, Tian, & Siegler, 2015). Rather, teachers should balance teaching algorithmic procedure with engaging their students in the meaning behind the mathematical concept, because they cannot assist students learn mathematics meaningfully if they do not completely grasp the core concepts (Siegler & Lortie-Forgues, 2015). Teachers also must employ an effective pedagogical approach that can actively engage students in building their conceptual grasp of mathematics and mathematical thinking to meet the demands of the current learner-focused views in mathematics education. Accordingly, in the mathematics classroom, opportunities to accomplish this are provided by inquiry-based teaching (Charalambous, 2015). An inquiry-based teaching emphasizes understanding the meaning of a concept, learning through hands-on activities and active learning by doing. Manipulatives tools and representations are also used widely in learning activities.

Inquiry-based teaching has also been known by past researchers to be successful in enhancing students' performance in fractions and increases their overall interest in learning mathematics. Through this approach, students are also expected to solve and make sense of a properly scaffolded series of mathematical tasks given by teachers in groups or individually, which is a type of active learning (Ernst, Hodge & Yoshinobu, 2017). However, teachers may find it challenging to apply inquiry-based teaching in mathematics lessons, due to several challenges it presents for them as it is different from the traditional approach widely used and normalized by mathematics teachers (Maass & Engeln, 2018). Past research has also shown that there is a lack of knowledge on how it been conducted in a real classroom setting (Gutierrez, 2015). The insights from a real classroom setting and the implementation of the inquiry-based teaching of fraction division can help teachers to understand how it can be done in classroom. Hence, this study is conducted to explore the teaching of fraction division using inquiry-based teaching method in a real classroom setting of a primary school mathematics teacher, to see whether the approach can facilitate meaningful teaching opportunities.

The objectives of this study are to explore the inquiry-based teaching of fraction division among primary school mathematics teachers and to explore the reasons behind the way they teach fraction division. Specifically, the research questions of this study are (a) "How do primary school mathematics teachers conduct inquiry-based teaching of fraction division?", and (b) "Why do the teachers teach the way they do?". Answers to the above research questions will give insights in understanding the implementation of inquiry-based teaching of fraction division in a real classroom setting.

Fraction Division

Fraction division is a challenging topic for both students and teachers (Getenet & Callingham, 2021). Often, fraction division is conceptualised mathematically as an algorithmic process that can be simply taught and learned as "invert and multiply." Nevertheless, this topic is theoretically complex and challenging since its significance necessitates an explanation using links to other areas of mathematics, different representations, or situations from the actual world. Teachers thus play a key role in facilitating students' understanding of fraction division. How the content is set up and the students' learning environment can have big impacts on the students' understanding of this topic. As such, it has been suggested that mathematics teachers need to have a relational grasp of fraction division and must be able to create learning environments with activities that foster the students' relational comprehension of the subject (Wahyu et.al., 2020).

Prior studies also support the notion that students often face difficulties in learning fraction division. This can be caused by the nature and the complexity of the topic (Lamon, 2020), the teachers' mastery of conceptual understanding of fraction division (Copur-Gencturk, 2021) and the teachers' pedagogical aspects (Getenet & Callingham, 2021). Most of the past studies are focused on the teachers' understanding of fraction division, and very few studies focused on how fraction division should be taught to help the students to understand it better. As such there is a need to conduct more studies in the latter.

Inquiry-Based Teaching of Mathematics

According to Dorier and Maass (2020), inquiry-based mathematics education is a student-centered approach that encourages students to observe a phenomenon or a situation, seek out mathematical solutions, draw diagrams, find patterns and relationship, make generalization, and communicate effectively to explain their solutions or findings. Some of the common terms frequently used to describe inquiry-based teaching are learner-focused, investigation or research, question-driven, communication, reflection, and collaboration (Chapman, 2011). For the past decade, there have been growing numbers of researchers and research focusing on inquiry-based teaching of mathematics. They discovered that inquiry-based teaching activities can be used in the mathematics classroom and are able to provide useful ways and resources for teaching algorithms. (Laudano, Tortoriello, & Vincenzi, 2020). Inquiry-based teaching imparts positive impacts on students' learning of mathematics.

Research by Karademir and Akman (2019) demonstrates that preschoolers' numerical and operations skills have improved and last longer because of the inquiry-based teaching activities. Furthermore, inquiry-based teaching has also been identified to facilitate a more fun and active learning environment, thus increasing students' motivation in learning mathematics (Karademir & Akman, 2021). In addition, the approach also helps to develop higher order and critical thinking skills among students (Kandil, & Işıksal-Bostan, 2019; Rooney, 2009). Many past studies on inquiry-based teaching of mathematics have focused on the effectiveness and impacts of the approach to students' learning (Divrik, Pilten, & Tas, 2020; Hastuti et.al, 2020). However, very few research focused on how it can be implemented in a real classroom setting, and specifically in the teaching of fraction division. Hence, this research is carried out to explore the inquiry-based teaching of fraction division among primary school mathematics teachers with the goal of outlining the specific methods it can be implemented.

METHODOLOGY

This study employs a case study design, and the participants consist of five primary school mathematics teachers who were purposively sampled based on predetermined criteria to obtain quality and comprehensive data. Specifically, the selection criteria required that the teachers must have at least five years of experience in teaching primary school mathematics. This is because the teachers will already possess well-developed knowledge and skills in teaching (Hiebert & Carpenter, 1992). Additionally, the teachers must have attended professional development courses in inquiry-based teaching of mathematics organized by the Ministry of Education Malaysia and frequently apply inquiry-based teaching of

mathematics. This paper only focuses on one participant, representative of one case study. The most significant limitation of this study is that findings from a single participant cannot be generalized to a larger population. The case study represents only one unique individual, and their experiences, behaviours, or outcomes may not be representative of others with similar characteristics or conditions. The research data was subsequently collected through lesson observations, interviews, and document analysis. The qualitative data was analyzed using qualitative content analysis method that consist of four stages; i) data transcribed, (ii) coding and identifying the categories, (iii) construct case study, and (iv) cross case analysis.

RESULTS

The result of this study provides answers to the research questions; i) “How do primary school mathematics teachers conduct inquiry-based teaching of fraction division?”, and ii) “Why do the teachers teach the way they do?”. This paper presents one case study of an experienced mathematics teacher, Mr. Ali, who teaches fraction division for a class of 40 students, Standard 6 Cempaka.

Mr. Ali (Pseudonym)

Mr. Ali is an experienced mathematics teacher and has been teaching primary school mathematics for 25 years. He is one of the writers for modules on inquiry-based teaching of mathematics published by the Ministry of Education Malaysia (MOE) and is also recognised by MOE as a master trainer in inquiry-based teaching of mathematics for teachers nationwide. He also practices inquiry-based teaching in his mathematics classroom including in the teaching of fraction division. How he teaches fraction division using inquiry-based teaching and why he teaches the way he does is presented below.

(a) How does the teacher teach fraction division using inquiry-based teaching?

Mr. Ali’s approach in using inquiry-based teaching of fraction division is discussed in three themes that emerged from the data analysis. The themes are (i) stimulation, (ii) hands-on activities, and (iii) making conclusions.

(i) Stimulation

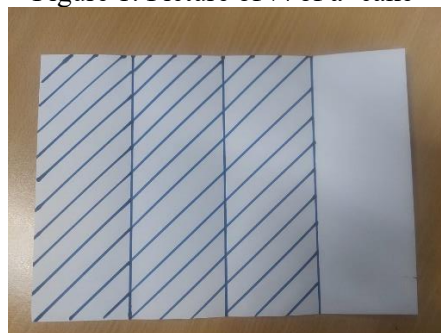
The stimulation phase highlights the importance of using real-life situations, visual aids, and questioning to engage students’ curiosity and interest in the topic.

Mr. Ali used a problem related to a real-life situation as the focus in this phase and wrote the problem on the whiteboard. An example of the problem is provided below:

“Fatimah had $\frac{3}{4}$ cake left from a birthday party. She wanted to divide the cake into half and give one half to Suzy. What is the fraction of the cake that Suzy gets?”

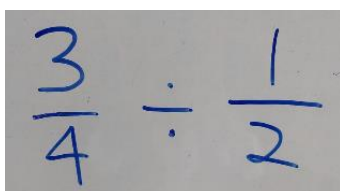
Mr. Ali used a visual aid (Figure 1), a piece of paper that had been sketched to represent $\frac{3}{4}$ cake and then he proceeded to show it in front of the class.

Figure 1: Picture of $\frac{3}{4}$ of a ‘cake’



He read the problem out loud and asked the students, “what is the fraction of the cake that Suzy got?”. The students remained silent. He continued asking, “how can we solve this problem?” The students appeared to have no idea on how to solve the problem and told Mr. Ali “We don’t know teacher”. Then, Mr. Ali tried to guide the students by prompting them on how to start solving the problem. “Okay, normally what do we do when we want to solve word problems? We try to write mathematics sentences for the problem. Write down your answer on your mini whiteboard.”

The students then wrote their answers on their mini whiteboards and Mr. Ali walked around the class to observe the students’ answers. Mr. Ali had enabled the students to visualize their thinking using their mini whiteboards. It was observed that most of the students wrote down a mathematic sentence as shown below:


$$\frac{3}{4} \div \frac{1}{2}$$

Next, Mr. Ali asked the students “Why did you write division symbol?”, in which the students answered, “because we have to divide the cake, so it’s division”. Mr. Ali agreed with the students’ answer and then he continued, “Okay, let’s explore how to divide fraction with fraction”.

During this stimulation phase, Mr. Ali did not target students to obtain the right answer to the given problem, instead he used the problem itself as a tool to engage the students and relate it back to the lesson. The lesson then continued with the next phase, which is themed as hands-on activities.

(ii) Hands-on activities

The hands-on activities observed in this study consisted of sketching and drawing diagrams for the students to explore the meaning of fraction division and solving fraction division using diagrams. The students were sitting in groups, and they were encouraged to discuss among their group members as they attempted to solve the problems in the worksheet given. They had to solve five fraction division questions in the worksheet. Each question had an empty diagram for the students to sketch. An example of one of the questions in the worksheet is shown in Figure 2.

Figure 2: Question 1 in the worksheet

FRACTION DIVISION

NAME: _____

YEAR : _____

A: Solve the questions below:

1) $\frac{1}{5} \div \frac{1}{2} =$



Total of shaded regions 

There are _____ parts from _____ parts that are shaded.

Answer = _____



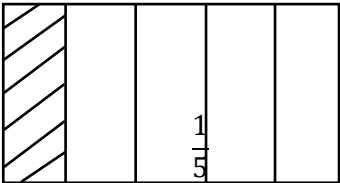
Total of shade regions 

For the first question in the worksheet, Mr. Ali guided the students by drawing diagrams on the white board in front of the class. The steps for sketching and drawing diagrams are shown in Figure 3. Mr. Ali started with asking the question “how many is $\frac{1}{5}$ inside of $\frac{1}{2}$?” Then he sketched diagrams on the whiteboard to illustrate the problem, as shown in Figure 4. An example of a student’s answer is provided in Figure 5.

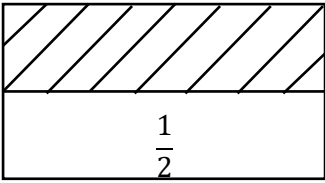
Figure 4: Steps for drawing and sketching diagrams for solving $\frac{1}{5} \div \frac{1}{2}$.

Teacher’s question: How many is $\frac{1}{5}$ in $\frac{1}{2}$?

a) Sketch $\frac{1}{5}$ and $\frac{1}{2}$ in different boxes.



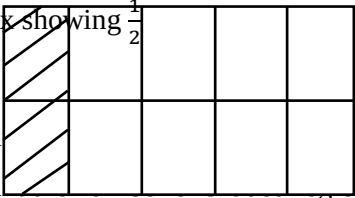
$\frac{1}{5}$



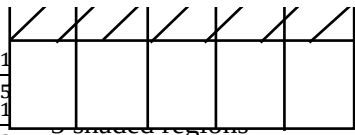
$\frac{1}{2}$

b) Equalize the number of parts in each box.

For the box showing $\frac{1}{5}$, draw one horizontal line to make it like the box showing $\frac{1}{2}$



For the box showing $\frac{1}{2}$, draw five vertical lines like make is like the box showing $\frac{1}{5}$



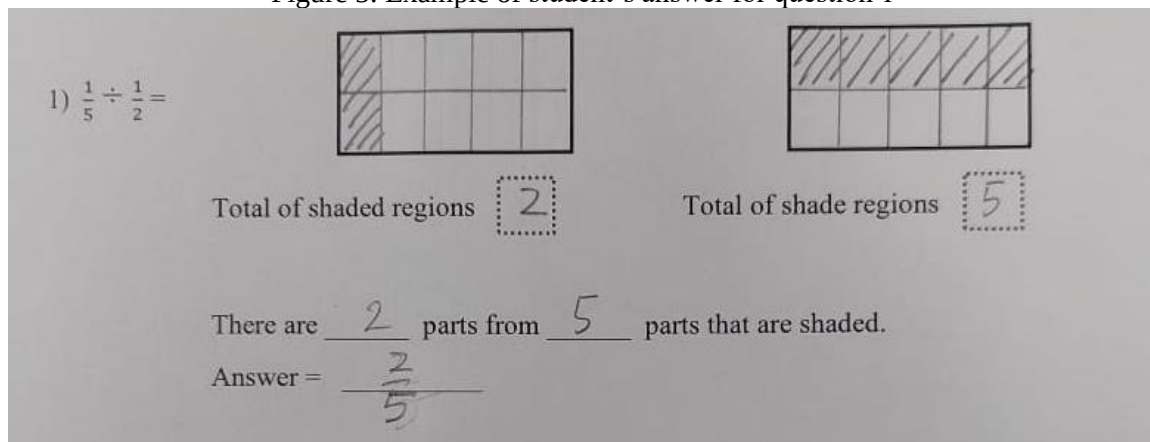
c) Count the shaded regions in diagram

d) Count the shaded regions in diagram

e) There are 2 parts from 5 parts of the shaded regions

f) Answer: $\frac{1}{5} \div \frac{1}{2} = \frac{2}{5}$

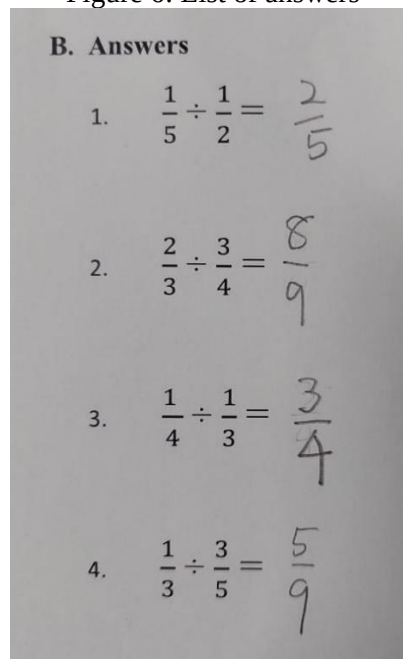
Figure 5: Example of student's answer for question 1



(iii) Making conclusion.

Making conclusion emphasizes the students' ability to state the procedure for dividing fractions from the answers they obtained during the hands-on activities. They listed down all the answers for all questions as shown in Figure 6. Then, they had to identify the pattern on how to get the solutions.

Figure 6: List of answers



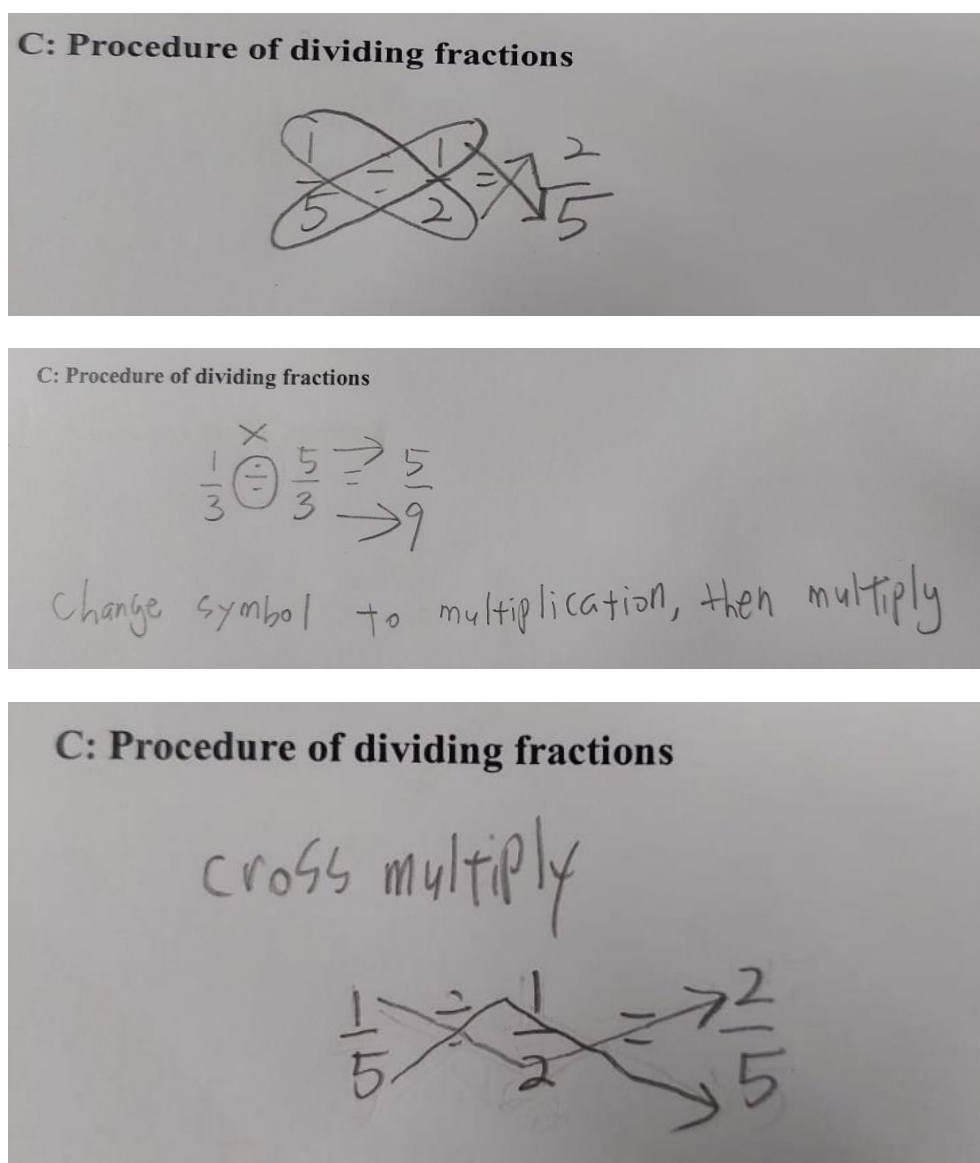
Mr. Ali used the following questions to prompt the students to come up with a conclusion for fraction division problems.

- Can you see a pattern in finding the answers for the questions given?
- Are you able to understand the steps to obtain the answers for all the questions we did just now?
- Are there other ways to get the answers to the questions we did apart from drawing diagrams?

Subsequently, there are students who answered, “we can cross multiply, teacher!”. To this, the teacher asked one of the students to come forward and illustrate their answer. The student explained that for fraction

divisions, cross multiplication can also be used, whereby the numerator of the first fraction is multiplied with the denominator of the second fraction and vice versa (Figure 7). There are also students who answered that the division symbol can be substituted with the multiplication symbol, and then completing the multiplication by multiplying the numerator of the first fraction with the numerator of the second fraction, followed by the denominator of the first fraction with the denominator of the second fraction (Figure 7). Other students suggested using the division symbol. As a result, the students made the following conclusions shown in Figure 7, for solving fraction divisions.

Figure 7: Three examples of students' answers on fraction division procedure



(b) Why do the teachers teach the way they do?

From the interviews, it is found that the teachers' approach to teaching fraction division using inquiry-based was influenced by their knowledge and beliefs on the effectiveness of this approach. The teachers believe that inquiry-based teaching is beneficial for promoting conceptual understanding, developing thinking skills, and making learning fun for students.

Mr. Ali has preferred to teach fraction division using inquiry-based teaching method ever since he was trained in the method. He believes that inquiry-based teaching should be used to teach fraction division since this method is effective in promoting conceptual understanding among the students, develops critical thinking skills among the students and makes learning fun. Mr. Ali confirmed this during the interviews as exemplified by the following interview excerpt:

"Since I've been introduced to this method, I have used it to teach fraction division and I think my students are showing great interest in learning mathematics specifically fraction division since it promotes conceptual understanding, can make my students think and the students actively engaged in the learning process..."

Mr. Ali believes that to start the lesson, the teacher must be able to get the students' attention and the simulation phase will provide the students with initial ideas on what they will learn during the lesson. This increases students' interest in learning and engages them throughout the lesson. Mr. Ali confirmed this during interviews as shown by the following interview excerpt:

"For the induction set, we must get the students' attention before the real lesson starts. We can give students problematic situations related to dividing fractions so that students can get an initial idea of what topic they will learn today."

Mr. Ali believes that the hands-on activity provides the students with an opportunity to build knowledge from their own experience, generating ideas and providing answers to the problems given and creating fun learning.

"Hands-on activity is important in inquiry-based teaching to trigger students' curiosity. Students will build knowledge from their experience in that activity, encouraging them to generate information and ideas translated into solutions and answers. Without hands-on activity, it's like we transmit the information one-way to the students, without any engagement on their part. Students will enjoy the learning process more when they are hands-on in the learning process."

Mr. Ali also believes that groupwork is an effective way to encourage critical thinking and problem-solving skills in the classroom. It will encourage students to work together as a team to solve problems related to fraction division and helps them to develop their communication and teamwork skills, which are important thinking skills. The interview excerpt is shown as below:

"This inquiry makes the students think. When we do hands-on activity in groups, the students will discuss and try to solve the problem among themselves. Through the discussion, students will develop communication skills and also thinking skills because there will be clash of ideas and so on."

DISCUSSION AND SUMMARY OF THE STUDY

The inquiry-based teaching of fraction division by primary school mathematics teachers was explored by using case study and data were collected through lesson observations, interviews, and document analysis to answer the research questions. The three themes that emerged from the data are stimulation, hands-on

activities, and making conclusions. These are consistent with the principles of inquiry-based teaching which emphasize active learning, exploration, and reflection.

The first theme, stimulation, highlights the importance of using real-life examples, visual aids, and thought-provoking questions to engage students' interest and curiosity in the topic. This helps students see the relevance of the topic to their own real-life experience, thus promoting their motivation to learn. This theme aligns with research by Bahar and Johnstone (2017), which finds that the use of real-life examples, visual aids, and thought-provoking questions enhance students' interest in the topic, making the learning experience more stimulating and relevant.

The second theme, hands-on activities, emphasizes the importance of providing students with concrete and tangible experience on the concept of fraction division. Hands-on activities in math education have been shown to promote students' problem-solving skills, reasoning skills, and conceptual understanding of mathematics. In the learning fraction division, providing students with this helps them to develop much deeper understanding and more meaningful engagement with the learning material (Chappell, 2013).

Finally, the third theme, making conclusions, emphasizes the importance of allowing students to reflect on what they have learned and draw connections between different concepts. According to Wu and Huang (2019), making conclusions is a critical aspect of inquiry-based learning, as it promotes students' metacognitive skills and their ability to transfer knowledge to new situations. By reflecting on what they have learned and drawing connections between different concepts, students can better understand the relevance of the topic to their lives and apply their learning in real-world contexts.

However, according to Bailey and Heritage (2020), although inquiry-based learning can be effective in promoting student learning outcomes, it is not a one-size-fits-all approach. Some students may not be highly motivated by real-life examples or hands-on activities and may prefer more traditional forms of instruction when learning mathematics. Hence, it is important for teachers to recognize and accommodate to their students' different learning preferences and styles when implementing inquiry-based teaching.

This research also finds that the teachers' approach to teaching fraction division using inquiry-based teaching is influenced by their knowledge and beliefs about the effectiveness of this approach. The teachers believe that inquiry-based teaching is beneficial for promoting conceptual understanding, developing thinking skills, and making learning fun for students. This aligns with previous research that has shown the benefits of inquiry-based teaching in promoting student engagement, motivation, and understanding of mathematical concepts. For example, a study by Hodge and Willis (2018) finds that inquiry-based teaching can improve student engagement and understanding of mathematical concepts in fractions. Similarly, a study by Gagnon and Cormier (2018) stipulates that inquiry-based teaching can promote critical thinking and problem-solving skills in students.

Overall, the findings of this study highlight the importance of using inquiry-based teaching to promote conceptual understanding and thinking skills in mathematics education, specifically in the teaching of fraction divisions. Nevertheless, it remains important for teachers to consider the individual needs of students and contextual factors when deciding on an instructional approach.

In summary, this study concludes that the teachers' approach to teaching fraction division using inquiry-based teaching is influenced by their knowledge and beliefs about the effectiveness of this approach. The themes of stimulation, hands-on activities, and making conclusions emerged from the data and emphasize the importance of active learning, exploration, and reflection in promoting student engagement and understanding. These findings are consistent with previous research and highlight the importance of considering individual needs and contextual factors in instructional decision-making.

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Analyze the Gaps in the Curriculum Improvement Process According to the Criteria Set by The ASEAN University Network-Quality Assurance (AUN-QA)

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ABSTRACT

The purpose of this research is threefold: A) to analyze the gaps between curriculum improvement based on The ASEAN University Network-Quality Assurance (AUN-QA) criteria, B) to study the strengths and weaknesses of adapting AUN-QA criteria for curriculum improvement, and C) to provide recommendations and guidelines for enhancing the curriculum improvement process. The study collected data through interviews with curriculum improvement stakeholders, university administrators, and educational quality assurance units, totaling 16 participants. Content analysis was employed for data analysis. The findings revealed that: A) the gaps in curriculum improvement stemmed from an incomplete analysis of industry needs and a lack of benchmarking with other universities, resulting in incremental curriculum adjustments from the original version; moreover, support systems for teaching and learning did not yet align with instructors' capacity for curriculum enhancement; B) the strengths of adopting AUN-QA criteria included the opportunity to produce graduates meeting future workforce needs, fostering exchanges between instructors and industry regarding future labor market requirements; however, the weaknesses arose from the multitude of assessment indicators within AUN-QA, which were not fully comprehended by instructors and administrators, leading to a slower curriculum improvement process due to insufficient consensus across parties; C) recommendations included developing central personnel to possess requisite knowledge, enabling support for instructors to meet AUN-QA criteria. Administrators should comprehend criteria and provide guidance while establishing a quality assurance network for enhancing exchanges among universities.

KEYWORDS: ASEAN University, Quality assurance, Gap analysis

INTRODUCTION

Quality Assurance System (QA) has become an increasingly important regulatory tool in the management of the global university sector. From one estimate Nearly half of countries around the world have quality assurance systems or QA regulators for university education (Darryl, 2014). There may be many common cultural characteristics. But there are large gaps in the development of the higher education system, and large differences in other subsystems such as economic and political conditions. Consequently, the extent to which borrowing of frameworks and forms has a profound effect on university education systems (Hamish and Mahsood, 2017) is the mechanism used by universities to assess quality assurance. Implementation of curriculum development Curriculum improvements quality supervision To create quality and be accepted (Siriphokaew et al., 2022)

The ASEAN University Network-Quality Assurance (AUN-QA) is a partnership of universities in the Association of South East Asian Nations (ASEAN) member countries. Founded on In November 1995, a total of 13 universities were established and later expanded to 27 universities in accordance with the resolution of the 4th ASEAN Summit, aiming to build an ASEAN identity and develop human resources through strengthening the university network, which will play an important role in helping to achieve results in the establishment of the ASEAN Community The purpose of establishing AUN (ASEAN university network, 2020) is

1. Promote cooperation among scholars and scientists in the region.
2. Develop academic and professional human resources in the region
3. Promote the dissemination of information among ASEAN academic communities.

With the need to develop a quality assurance system at the university level in the same direction by quality assurance system AUN-QA consists of 3 dimensions:

1. Strategic is a university education quality assurance.
2. Systemic It is an internal quality assurance system quality assurance.
3. Tactical It is quality assurance at the program level or at the program level.

AUN QA will use a rating system based on a full score of 7 in the form of a Rating Scale consisting of 8 criteria, each criterion also consists of sub-criteria for further consideration. The main criteria for quality assessment in the area of Expected Learning Outcomes, Program Structure and Content, Teaching and Learning Approach, Student Assessment, Academic Staff, Student Support Services, Facilities and Infrastructure, Output and Outcomes (Asean university network, 2020)

For Thailand, criteria, and guidelines for internal quality assurance at the university level have been announced. Require universities to provide internal educational quality assurance at the program level. and university with a quality assessment system Council of the University Presidents of Thailand Quality Assurance: CUPT QA that has been developed to cover all 3 levels and has principles that focus on continuous quality improvement to excellence and international competitiveness. At the curriculum level, the CUPT QA quality assurance system requires ASEAN University Network Quality Assurance, AUN-QA is primarily because it was developed in collaboration with many parties at an international level, and AUN-QA has already been implemented in Member States. Including Thailand where some universities have already begun operations. And in order to prepare the teaching and learning curriculum to be ready to support such quality assurance. Thailand, therefore, has prepared for universities to aim for educational management. Outcome-Based Education (OBE) is the outcome that occurs to learners through the learning process gained from education and training, or experiences that arise from actual practice or learning at work during the course of study, or actual learning during on-the-job training. To help support quality assurance in accordance with the criteria of The ASEAN University Network-Quality Assurance (AUN-QA) (Asean university network, 2020).

As mentioned above, the change in quality assurance criteria from the old system to The ASEAN University Network-Quality Assurance (AUN-QA) fills gaps in curriculum development to meet the criteria. including the availability of equipment for teaching and learning knowledge and understanding of teachers about the criteria The said change has a period of not more than 2 years that all actions must be completed. Therefore, causing concern in the administration of the university that will not meet the specified criteria. and affect the credibility of

OBJECTIVES OF THE STUDY

The purposes of the study are to:

1. Analyze the gap between curriculum improvement according to the learning style. Outcome-Based Education (OBE) to comply with The ASEAN University Network-Quality Assurance (AUN-QA) criteria.
2. Studying the strengths and weaknesses of applying the AUN-QA criteria to improve the curriculum
3. Suggestions for improving the curriculum improvement process

METHODOLOGY

1.Research Methodology

this researchIt is a qualitative work that conducts interviews with administrators, professors and responsible quality assurance units. about the gap between curriculum improvements based on learning s t y l e s Outcome-Based Education (OBE) to comply with The ASEAN University Network-Quality Assurance (AUN-QA) criteria and conduct a focus group discussion with the person in charge.

2.Population

- 2.1 Responsible executive 1 person
- 2.2 Instructors who need to improve the curriculum 12 people
- 2.3 Officers in the quality assurance department, 3 people

3. Instrument

The instrument in this study can be divided into two types as follows:

3.1 An interview about the gap between curriculum improvements based on learning styles. Outcome-Based Education (OBE) to comply with the criteria of The ASEAN University Network-Quality Assurance (AUN-QA) in all 8 areas as follows

- 1) Expected Learning Outcomes
- 2)Program Structure and Content
- 3)Teaching and Learning Approach
- 4)Student Assessment
- 5)Academic Staff
- 6)Student Support Services
- 7)Facilities and Infrastructure
- 8)Output and Outcomes

3.2 Group chat Inquire about strengths, weaknesses, and ways to improve the curriculum in order to comply with the criteria ofThe ASEAN University Network-Quality Assurance (AUN-QA)

4. Data collection

In this study, the data were collected as follows:

4.1 Coordinate for interviews with school administrators, teachers, and staff responsible for quality assurance.

4.2 Take the results from the interview to analyze the gap between curriculum improvement according to learning styles. Outcome-Based Education (OBE) to comply with the criteria of The ASEAN

University Network-Quality Assurance (AUN-QA) with stakeholders.

4.3 Organizing group discussions with administrators, teachers, and staff responsible for quality assurance to analyze strengths, weaknesses and ways to improve together

4.4 Summary and preparation of reports

5. Data Analysis

The researcher conducted an interview. and translate information from received documents By analyzing the data as narrative data obtained from interviews, notes and document analysis. Then conduct content analysis categorize according to the issues that have been created and interpret the connection of the information. Check the accuracy of each person's information. Is it complete enough? Then compile the content. To find conclusions from the data collected and analysis by classification of data types is to classify data into types. according to the issues that have been identified Then check the received data. Triangulation Method is 1) Verify data from human resources. by doing interviews on the same topic but different people 2) checking information from sources and places and 3) checking the data from time sources by conducting interviews on the same topic but at different times. To confirm the data of the in-depth interview and then analyze the data.

FINDINGS AND DISCUSSION

1) Gap analysis of curriculum improvement

Curriculum Improvement Gap Analysis according to the criteria of The ASEAN University Network-Quality Assurance (AUN-QA) according to the assessment criteria are as follows:

Table 1 : Gap analysis of curriculum improvement based on criteria AUN-QA

Assessment Criteria	operation gap
Expected Learning Outcomes	1. Learning outcomes that do not cover stakeholder needs due to limitations on inviting few stakeholders, needs survey results do not cover the outcomes. Learning of the course solves problems by inviting stakeholders to complete all aspects.
Program Structure and Content	2. The structure and content of the course are inconsistent with the learning outcomes focus of the program. The focus is unbalanced. Most of them are improved from the traditional curriculum. that uses traditional quality assessment
Teaching and Learning Approach	3. Guidelines for teaching and learning, teachers use traditional teaching methods. both general education subjects and majors of the program did not come back to look at the revised curriculum, therefore, there should be a meeting to clarify the improvement of teaching and learning Focusing on student outcomes
Student Assessment	4. Assessment of learners has a variety of assessments, but may not be consistent with the learning outcomes of the subjects being taught due to Teachers improve their own personalized assessments.
Academic Staff	5. Academic personnel are in line with the central personnel development plan. But the evaluation did not reach as planned, depending on the duration of further education and development of the personnel.
Student Support Services	6. Services and student assistance are in accordance with the central plan according to the budget. Some branches do not have support personnel as required by the branches.
Facilities and Infrastructure	7. Facilities and infrastructure are in accordance with the central

Assessment Criteria	operation gap
	development plan. Some branches may be ready, but some branches still lack necessary facilities according to the needs of the curriculum and therefore do not meet the plan.
Output and Outcomes	8. Productivity and outcomes Students who enter are often not qualified for the branch due to the small number of students. Lack of comparison with other university courses at the same level for development. Most of the comparable courses have different contexts. Employment after graduation does not match the learning outcomes of a given field depending on labor demand.

2) Strength-weakness analysis

2.1) Strengths

Strengths in curriculum improvement according to learning styles Outcome-Based Education (OBE) is an internationally recognized benchmark. This causes a process to compare similar courses to improve teaching and learning according to the desired learning outcomes. This is considered to be a curriculum improvement that mainly focuses on the expected learning outcomes and if it can be developed according to the criteria, it can be considered that the development is holistic at the program branch level. and university In the evaluation criteria, there is a reflection on the needs of stakeholders such as enterprises, parents and graduates. It causes an exchange of learning between teachers, learners, stakeholders, academic experts in curriculum development to achieve the expected learning outcomes. If the criteria can be implemented, it will result in graduates having characteristics that are in line with the needs of stakeholders and the labor market. If the criteria can be implemented

2.2) Weakness

Weaknesses of the criteria of The ASEAN University Network-Quality Assurance (AUN-QA) has a total of 53 indicators, which increases the burden on teachers. This caused most teachers to react against the new criteria for syllabus assessment. And most of the administrators lack knowledge of the criteria for assessing the quality of education in the new system. In addition, the infrastructure of some programs is insufficient for development to meet the criteria. and support personnel to help are inadequate Including science and social science teachers lack knowledge and understanding in the process of curriculum improvement, measurement, and evaluation. Despite the improvement of the curriculum focusing on the learning outcomes of the learners, most of the teaching methods are still taught by traditional teachers. Reasons due to inviting academic stakeholders may not cover course requirements. Causing teaching and learning management to remain the same, Anuwong et al., (2022) discussed the weaknesses of the teachers, namely Most instructors still do not understand the principles or methods of benchmarking, which should develop knowledge Understanding of principles and methods of educational management according to the guidelines Outcome-Based Education for teachers

3.Recommendations for improving the curriculum improvement process

Curriculum improvement process must be carried out accordingly. Outcome-Based Education (OBE) in conjunction with the central AUN-QA criteria of universities should implement policies to improve curriculum based on criteria. Emphasize learning outcomes in line with the university's philosophy. Develop personnel development plans and learning support to be ready and consistent with the needs of the curriculum. A process for supervising and monitoring curriculum assessment has been developed to bring suggestions to make improvement plans and operate in accordance with the assessment system. Knowledge is provided from the level of executives, teachers, and quality assurance officers. to understand, including assisting in curriculum development And develop cooperation with universities with similar standards

including student employment to bring benchmark results to improve learning outcomes. Muhammad. (2018) mentioned the involvement of personnel with criteria. AUN-QA The institute should organize training and seminars both externally and internally. to personnel of all departments at all levels to have knowledge and understanding continually and encourage personnel to realize the importance of educational quality assurance (AUN-QA) and emphasizing the participation of personnel in the institution together, planning, implementation, inspection and improvement. In conducting more educational quality assurance work, it will result in the development of educational quality assurance operations to be more efficient and effective.

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Reframing Gender and Development Programs of Higher Education Institutions in Legazpi City for Inclusive and Equitable Tertiary Education

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ABSTRACT

This two-phase study consists of a research-based description of the enrollment and graduation trends in three Higher Education Institutions (HEIs) in Legazpi City to validate the claim of gender reversal in tertiary education admission and exit of students from what used to be a male's domain to what now appears as becoming a female's domain. The study 1) established the enrollment and graduation trends in the HEIs' advanced and baccalaureate course programs; 2) determined the completion rates among the female and male students in various course programs; 3) determined gender differences in enrollment and graduation in the hard and soft sciences; and 4) proposed a reframed Gender and Development (GAD) plan promoting inclusive and equitable tertiary education responsive to females' and males' educational needs alike. Results of the analysis of the quantitative data drawn from documents and qualitative data collected through in-depth interviews, confirmed the observations that: there is indeed a disproportionate number of male and female enrollees in tertiary education in favor of female; there are more females who complete their degree programs earlier compared to their male counterparts; male's enrollment is more prevalent in the hard sciences and female's in the soft sciences; and that these observations are continual over the five-year period covered by the study. The observed gender differences in enrollment and graduation in the advanced and baccalaureate degree levels and in the hard and soft sciences informed the reframing of the existing GAD programs in the three HEIs studied, aligning them with the 2030 Sustainable Development Goals (SDGs) towards the promotion of more gender inclusive and equitable educational programs at the tertiary level.

KEYWORDS: Gender differences in higher education institutions, Gender equality and equity, Equitable education, Inclusive education, Sex ratio

INTRODUCTION

Half of humanity consists of women and the other half, men. Human development is inclusive of both on equal footing. No woman, no man must be left behind in all spheres of human development. The social reality, however, is still far from the ideal. Gender bias persists in some societies, despite worldwide efforts invested in promoting gender equality. In many parts of the world, there are still fields disadvantaging women. For instance, there is still underrepresentation of women in top-tier institutions in science and engineering fields, in politics and governance, in military and maritime industries, and blatantly, in ecclesiastical leadership. These are arenas where women still trail men; where women may not keep pace with men for generations to come.

In September 2015, the United Nations framed the 2030 Agenda for Sustainable Development listing 17 goals, the fourth of which pertains to inclusive and equitable quality education and promotion of lifelong learning opportunities for all (SDG4). The fifth goal (SDG5) pertains to achievement of gender equality and empowerment of all women and girls which reads in part, "... The achievement of full human potential and of sustainable development is not possible if one half of humanity continues to be denied its full human rights and opportunities. Women and girls must enjoy equal access to quality education, economic resources, and political participation as well as equal opportunities with men and boys for employment, leadership, and decision-making at all levels..." (UN, A/RES/70/1).

The challenge highlighted in this paper is how to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG4) and achieve gender equality and empower all women and girls (SDF 5) without prejudice to men. Gender equality is an important goal by itself and a means for achieving development. Hence, development policies and institutions must ensure that all segments of society – both women and men – have a voice in decision making, either directly or through institutions that legitimately represent their interests and needs (World Bank, 2016).

For decades, the Philippine government has continuously undertaken steps toward attaining the vision of bringing about a future that is peaceful and just, unmarked by gender and other biases, respectful of human rights and democratic processes. Gender concerns had already been addressed as early as 1989 when the Philippine Development Plan for Women (PDPW) was approved. Since then, the PDPW has guided the efforts of the state's National Commission on the Role of Filipino Women (NCRFW) and provided the bases for subsequent initiatives on Gender and Development (GAD). Among the landmark GAD achievements in the Philippines to date include: 1) establishment of sex-disaggregated data-base in government agencies and programs; conduct of gender-training and advocacy activities in most departments and attached offices; legislations mandating gender advocacy including the annual legislation of the General Appropriation Act (GAA) which instructs government agencies to set aside a portion of their budgets for women/gender and development activities. Moreover, as mandated, focal points have been formed in various government offices to address gender concerns. The Philippine Plan for Gender-Responsive Development (PPGD) 1995-2025, approved and adopted through Executive Order No. 273, s. 1995 is still in force. But a general observation of the country's GAD program is that most of the programs, projects, and activities (P/P/As) proposed, funded, and implemented in public and private institutions are directed at women, favoring their interest and welfare. Addressing the welfare of men is scantily mentioned in existing policies. Consequently, men are beginning to feel disadvantaged, and are clamoring for a balanced GAD treatment, that is, the planned P/P/As must address men's and women's welfare equally, given that sustainable development is development of humankind – women and men alike. UNESCO enjoins countries to integrate gender awareness and competence into mainstream development and emphasize the need to apply appropriate gender planning to ensure that the resulting condition and results are equitable to women and men (UNESCO in Sumadsad and Tuazon, 2016).

RATIONALE

The observed imbalance in the treatment of men and women in the GAD programs in favor of women can lead to gender equality in the reverse. This emerging phenomenon is manifest in the education sector. One indicator of the seeming gender imbalance in the reverse is the observation that men are outpaced by women in education. Pekkarinen (2011) reported the rapid increase in female educational attainment in the past two or three decades where women are in clear majority among secondary school graduates; among students enrolled in tertiary education; and among tertiary graduates. Further, he projected that the gender gap in educational attainment will keep on widening in favor of women in future. This confirms Buchanan's (2009) report that, "In terms of high school graduation, college entry, and persistence to earning a college degree, young women now consistently outperform their male peers. Arne Hoel (2016) wrote that women now represent more than half the world's university students.

Concerned agencies in the Philippines are not oblivious to gender issues concerning boys or men. No less than the Philippine Commission on Women (PCW) admitted the existence of such issues in Philippine education. Pertinent to this study are the observations that: 1) boys are underperforming in key education indicators compared to girls; 2) higher education degrees manifest marked gender-segregation; and that 3) gender biases and stereotypes, are still embedded in the curricula, instructional methods, materials and learning media (DepEd Order No. 32, s. 2017). However, there is a dearth of conclusive data that can affirm these observations at the local level.

The growing gender disparity in education in the local setting can only be deduced from the literacy rate report of the province of Albay (2018), where simple literacy rate of 10 years old and over was reported to be slightly higher in female (97.1) than in male (96.1) and the functional literacy rate of 10 to 64 years old was markedly higher in female (83.8) than in male (76.2). It is likely that these observed differences in literacy will be perpetuated in tertiary education as more and more basic senior high school graduates seek admission in college. There is therefore a need to conduct studies exploring the reported rising female advantage in tertiary education. The paucity of research on the realms where women outpace men, namely college enrolment and completion, constitutes a major gap in the literature. Some local studies mentioning gender differences in college course enrolment were done to profile the study participants (Barberan, 2020; Nacion, 2018). The extent of gender gap in education in the locality, if indeed there is, needs to be established and this study aimed to provide hard data on the state of gender differences in tertiary education, particularly on enrollment and degree completion. The social and economic costs related to enrollment and degree completion and the consequences of gender inequality and inequity in access to course programs in tertiary education institutions are high. While this concern is outside the scope of this study, the data generated by this study would be a valuable starting point in reviewing and reframing the GAD programs of higher education institutions (HEIs).

The development envisioned in the PPGD 1995-2025 is people-centered, sensitive to the needs and concerns of women and men alike. It is designed "to promote gender equity and equality and to help women and men actualize their potentials...." If the menfolk feel disadvantaged, as many of them openly expressed, then the vision of promoting gender equity and equality is compromised. Thus, the results of this tracer-cum-policy study would be useful in crafting gender inclusive education. Inclusion as an educational philosophy recognizes that all students are learners who benefit from a meaningful, challenging, and appropriate curriculum delivered within the general education classroom, and from differentiated instruction techniques that address their unique strengths and challenges (Idol, 2006; Voltz, Sims, Nelson, & Bivens, 2005, in Salend, 2008). Inclusion seeks to provide all students with fairness by establishing collaborative, supportive, and nurturing communities of learners that are based on giving all students the services and accommodations they need to succeed. In this study, inclusive education explored how the GAD programs could be used to foster the success of the HEIs' inclusion programs in terms of provision of strategies, resources, and supports to be accessed equitably by all – females, males alike. Equity means

being fair and impartial. Clearly, there is a need for educational policies and GAD programs in tertiary education institutions to promote a balanced treatment of women and men as audiences/beneficiaries of trainings, advocacies, and research activities.

RESEARCH OBJECTIVES

This study was conducted with four objectives – i.e. using the sex-disaggregated data from the three selected HEIs, (1) to establish the enrollment and graduation trends in the HEIs' advanced and baccalaureate course programs; (2) to determine the completion rates among the female and male students enrolled in the various course programs; (3) to determine gender differences in the hard and soft science courses; and (4) to propose a reframed GAD Plan that would promote inclusive and equitable tertiary education responsive to the females' and males' educational needs alike.

FRAMEWORK OF THE STUDY

The variables of interest in this study are identified and illustrated in Figure 1. Collecting the data for this study was very straightforward requiring but counting and transforming the counts (frequencies) into percentages or rates. Gender differences in enrolment at the three levels of tertiary education: baccalaureate, master's and doctoral levels were determined from the AY 2013-2014 cohort whose attendance in school until completion was tracked to determine the completion and attrition rates by gender.

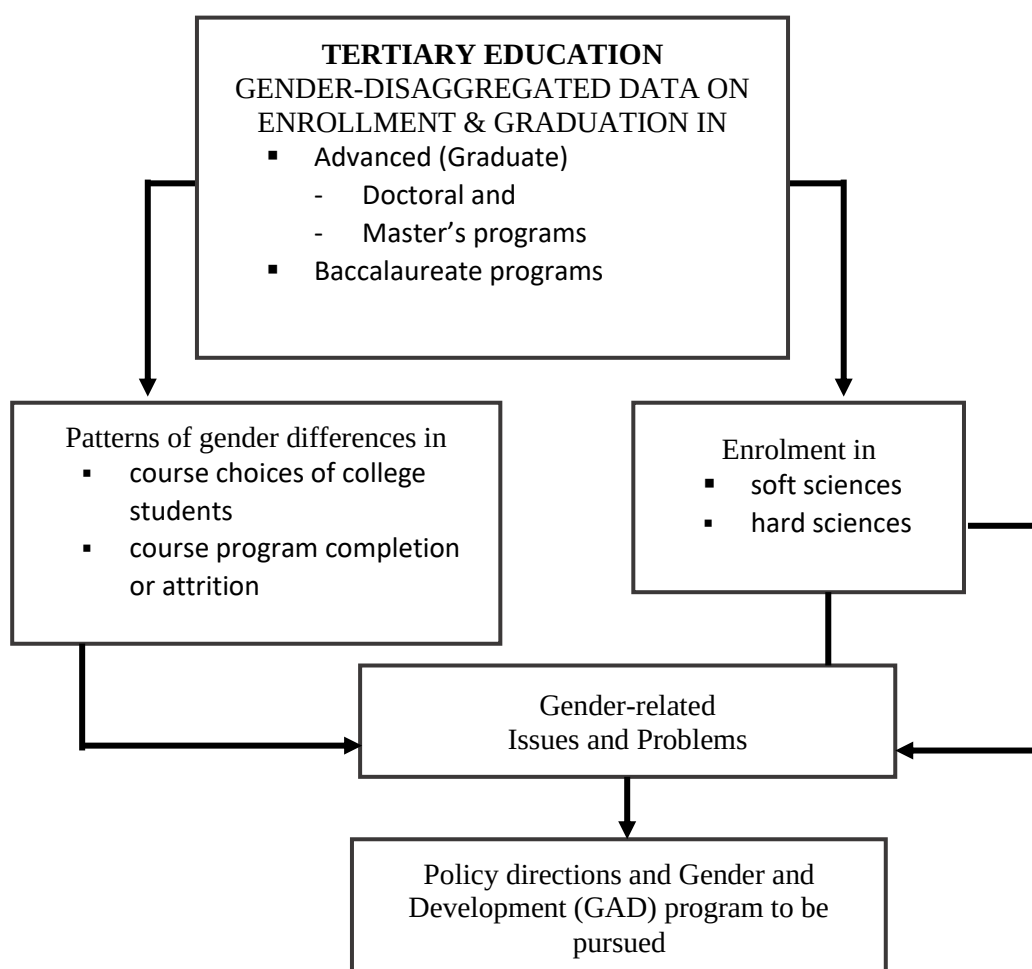


Figure 1. Conceptual Framework

HYPOTHESES

Based on the conceptual framework in Figure 1, the following hypotheses, stated in the null were raised:

- H₀₁ – There is equal proportion of women and men enrolled in the various curricular programs in the HEIs in Legazpi City.
- H₀₂ – Women’s and men’s baccalaureate degree program choices do not differ.
- H₀₃ – The completion rates among women and men from SY 2013 - 2014 enrollees across colleges and baccalaureate degree programs are the same.
- H₀₄ – There are as many women as men enrolled in the hard and soft sciences.
- H₀₅ – No gender differences exist in the graduation rates of women and men across colleges and baccalaureate degree programs.

Most of the fields of study offered as degree programs by the three HEIs covered by the study are multidisciplinary. For clarity, fields of study whose major courses are based on the disciplines - biology, chemistry, computer science, engineering, mathematics, physics, astronomy, geology, meteorology, oceanography, and medicine were categorized as hard sciences. *Hard sciences* are fields that are perceived to be more rigorous and objective than *soft sciences*, described as scientific fields that are perceived to be less rigorous and objective than hard sciences. The fields of study categorized under soft sciences, are those focused on human behavior and social interaction and are based mainly on the disciplines - anthropology, communication, economics, education, geography, history, law, linguistics, philosophy, political science, psychology, and sociology (Thesaurus dictionary.com, Through Co, Peck, 2020).

METHODS

This two-stage study applied a mixed methods research (APA, <https://apastyle.apa.org>, Fraenkel, Jack R., Wallen, Normal E. & Hyun, Helen H., 2013). Stage 1 consisted of quantitative data analysis drawing enrollment and graduation data from the HEI Admissions and Registrar’s Offices. Results of the quantitative data analysis were used as bases of the institution-specific interview schedule used with the key informants (KIs) - the vice presidents for academic affairs (VPAAAs) and the deans and key faculty members of the three HEIs cased in this study. Stage 2 of the study consisted of qualitative analysis of data gathered through in-depth interviews of the KIs to get their views on the policy directions and GAD program plans that were developed by the researcher in response to the issues and problems illuminated by the quantitative data analysis in Stage 1. Documents analysis of existing HEIs’ GAD programs was also undertaken in Stage 2.

Methods and Sources of Data

The selection of HEIs for casing was limited to three – Bicol University (BU), University of Santo Tomas-Legazpi (UST-L) and Divine Word College of Legazpi (DWCL) because these are the only HEIs in Legazpi City that provide graduate and undergraduate programs. Approval sought for the conduct of the study was duly granted by the Presidents of the HEIs. Institution-specific interview protocol was prepared informed by the results of the secondary data analysis made for each HEI for the VPAAAs and deans to react upon and give their insights to. Data from the HEI Offices of Admissions and Registrar were processed using descriptive statistics. The state’s Data Privacy Law limited the data collection. Only numbers were provided by the concerned offices which were used by the researcher in tracking the flow of cohorts of students in baccalaureate and advanced education levels from their entry (SY 2013 -2014) to their exit.

Procedures

Since the data requirements of the study came from the documents on file in the HEIs, permission to collect the data was sought from the three Presidents of the HEIs and upon approval, letters to the heads of the

concerned offices with the Presidents’ approval attached, were personally handed by the researcher. The Presidents’ permission facilitated the researcher’s access to the needed data. To confirm the statistical results and analysis, the researcher presented the data back to the sources for correction. Based on the results of the data analysis, interview schedules, one for each of the VPAAAs, was constructed and conducted by the researcher personally. The questionnaire for the other KIs -- deans and senior faculty members were hand – delivered with the request to return the questionnaire by email. Those who did not send back the completed questionnaires were followed up personally. Responses to the interview schedules and questionnaires were content analyzed and used as bases for developing the proposed GAD framework intended as resource material for reframing the GAD development plan of the HEIs.

Data Analysis

For the quantitative analysis, the HEI enrollment and graduation data were analyzed using descriptive statistics. Since the total population of a cohort of students was covered, inferential statistics was not necessary. Descriptive statistics such as frequency count, ratio, and percentages, mean, and standard deviation were used for data analysis. Sex ratio, defined as the number of males for every 100 females (Philippine Statistics Authority, 2018) was the principal statistical tool used to describe the sex differences in enrollment and graduation in various course programs. The 7- point scale presented below was used to describe the “*genderedness*” of enrolment and graduation data. The term *genderedness* was coined in this study to refer not to a person’s maleness or femaleness but to the extent of male- or female-orientedness of the course programs indicated by the predominance of male or female in the enrollment or graduation data. The researcher determined the association of the variables *genderedness* of courses and the students’ sex attributes (female-male). Yule’s Q (John D Cook Consulting, 2021) was used for this purpose. An arbitrary scale was built by the researcher for the purpose of this study and was used in the data interpretation. Percentages and means were used to describe the enrollment and graduation (or completion or attrition) trends of a given cohort of students.

Range	Description	Range	Description
24 and under	Highly female-oriented	100 -- Gender-neutral	
25 - 74	Moderately female-oriented	101 - 124	Slightly male-oriented
75 – 99	Slightly female-oriented	125 – 174	Moderately male-oriented
		175 and over	Highly male-oriented

To validate the hypotheses, two non-parametric measures of association were employed – percent point difference and Q Coefficient or Yule’s Q. The percentage difference is easy to compute and has a clear conceptual meaning. Its value goes from 0 percent when there is no association, to 100 percent when there is complete association between the variables under study. The Yule’s Q, also known as Yule coefficient of association (John D Cook Consulting, 2021) is defined by the formula: $Q = \frac{ad-bc}{ad+bc}$

Qualitative data analysis made use of content analysis of the responses of the relevant HEI officials to the unstructured interview protocol. The write up of the qualitative analysis was shown to the VPAAAs for their comments and remarks. The analytic process used was iterative consistent with what is required of qualitative data collection.

RESULTS AND DISCUSSION

This study is laden with sex-disaggregated quantitative data indicating the year-by- year trend in enrollment and graduation by institution. Table 1 reflects the summary of sex disaggregated enrollment and graduation data in undergraduate and graduate levels showing a consistent lower number of male enrollees compared with female enrollees in all three HEIs – BU, UST-L and DWCL.

Table 1. Sex-Disaggregated Enrolment and Graduation Data in Undergraduate and Graduate Levels: SY 2015-'16 to SY 2019-'20

HEI	Level	Enrollment			Graduation		
		Male	Female	Total	Male	Female	Total
BU	Undergraduate	25,436	42,051	67,487	9,317	16,023	25,340
	Graduate	934	2,055	2,989	373	632	1,005
UST-L	Undergraduate	4,465	5,046	9,511	350	473	832
	Graduate	245	351	596	59 ⁽¹⁾	88 ⁽¹⁾	149 ⁽¹⁾
DWCL ⁽²⁾	Undergraduate	395	432	827	157	351	508
	Graduate	70	135	205	10	41	51
Total	Undergraduate	30,296	47,529	77,825	9,824	16,847	26,671
	Graduate	1,249	2,541	3,790	442	761	1,203

¹ Graduation data for two school years only.

² Represents the sex-disaggregated data for SY 2013-2014 and the graduation data of the same cohort in SY 2018-2019 analyzed to lend support to the data collected from the two big universities.

The data matrix in Table 2 reflects the summary of the trend in enrollment, graduation, in the hard and soft sciences separately for the HEIs covered by the study. The consolidated data represents the 5-year average for each institution. Only the summarized data averaged for the five-year period could be presented given the page-limit set for the research report. The trend is reported in sex ratio. No averaging was done across institutions because of the huge disparity in the number of enrollees and graduates in the three HEIs. Besides, there were also differences in the data for school years made available to the researcher. This is one methodological weakness of the study.

The tracking of a cohort of students enrolled in SY 2013-2014 revealed that not all of them graduated within the four-year or five-year time frame prescribed for their courses. There is a substantial difference in the number of enrollees and graduates. Generally, the number of graduates is fewer than that of the enrollees. The magnitude of the difference between enrollment and graduation drawn from the aggregated data per course program is substantial enough to say, although not conclusively, that the non-completion rates among women and men from the SY 2013-2014 are not the same across course programs. There was an observed difference in the females' and males' graduation rates. This gender gap in course completion should be studied thoroughly for appropriate intervention. Questions raised in some literature –e.g. Do males achieve less well than their female peers in specific courses? Are females more persistent than males in completing college? Are males more likely to drop out of school than girls? – are interesting research topics to pursue. The differences observed in some programs imply the need for a thorough tracking of the students, their whereabouts and the reasons for their non-completion of their respective courses.

Table 2 clearly shows that in both enrollment and graduation in the advanced and undergraduate levels, in all the three HEIs, the females outpaced the males except in the enrollment and graduation data in the hard sciences which is male dominated. Figures fewer than 100 means female-dominated courses e.g., 44 in advanced education in BU means 44 males per 100 females; figures greater more than 100 means male-dominated courses, e.g., 111 in the hard sciences in BU means 111 male- per 100 female- enrollees. Enrollment data showed more presence of women than men in both advanced and baccalaureate education levels except in engineering, computer and IT and industrial technology. This finding is true to all the three HEIs --BU, UST-L and DWCL, although the gender difference was more pronounced in BU than in either of the two private HEIs. Women's and men's course choices differed, as evidenced by women enrolled in more number of course programs than men, thus rejecting the hypothesis of no difference in women's and men's course choices.

Table 2: General Enrollment and Graduation Trend in the Soft and Hard Sciences in BU, UST-L and DWCL Expressed in Sex Ratio

Trend	BU	UST-L	DWCL
Enrolment			
Advanced Education	44 ¹	68 ³	57 ⁶
Undergraduate	60 ¹	88 ⁴	91 ⁶
Graduation			
Advanced Education	55 ¹	67 ³	24 ⁶
Undergraduate	58 ¹	74 ⁴	62 ⁶
Enrollment in the			
Hard Sciences	111 ²	243 ⁵	340 ⁷
Soft Sciences	36 ²	65 ⁵	65 ⁷
Graduation in the			
Hard Sciences	103 ²	13 ⁵	64 ⁷
Soft Sciences	34 ²	50 ⁵	45 ⁷

¹Average for enrolment data (for SY 2015-2016 to SY 2019-2020)

²Enrolment data (for SY 2013-2014 student cohort) vis-à-vis graduation data (SY 2016-2017 for 4-year and SY 2017-2018 (for 5-year course programs) Soft and Hard Sciences

³Average for enrollment data (for SY 2015-2016 to SY 2019-2020)

⁴Average graduation data (for SY 2016-2017 to 2017-2018)

⁵Enrolment data (for SY 2013-2014 student cohort) vis-à-vis graduation data (SY 2016-2017 for 4-year and SY 2017-2018 (for 5-year course programs) Soft and Hard Sciences

⁶ Average for 3 enrollment years (for SY 2013-2014, SY 2018-2019, and SY 2019-2020)

⁷ Enrolment data (for SY 2013-2014 student cohort) vis-à-vis graduation data (for SY 2016-2017 for 4-year and SY 2017-2018 (for year course programs) Soft and Hard Sciences

Another hypothesis negated by the findings of the study is that there are as many women as men enrolled in the hard or soft sciences. The study found that the presence of females is more pronounced in the soft sciences, particular in course programs related to education and communication, health, and business, while the presence of men is perceived more in engineering, computer, and technology-related course programs.

Gender Differences in Tertiary Education and GAD Program Implication

The results of this study revealed that virtually all course programs are gendered at varying degrees – highly, moderately, or slightly. The hard sciences are male gender-oriented while the soft sciences are female gender-oriented. It appears that no HEI has made any special effort to overcome the stereotype that females are less well suited to the hard sciences as affirmed by the KIs interviewed.

Data reveal that there is underrepresentation of females in the hard sciences -- engineering, computer and IT sciences and industrial technology course programs. This is a consistent observation in the three HEIs. The interview responses of the deans/directors and the VPAs put this *genderedness* of courses to cultural influence, that is, that engineering, and technology best fit the males and education and nursing fit the females. This stereotypical view persists in the students' and the parents' minds. Culturally, parents are still the major influencers of students' career choices. Seemingly, stereotypes in the larger social culture impinge on the students' and parents' choices of courses for their children and result in limited opportunities for them.

Proportionately, more females than males complete the courses within the four- or five- year time frame. There is no single explanation why students fail to graduate on time. Subject failure could be one. According to one recent study, more than half of the student population (59.6%) in the course programs in one college had to take special classes on cost recovery because of failure in some subjects (Morales, 2021).

Whether the failures are incurred more by females than males or vice versa would be an interesting area to explore. Adoption of retention policy where students are required to meet a grade point average (GPA) to be retained in a program could also be another explanation. This reduces the number of graduates from a given student cohort. Perhaps there is a need to rethink this exclusionary policy and adopt interventions to help students complete their courses successfully. Are students properly placed in courses they are likely to succeed? Movements of students across courses cause them to become irregular students unable to graduate on time. Failing to graduate within the time frame incurs a tremendous cost to parents, the school, and the state, as in the case of Bicol University, which is a state university. Of all the three HEIs cased in this study, Bicol University, being a state university, registers the highest number of enrollees and graduates from diverse background, so the data coming from this institution could better over the years.

Data from the Bicol University (BU) Admission's Office show that in the two recent enrolment periods, females still grossly outnumbered the males with sex ratio of 59 for SY 2019-2020 and 64 for SY 2020-2021, lower than the sex ratio of 65 for the SY 2013-2014 student cohort, confirming the observation that female domination of enrollment in college will persist. Could there indeed be an achievement gap between the male and female seeking college admission? Could this be a reason why there are roughly only 4 males out of 10 who qualify in the BU Entrance Examination and admitted to the University. Answer to this question needs a thorough study. What academic intervention may be put in place informed by research? Indeed, there is a need to explore the barriers that limit the males' equitable access to tertiary education.

Underrepresentation of males in tertiary education can reinforce existing societal inequities. In both graduate and undergraduate education levels, females outnumbered their male peers. There is a strong likelihood that females will hold top level positions while males can become over-represented in low-paying and low-status occupations (e.g., in construction, security, driving, or other petty jobs) that offer fewer benefits and job security. Without adequate and appropriate tertiary education, males will have few places in today's highly competitive knowledge-driven workplace. In a culture where the male is regarded as head and breadwinner of the family, the situation where the female spouse brings in more cash than the male spouse can have a devastating effect in the latter's psyche. When the economic power within the household tilts towards the female, this can engender domestic problems as many literatures portray. This psychosocial implication of imbalance power in households will not be elaborated here as it is outside the bounds of this study. Suffice it to say that if GAD programs promote women's empowerment so must they promote men's empowerment equally. Currently, however, as shown by the result of this study, the male students' unique and specialized needs seemed to be often overlooked.

A result of an equitable gender development program must be an educational program that is inclusive, one that looks after the welfare of both male and female students; that no males, no females are left behind in their academic journey. Asked if the GAD funds could be used for educational programs that address males' needs as much as females' needs, all KIs replied in the affirmative, hence the proposal on reframing the HEIs, GAD program.

Reframing the HEIs' Gender and Development Framework

Results of the enrollment and graduation data analysis, the documents analysis, and the interview response of the KIs all confirmed the observation that males lag behind their female counterparts in tertiary education achievements. The gender imbalance poses a challenge to policy makers of HEIs. One of the vehicles through which the imbalance may be addressed is through a comprehensive GAD Plan. The P/P/As for GAD guaranteed by a five percent institutional budget allocation can make a dent in ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG 4) and achieve gender equality for women and girls (SDG 5) alongside men and boys.

The proposed framework is designed for all male and female members of the academic community, without

prejudice to any gender. The details of the proposed framework consist of rationale, recommendation for action and operationalization of 13 programs intended as a resource from which, HEIs may draw possible ideas for integration in their GAD plan along the HEIs three-fold function of instruction, research, and extension. [Note: the reframed framework consists of 22 pages in the original paper, too bulky to be included here even as appendix].

The 13 reframed programs recommended for consideration include: 1) Formulation/Reformulation of the HEI Manual of Operation to reflect inclusivity and equitability in their respective GAD Plan; 2) Formulation of a medium term GAD Plan complete with monitoring and evaluation guidelines aligned with the 2030 SDG and the institutions' vision, mission, and goals; 3) Development of projectized organization structure (Ferraro, 2012); 4) Formulation of clear policies and procedures on managing projects from initiation to closure; 5) Planning and implementation of strategic organization change projects to address the learning needs of students, the working environment of the administration, faculty and the staff that support them; 6) Launching of academic interventions for college students lagging behind in their academic work, those at risk for failing, or for dropping out of school; 7) Rethinking of the curricular programs offered in HEIs within the context of the present education set-up and the needs of the times; 8) Increasing the entry of males in advanced and baccalaureate levels and sustaining their stay through to degree completion through responsive guidance program; 9) Strengthening of graduate faculty's thesis/dissertation writing supervision; 10) Formulation of policy of attraction for students to enroll in undersubscribed course programs that are being promoted by the national government, e.g. baccalaureate degree programs in agriculture and fisheries; 11) Formulation of 5-Year Research and Development Agenda in support of planned strategic organization change; 12) Widening and keeping the doors open to all members of the community who want to pursue more education – e.g. out-of-school-youth, mature students; and 13) Redefining the role of the two universities (BU and UST-L) with respect to the community colleges, emphasizing the complementarity of their respective roles.

Some of the recommendations may be worked out by HEIs individually. Others may best be carried out collaboratively by HEIs. The latter is currently being spearheaded by the principal researcher who is now in the process of brokering the idea of collaborative GAD undertakings of the three HEIs – BU, UST-L and DWCL.

CONCLUSION

The enrollment and graduation trends in the three HEIs in Legazpi City in the advanced and baccalaureate course programs bear a remarkable resemblance to those found in other countries – i.e., a gender reversal in tertiary education trend from what used to be a male's domain a century or so ago, to what appears now as a female's domain. Findings of the study negate the hypothesis that there is equal proportion of women and men enrolled in the various curricular programs in the HEIs in Legazpi City. Women's and men's course choices differed, as evidenced by women enrolled in more number of course programs than men, thus rejecting the hypothesis of no difference in women's and men's course choices. Another hypothesis negated by the findings of the study is that there are as many women as men enrolled in the hard or soft sciences. The study found that the presence of females is more pronounced in the soft sciences, particular in course programs related to education and communication, health, and business, while the presence of men is perceived more in engineering, computer, and technology-related course programs.

The tracking of a cohort of students enrolled in SY 2013-2014 revealed that not all of them graduated within the four-year or five-year time frame prescribed for their courses. There is a substantial difference in the number of enrollees and graduates. Generally, the number of graduates is fewer than that of the enrollees. The magnitude of the difference between enrollment and graduation drawn from the aggregated data per course program is substantial enough to say, although not conclusively, that the non-completion rates among women and men from the SY 2013-2014 are not the same across course programs.

With the SUCs' and community colleges' free higher education guaranteed by R.A. 10831, private HEIs cannot compete in attracting enrollment even with the government's Tertiary Education Subsidy (TES). But with the private HEIs' vast resources, they can help, especially the community colleges in the provision of quality higher education. Partnership between well-established private HEIs like UST-L and DWCL and the community colleges can be forged. Many possibilities can be explored, like the proposed Transfer Program, Faculty Development Program for the community colleges delivered by the private HEIs through learning modes convenient to the faculty.

Public and private HEIs are bound by a common goal – ensure inclusive and equitable quality education and promote lifelong learning (SDG 4). One of the underlying principles of SDG 4 is that gender is inextricably linked to the right to education for all; and that achieving gender equality requires a rights-based approach that ensures that girls and boys, women and men not only gain access to and complete education cycles, but are empowered equally and through education (UNESCO, 2015). Much can be achieved in promoting SDG 4 if private HEIs, SUCs and community colleges can collaborate, mediated by CHED and participated in by government agencies like TESDA and DEPED, to find a common ground for helping women and men reach their full potentials as human beings, the HEIs' reason for being.

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The Relationship between Personal Factors and the Implementation Level of Project-Based Learning among Physics Teacher

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ABSTRACT

This study examines the level of knowledge, self-efficacy, attitude, and implementation of Project-Based Learning (PBL) among physics teachers in Malaysia. It aims to determine if personal factors such as knowledge, self-efficacy, and attitude are related to the implementation of PBL in the classroom. The study adopts a descriptive approach to assess the level of knowledge, self-efficacy, attitude, and implementation of PBL. Pearson's correlation is used to explore the relationship between these factors and PBL implementation. The findings reveal that physics teachers have a moderate level of knowledge regarding PBL, while their self-efficacy, attitude, and implementation of PBL in the classroom are high. Although no significant relationship is found between knowledge and implementation, a moderately significant relationship exists between self-efficacy and implementation, and a highly significant relationship is observed between attitude and implementation. The study suggests collaboration between the Ministry of Education and universities to better prepare future teachers for PBL implementation and the use of standardized PBL modules to save time. Encouraging physics teachers to attend PBL-related courses is also suggested.

KEYWORDS: Project Based Learning, Physics teachers, Physics teaching and learning

INTRODUCTION

The education practices of the 21st century emphasize four key skills: critical thinking, creativity, collaboration, and communication (MOE, 2015). One suitable teaching approach that meets the criteria of 21st-century educational practices is Project-Based Learning (PBL) because the pedagogical design of the PBL approach is highly suitable for replacing traditional methods (Hawari & Noor, 2020). Past studies on the PBL approach in physics education have yielded positive findings, including its compatibility with other approaches (Baran et al., 2018; Widyaningsih & Yusuf, 2020) its greater effectiveness compared to teacher-centered methods (Balemen & Özer Keskin, 2018; Santyasa et al., 2020), and its ability to enhance motivation in solving physics problems (Ale Ebrahim et al., 2020; Lestari & Sumarti, 2018; Mahasneh & Alwan, 2018). Despite the positive impact of the PBL approach on students, there are still issues regarding its implementation by physics teachers in the classroom. One of the issues is related to the teaching practices of teachers who still adhere to teacher-centered approaches in the classroom (Harun & Hadi Yaacob, 2021). This raises questions about the level of PBL implementation and the factors contributing to its implementation.

The factors identified as contributing to the implementation of the PBL approach in the classroom are knowledge, self-efficacy, and teachers' attitudes toward the PBL approach (Du & Chaaban, 2020). These findings are supported by several previous studies, such as Moore (2019), who found that teachers do not implement the PBL approach due to a lack of knowledge about it, and a meta-analysis study by Zee & Koomen (2016), which found that teachers with high self-efficacy tend to teach using recommended new approaches. Previous studies also found that teachers recognize the importance of implementing the PBL approach but lack confidence in doing so (Aksela & Haatainen, 2019; Cintang et al., 2018).

The implication is that these factors contribute to the implementation of the PBL approach. However, previous studies have not focused on physics teachers as respondents; instead, most studies have focused on students as respondents to assess the effectiveness of PBL (Balemen & Özer Keskin, 2018; Chen & Yang, 2019). Therefore, several suggestions have been proposed by previous researchers to address this issue. For example, Abd Aziz et al. (2020) suggested conducting studies on teachers' knowledge levels of PBL so that the Ministry of Education can work together to enhance PBL as a teaching strategy. Similarly, Ale Ebrahim et al. (2020) found that research on self-efficacy related to the PBL approach in STEM subjects is still lacking and they also suggested conducting studies on the PBL approach and STEM subjects in secondary schools.

Hence, it is important to conduct studies on personal factors such as the level of knowledge, self-efficacy, and attitudes of physics teachers toward PBL to examine their relationship with implementation in the classroom.

LITERATURE REVIEW

In line with curriculum changes, studies involving the Project-Based Learning (PBL) approach are increasing. Past studies have found that the PBL approach enhances students' achievements at every level and proves to be an effective method for science subjects such as physics, chemistry, and biology (Balemen & Özer Keskin, 2018). Based on researchers' observations, most conducted studies on the PBL approach can be categorized into three main aspects: teachers' perceptions of the PBL approach, the effectiveness of PBL compared to teacher-centered approaches, and meta-analysis studies involving PBL.

Teachers' Perceptions of the PBL Approach

In a study involving teachers' perceptions of PBL conducted by Habók and Nagy (2016) with 109 teachers, it was found that PBL is not the preferred choice for implementation in the classroom. The study revealed that teachers still tend to adopt teacher-centered approaches. This is because teachers are concerned about

losing control over students during PBL sessions (Le Fevre, 2014). In this study, most respondents agreed that their main task as facilitators in implementing the PBL approach is to provide motivation to students in completing assignments. Regarding the question of effective learning characteristics, most respondents felt that learning involving student activities is the most suitable approach to be implemented in the classroom.

In another study conducted by Viro et al. (2020), they found that most respondents believed the main purpose of the PBL approach is to enhance 21st-century skills in students. The study also found that 55 percent of the respondents agreed that PBL is only suitable for review purposes after students have been taught using traditional teacher-centered methods. These findings align with Habók and Nagy (2016), which indicates that teachers still have less confidence in using the PBL approach in the classroom. Based on both studies, it can be concluded that teachers are aware of the importance of the PBL approach but still have a lack of confidence in its implementation. One of the reasons for teachers' lack of confidence in implementing the PBL approach is their lack of proficiency in planning and uncertainty about how PBL assessment is conducted (Moore, 2019).

The Constraints in Implementing Project-Based Learning Approaches.

The implementation of the Project-Based Learning (PBL) approach faces various constraints. Aldabbus (2018) found that many teachers in Bahrain were not ready to implement PBL due to time constraints, assessment difficulties, content selection challenges, and lack of facilities. Similar constraints were observed in studies by Aksela and Haatainen (2019) and Cintang et al. (2018), highlighting insufficient time, planning challenges, and teacher-related factors as obstacles. However, these studies suggest that training and guidance can help overcome these constraints.

Teachers' readiness to implement PBL is crucial, and their knowledge, attitude, and self-efficacy play significant roles (Bliss & Wanless, 2018; Norliza, 2012). While Norliza's study showed a positive correlation between knowledge, skills, and attitude towards PBL, Du and Chaban's study in Qatar revealed low levels of knowledge, attitude, and self-efficacy. These varying findings may be attributed to location and study design. Nonetheless, teachers' knowledge, attitudes, and self-efficacy are key factors influencing PBL implementation.

Meta-Analysis Study Involving the PBL

In addition to previous studies, meta-analyses have explored the effectiveness of the PBL approach. Balemen and Özer Keskin's (2018) meta-analysis found that the PBL approach is significantly more effective than teacher-centered approaches, particularly in secondary schools. Chen and Yang (2019) conducted a meta-analysis on student achievement and obtained similar results, emphasizing the effectiveness of the PBL approach in science and mathematics subjects. However, most previous studies focused on students rather than the implementation of PBL by teachers, particularly science teachers. Therefore, further studies should investigate the implementation of the PBL approach among science teachers specifically.

Theory

Theory serves as the foundation for any study. In this particular study, there are two theories and one model being used, namely the Theory of Adaptive Control Thinking (Anderson, 1983), the Teacher Self-Efficacy Model (Tschannen-Moran, Hoy & Hoy, 1998), and the ABC Attitude Theory (Eagly & Chaiken, 1993).

The Adaptive Control of Thought (ACT) (Anderson, 1983)

The Adaptive Control of Thought (ACT) theory (Anderson, 1983) supports teachers' knowledge of the Problem-Based Learning (PBL) approach. It emphasizes the importance of aligning knowledge with the curriculum and the design of teaching and assessment. Declarative knowledge, conscious and controllable, forms the foundation, while procedural knowledge represents the ability to apply knowledge in practice (Evertson et al., 1980). Physics teachers' knowledge of the PBL approach is assessed based on declarative

knowledge (definition, theory, and characteristics) and procedural knowledge (ability to solve problems and implement teaching approaches) (Khashan, 2014). Implementing PBL requires following specific steps, such as posing a problem, planning a project, scheduling, monitoring, assessing, and reflecting (MOE, 2017). Assessing teachers' knowledge regarding PBL implementation provides valuable insights into their declarative and procedural knowledge levels. Overall, the ACT theory highlights the interconnectedness of declarative and procedural knowledge and guides the assessment of physics teachers' knowledge in implementing the PBL approach.

Teacher Self-Efficacy Model ((Tschannen-Moran, Hoy & Hoy,1998)

Self-efficacy, as described by Bandura (1995), refers to a person's belief in their ability to effectively carry out activities and handle different situations. In the context of teaching, teacher self-efficacy refers to a teacher's belief in their ability to organize and perform teaching tasks. High levels of self-efficacy are essential for effective teaching and learning sessions. The Teacher's Sense of Efficacy Scale (TSES) divides self-efficacy into three categories: student engagement, classroom management, and instructional strategy. Active student involvement and effective classroom management are crucial aspects of the student-centered approach, which requires teachers to facilitate and encourage student participation. Mastery of instructional strategies, such as time management and using current technology, also contributes to effective implementation of the student-centered approach. Classroom management skills are learned through practice and experience. Teacher self-efficacy has a significant impact on teacher performance and may influence the implementation of specific teaching approaches, as demonstrated in previous studies. Overall, teacher self-efficacy plays a vital role in implementing the student-centered approach, as it influences student engagement, classroom management, and the effective use of instructional strategies.

The ABC Attitude Theory (Eagly & Chaiken, 1993)

Attitude, as defined by Sarnoff (1970), Soetarno (1994), and Eagly and Chaiken (2007), refers to a person's tendency to react and respond to a particular object or situation with either positive or negative feelings and evaluations. In this study, the ABC Attitude Theory by Eagly and Chaiken (1993) is utilized to assess teachers' attitudes towards the student-centered approach. The theory emphasizes the affective, behavioral, and cognitive aspects of attitudes, which must align to form a strong attitude. The affective aspect involves feelings and emotions towards the stimulus material, the behavioral aspect relates to the tendency to act and respond, and the cognitive aspect pertains to knowledge and perceptions acquired through direct experiences and information sources. Attitudes are formed, changed, and reinforced based on beliefs and evaluations of the stimulus material. This study examines physics teachers' attitudes towards the student-centered approach using the ABC Attitude Theory as a framework, considering the affective, behavioral, and cognitive aspects through a questionnaire adapted from previous studies.

In summary, this study investigates the attitudes of physics teachers towards the student-centered approach, taking into account their affective, behavioral, and cognitive responses. The ABC Attitude Theory provides a foundation for understanding the formation and evaluation of attitudes, and a questionnaire is used as a tool to measure these attitudes among teachers

METHOD

This study is a descriptive study involving a survey and correlation analysis with physics teachers in Malaysia as the study sample. The survey was conducted to assess the level of knowledge about the PBL approach, self-efficacy, attitudes toward the PBL approach, and the implementation level of the PBL approach by physics teachers. The survey is suitable to be conducted as the sample size used in this study is large, and the study results can be accurately and effectively generalized to the population (Chua, 2006).

The correlation analysis was conducted to examine the relationship between knowledge about PBL, self-efficacy toward PBL, attitudes toward PBL, and the implementation of PBL in the classroom by physics

teachers. According to Mohd Najib (1999), correlation analysis aims to examine the relationship or influence between two factors. Therefore, Pearson correlation coefficients were used to assess the presence of relationships between two variables.

For the survey, the overall minimum values for each variable were analyzed to determine the level of knowledge about PBL, attitudes toward PBL, self-efficacy toward PBL, and the implementation level of PBL in the classroom. For the correlation analysis, which aims to examine the relationship between two variables, Pearson correlation was used as the data obtained were normally distributed and in interval form. Both studies were analyzed using Statistical Package for the Social Sciences version 26 (SPSS 26).

Sample

A sample study is a group of respondents selected from a population for the purpose of a survey (Salant & Dillman, 1994). This study utilizes cluster sampling method, where the selected respondents consist of physics teachers in Malaysia. Referring to data from the Ministry of Education (MOE), the population of physics teachers in Malaysia in 2021 is 3,509. Based on the sample size determination table by Krejcie and Morgan (1970), the number of respondents to be taken as a sample for this study is 346 teachers. However, researchers rounded the number of samples to 350 individuals in order to have an equal sample size taken in each zone.

This study employs cluster sampling method, where the population of physics teachers is divided into five zones, namely the northern zone, southern zone, eastern zone, central zone, western zone, and East Malaysia zone. Sample size taken from each zone is calculated using the following formula, and then the sample is selected using simple random sampling within each zone.

$$\begin{aligned}\text{sample} &= (\text{population size})/(\text{number of zones}) \\ &= (346 \text{ teachers})/(5) = 69.2 \\ &= 70 \text{ teachers}\end{aligned}$$

Instrument

This study utilizes a questionnaire as a research instrument, where a set of survey forms were distributed to the study sample. These forms were used to assess the level of implementation of the Project-Based Learning (PBL) approach, the physics teachers' knowledge of PBL, the self-efficacy of physics teachers towards PBL, and the attitudes of physics teachers in handling PBL in the classroom.

Knowledge level instrument

The knowledge level instrument consists of a test comprising 15 questions, divided into two constructs: declarative knowledge and procedural knowledge. The test questions were adapted from a research instrument by Jekri dan Han (2019) in their study on the construction and validation of instruments measuring the knowledge, affective, and motivational aspects of science teachers towards STEM teaching and learning. Additionally, the instrument was also adapted from the knowledge variable instrument used in the study by Mohamed Hata dan Mahmud (2020). The instruments from both studies were suitable for adaptation because they focused on STEM knowledge and had high Cronbach's alpha values, 0.84 and 0.936. The adapted questions were also ensured to be aligned with the PAK 21 Kit provided by the Ministry of Education for the use and reference of teachers in implementing 21st Century Skills.

Self efficacy level instrument

Teacher self-efficacy is assessed using the Teacher Self-Efficacy Scale (TSES) developed by Tschannen-Moran and Hoy (2001). The adapted instrument contains 12 items and is divided into three constructs: teaching strategies, classroom management, and student engagement. The TSES instrument was chosen for adaptation because it is commonly used in studies involving self-efficacy and is easily adaptable. Additionally, this instrument has high reliability with a coefficient alpha of 0.86 for teaching strategies, 0.86 for classroom management, and 0.81 for student engagement.

Attitude level instrument

The attitude instrument towards the PBL approach consists of ten items divided into three constructs: cognitive, affective, and behavioral aspects of physics teachers in implementing PBL, in line with Eagly and Chaiken's theory (1993). The research questions were adapted from Mohamed Hata and Mahmud (2020), Jekri and K Han (2019), and Abdul Rahim and Abdullah (2016) because the items used in their studies align with the current study. All three studies examined teachers' attitudes towards STEM education and had high reliability, exceeding 0.7 (Hinton et al., 2004), making them suitable for adaptation.

Data Collection Procedure

The survey questionnaire was distributed to physics teachers in Malaysia using a cluster sampling method, where respondents were selected based on zones. Prior to distributing the questionnaire, the researcher obtained permission from the Education Policy and Research Division (EPRD) to conduct the study. The data collection process took three months and involved 350 physics teachers in Malaysia.

The data collection process was conducted by distributing the questionnaire in the form of a Google Form. Google Form was used to facilitate the quick and widespread distribution of the questionnaire. A total of 83 physics teachers in the northern zone, 97 in the eastern zone, 77 in the central zone, 75 in the western zone, and 71 in the East Malaysia zone were contacted via the Telegram application to answer the questionnaire. However, the distribution of the questionnaire was stopped when the number of willing physics teachers to answer the questionnaire reached 70 respondents per zone. This decision was made due to the required sample size of 350 physics teachers, equivalent to 70 teachers per region. Physics teachers who agreed to participate in the study were required to complete the received questionnaire within 30 minutes to avoid respondents seeking information or answers to test-like questions. Overall, the data collection process spanned 3 months to gather responses from all the participants.

Table 1: The issue of the study and method of analysis

Issues of the study	Method of analysis
1. What is the implementation stage fo physics teachers inside the classroom?	Descriptive
2. What is the level of knowledge of physics teachers regarding the PBL approach in physics teaching and learning?	Descriptive
3. What is the level of self-efficacy of physics teacher towards PBL	Descriptive
4. What is the attitude of physics teachers towards of PBL approach in physics teaching and learning?	Descriptive
5. What is the between the level of knowledge, self efficacy and attitude of physics teacher towards the implementation of the PBL approach in physics teaching and learning	Correlation

RESULT AND DISCUSSION

Descriptive analysis is used to obtain the mean values and standard deviations to describe the distribution of data more clearly. The descriptive analysis in this study aims to answer the first to fourth research questions. The survey data was analyzed using the Statistical Package for the Social Sciences version 26 (SPSS 26) software. The data analysis process involved descriptive statistical methods, including minimum scores, standard deviations, percentages, and frequencies. Table 2 below presents the interpretation of the levels used in Jamil's study (2002). The interpretation of levels is divided into three categories: low, moderate, and high. However, this level interpretation table is only suitable for instruments with a five-point scale, such as the level of PBP implementation, self-efficacy level towards PBP, and the attitude of

physics teachers towards PBL.

Table 2: The Level of Interpretation Based on Jamil (2002)

1.00 - 2.33	Low	For
2.34 - 3.66	Moderate	
3.67 - 5.00	High	

knowledge assessment instruments that utilize only a three-point scale, the interpretation of levels is based on Table 3. The calculation method for each interval is also provided below. According to the calculation, the size of each interval is 0.67.

Table 3 : The Level of Interpretation for 3 level Scale

Skor min	Interprestasi
1.00 - 1.66	Low
1.67 - 2.34	Moderate
2.35 - 3.00	High

calculation of interval

$$= \frac{\text{highest mean score} - \text{lowest mean score}}{\text{level group}} = \frac{3 - 1}{3} = 0.67$$

The level of implementation of PBL

Table 4 : The mean values and standard deviations for the implementation level of the PBL

Construct	Mean	Standard deviation	Level
Readiness to implement	4.14	.430	High
Challengers	3.76	.502	High
Improvement	3.98	.522	High
Overall	3.98	.424	High

(Low=1.00-2.33, Moderate = 2.34 – 3.66, High= 3.67 – 5.00)

Table 4 shows the mean values and standard deviations for the implementation level of the PBL approach based on three constructs: readiness to implement, challenges, and improvement. Based on Table 4, the overall mean value for the implementation level is high, specifically 3.98. This indicates that the implementation level of the PBL approach among physics teachers is high. This finding is contributed by the high mean values for each construct. The readiness to implement construct has the highest mean value of 4.14, while the challenges construct has the lowest mean value of 3.76. However, overall, all the mean values for each construct exceed 3.67, indicating a high level of implementation as per the data interpretation table by Jamil (2002)

The level of knowledge towards PBL

Table 5 shows the mean value and standard deviation of physics teachers' knowledge level towards PBL based on two constructs, namely declarative and procedural.

Table 5: the mean value and standard deviation of physics teachers' knowledge level towards PBL

Construct	Mean	Standard deviation	Level
Declarative	2.39	.590	High
Procedural	2.17	.490	Moderate
Overall	2.31	.493	Moderate

(Tahap : Low = 1.00-1.67, Moderate = 1.68 - 2.35, high= 2.36 -3.00)

Overall, the knowledge level of physics teachers towards the PBL approach is at a moderate level. This is contributed by the declarative knowledge construct, which provides a high minimum value of 2.39, followed by the procedural knowledge construct with a minimum value of 2.17 at a moderate level. Based on this table, it can also be observed that the teachers' knowledge in the declarative aspect is higher compared to their procedural knowledge.

The level of self-efficacy of physics teachers towards PBL

Table 6 shows the mean value and standard deviation for self-efficacy towards PBL based on three constructs: teaching strategies, classroom management, and student engagement.

Table 6: Mean score and standard deviation for self-efficacy towards PBL

Construct	Mean	Standard deviation	Level
Teaching strategies	3.85	.687	High
Classroom management	3.97	.712	High
Student engagement	3.86	.681	High
Overall	3.89	.666	High

(Level: Low=1.00 – 2.33, Moderate = 2.34 – 3.66, High= 3.67 – 5.00)

The assessment conducted found that the mean score for the level of self-efficacy of physics teachers regarding the implementation of the PBL approach in the classroom is high, at 3.89. This is supported by the mean scores from the constructs of teaching strategies, classroom management, and student engagement, which have provided high minimum scores of 3.85, 3.97, and 3.86 respectively. These high mean scores indicate that physics teachers in Malaysia have a high level of self-efficacy in implementing the PBL approach, particularly in terms of classroom management.

The Level of Physics Teachers' Attitude Towards PBL

Table 7 shows the mean values and standard deviations for the level of physics teachers' attitude towards the PBL approach based on three constructs, namely cognitive, affective, and behavioral.

Table 7: Mean score and standard deviation for self-efficacy towards PBL

Construct	Mean	Standard deviation	Level
Cognitive	4.19	.448	High
Affective	4.10	.535	High
Behavioral	4.23	.425	High
Overall	4.17	.430	High

(Level: Low=1.00 - 2.33, Moderate = 2.34 – 3.66, High= 3.67 – 5.00)

Table 7 shows that the mean value for the overall attitude aspect is very high at 4.17. This indicates that physics teachers in Malaysia have a positive attitude towards the implementation of the PBL approach in the classroom, whether in terms of cognitive, affective, or behavioral aspects. Among the three stated constructs, the behavioral construct exhibits a significantly high mean value of 4.23 compared to the cognitive construct at 4.19 and affective construct at 4.11. However, it is important to note that all mean values for the stated constructs are high as they exceed 3.67, as stated in the interpretation table by Jamil (2002).

Pearson correlation analysis

The purpose of this analysis is to answer the fifth research question, which is to identify the relationship between the level of knowledge, self-efficacy, and attitudes of physics teachers towards the PBL approach, as well as the implementation of the PBL approach in the physics subject. It also evaluates the following hypotheses.

- i. There is no significant relationship between the level of teachers' knowledge of PBL and the implementation of PBL in physics instruction.
- ii. There is no significant relationship between the level of teachers' self-efficacy in PBL and the implementation of PBL in physics instruction.
- iii. There is no significant relationship between the level of teachers' attitudes towards PBL and the implementation of PBL in physics instruction.

The relationship between the level of teachers' knowledge of PBL and the implementation of PBL in physics instruction.

Table 8: Analyzing the correlation between the knowledge stage and the PBL approach and the implementation stage of the PBL approach in Physics TnL

			Knowledge
Correlation			0.048
Implementation	sig. (2		0.366
tailed)			
N			350

**p < 0.05

Table 8 shows the analysis of the correlation between the teacher's knowledge level and the PBL approach, as well as the implementation level of the PBL approach in Physics TnL. The correlation coefficient value of $r = 0.048$ indicates a weak relationship between the two variables, but it is not statistically significant ($p > 0.05$). This means that the study fails to reject the null hypothesis (H_0), suggesting that there is no significant relationship between the teacher's knowledge level in physics and the PBL approach, as well as the implementation level of the PBL approach in the classroom.

The relationship between the teacher's self-efficacy level towards PBL and the implementation level of the PBL approach in Physics TnL

Table 9: An analysis of the correlation between the level of self-efficacy and the PBL approach, as well as the implementation stage of the PBL approach in Physics TnL

		Self-efficacy
Correlation		0.43
Implementation	sig. (2 tailed)	.000
N		350

**p < 0.05

Based on Table 9, it can be observed that there is a moderate positive correlation ($r = 0.43$; $p < 0.05$) that is statistically significant between self-efficacy and the implementation stage of the PBL approach. This means that the null hypothesis (H_0) is rejected, indicating that self-efficacy scores have a moderate association with the implementation of the PBL approach. The results indicate that there is a relationship between the level of self-efficacy and the PBL approach, as well as the implementation stage of the PBL approach in the classroom, but only at a moderate level. The value of $r^2 = 0.187$ indicates that 18.7% of the variance in self-efficacy of physics teachers towards PBL is associated with the variance in the implementation stage of PBL in the classroom.

The relationship between the teacher's attitude level and the implementation stage of the PBL approach in Physics TnL

Table 10: An analysis of the correlation between the attitude level towards the PBL approach and the implementation stage of the PBL approach in Physics TnL

	Attitude
Correlation	0.75
Implementation sig. (2 tailed)	.000
N	350

** $p < 0.05$

Based on Table 10, it can be observed that there is a strong positive correlation ($r = 0.75$; $p < 0.05$) that is statistically significant between the attitude level and the implementation level of the PBL approach. This means that the null hypothesis (H_0) is rejected, indicating that attitude scores have a strong association with the implementation of the PBL approach. These findings suggest that the attitude towards PBL is a key factor contributing to the implementation of the PBL approach in the classroom among physics teachers. The coefficient value of $r^2 = 0.56$ indicates that 56% of the variance in the attitude level of physics teachers towards PBL is associated with the variance in the implementation level of the PBL approach in the classroom.

DISCUSSION

Level of implementation

Physics teachers in Malaysia display a high level of readiness and enthusiasm for implementing Project-Based Learning (PBL) in their classrooms. This is in contrast to previous research, which suggested a lack of preparedness among teachers (Du & Chaaban, 2020). The Ministry of Education's support, including topic suggestions in physics textbooks, has contributed to their preparedness (MOE, 2020). Additionally, these teachers actively engage in discussions with their colleagues and actively seek professional development opportunities to enhance their teaching methods (Baran et al., 2018; Widyaningsih & Yusuf, 2020). These findings underscore the proactive and dedicated approach of physics teachers in Malaysia towards embracing PBL.

The commitment of physics teachers in Malaysia to implement PBL is further evident in their proactive efforts to enhance their instructional practices. They actively engage in knowledge-sharing discussions with colleagues and demonstrate a strong interest in professional development courses (Baran et al., 2018; Widyaningsih & Yusuf, 2020). These initiatives reflect their determination to continuously improve their teaching strategies and effectively integrate PBL into their classrooms. Overall, the study highlights the readiness and proactive mindset of physics teachers in Malaysia, indicating a positive outlook towards the successful implementation of PBL.

Level of knowledge

Liu and Sun (2020) emphasized the importance of pedagogical and TnL knowledge for effective teaching by physics teachers. The study divided knowledge into declarative and procedural categories, consistent with Guerriero (2013). Findings revealed moderate knowledge levels among physics teachers regarding the PBL approach, which is concerning as previous studies by Du and Chaaban (2020) and Moore (2019) indicated difficulties in implementation due to low knowledge. However, these studies did not involve physics teachers as respondents and were not conducted in Malaysia. The current study showed high declarative knowledge among physics teachers, indicating awareness of their role as facilitators and the benefits of the PBL approach. Nevertheless, confusion persisted regarding identifying the final product of PBL activities. Procedural knowledge was found to be moderate, with a lack of understanding on assessing PBL activities. Enhancing teachers' knowledge in assessment and implementation methods is necessary for smooth adoption of the PBL approach. The ACT theory (Anderson, 1983) emphasizes the interrelation of declarative and procedural knowledge, highlighting the need for mastery in both areas to prevent disruptions in the learning process. Taking steps to address moderate procedural knowledge will enable physics teachers to effectively implement the PBL approach and prevent student setbacks.

Level of self-efficacy

The study results indicate that Malaysian physics teachers exhibit a high level of self-efficacy when implementing Project-Based Learning (PBL), as evidenced by their confident utilization of the approach (Norsimah & Mohd Mahadzir, 2020). This self-efficacy positively impacts job performance and job satisfaction, consistent with prior research linking self-efficacy to these outcomes (Caprara, 2003). The study also reveals that Malaysian physics teachers demonstrate readiness and confidence in PBL implementation, as reflected in their high minimum scores for instructional strategies, student engagement, and classroom management. This counters challenges identified in previous studies (Aldabbus, 2018; Aksela & Haatainen, 2019) and highlights teachers' belief in overcoming obstacles. Furthermore, teachers' high self-efficacy in PBL positively influences students' learning outcomes (Capraro et al., 2016; Enroglu & Unlu, 2015), ensuring quality education and fostering 21st-century skills in physics students.

Level of attitude

The study findings reveal that physics teachers in Malaysia hold a highly positive attitude towards Project-Based Learning (PBL). They believe that PBL contributes to improved student achievement and fosters a conducive learning environment. The teachers appreciate the active involvement of students in PBL activities and recognize the alignment of PBL with the development of 21st-century skills (Viro et al., 2020).

The study also highlights that physics teachers have a strong understanding of the benefits of implementing PBL. They actively seek knowledge and engage in discussions with colleagues, demonstrating their proactive approach to enhancing their teaching practices. Additionally, these teachers consistently encourage active student participation during PBL activities, fulfilling their role as facilitators in guiding the approach (Dole et al., 2015; Le Fevre, 2014). The findings collectively reflect the positive attitude of physics teachers towards PBL, aligning with previous studies and indicating their commitment to successful PBL implementation (Mohamed Hata & Mahmud, 2020).

Relationship between the level of knowledge and the level of implementation PBL

Based on the findings from correlation table 6, it can be concluded that there is no significant correlation between teachers' knowledge of PBL and its implementation in the classroom. This study indicates that even though teachers possess only moderate procedural knowledge, they still actively implement the PBL approach in their teaching practices. This finding contradicts previous studies by Aldabbus (2018), Cintang et al. (2018), and Aksela and Haatainen (2019), which emphasized the lack of knowledge as a constraint in PBL implementation. However, it is worth noting that the teachers in this study demonstrate a positive approach by implementing PBL while simultaneously seeking to improve their knowledge.

The study suggests considering additional measures to enhance teachers' understanding of the PBL approach. For instance, workshops and courses, as proposed by Siew (2015), could be valuable in augmenting teachers' knowledge and implementation of PBL. These interventions would provide opportunities for professional development and collaborative discussions among educators, ultimately contributing to a more effective implementation of the PBL approach in the classroom.

Relationship between the level of self-efficacy and the level of implementation

The relationship between physics teachers' self-efficacy and the implementation of the PBL approach in the classroom is moderately strong. It indicates that self-efficacy is not the sole determining factor for successful PBL implementation. Surprisingly, both self-efficacy levels and PBL implementation levels are high. However, other factors contribute to this relationship.

Teaching strategies play a role, as some physics teachers lack confidence in effectively implementing the PBL approach due to inadequate instructional planning. Although textbooks are commonly used as a guide, this study found that some teachers deviate from using them. Similarly, in terms of student involvement, physics teachers are reluctant to assist parents in supporting PBL tasks at home, despite the importance of collaboration between teachers and parents.

In summary, while there is a moderate relationship between physics teachers' self-efficacy and PBL implementation, it is influenced by factors such as teaching strategies and student involvement. This indicates that self-efficacy alone does not determine the success of PBL implementation.

Relationship between the level of attitude towards PBL and the level of implementation of PBL

The study findings highlight the strong connection between physics teachers' attitudes and the implementation of the PBL approach in their classrooms. Positive attitudes, such as enthusiasm and a proactive mindset, significantly contribute to successful implementation. Teachers who create an active learning environment and show genuine commitment are more likely to effectively adopt and execute the PBL approach. The study also reveals that affective attitudes are closely linked to readiness, as teachers who enjoy implementing the PBL approach are more prepared to provide opportunities for active student participation and monitor student progress.

However, effective implementation of the PBL approach requires careful planning and preparation. While teachers may initially lack confidence, the study demonstrates that physics teachers can overcome implementation challenges by emphasizing pre-planning activities and achieving instructional objectives. The findings underscore the importance of positive attitudes and ongoing professional development in promoting effective PBL implementation. By fostering positive attitudes and embracing strategies for planning and growth, physics teachers can create engaging and impactful learning experiences for their students.

IMPLICATIONS OF THE STUDY

Overall, the study found that teachers' knowledge about the PBL approach is moderate, but their confidence, attitude, and implementation of PBL are high. The study also revealed a connection between teachers' self-confidence and their attitude toward using PBL. It suggests that physics teachers are capable of implementing PBL in the classroom. Some recommendations were made to improve teachers' knowledge and skills in PBL.

Based on the study, it is important for the Ministry of Education to enhance teachers' knowledge of PBL, both in terms of theory and practice. They can include PBL in university curricula for future teachers and collaborate with organizations like the National Science Center to support teacher training. The findings also show that teachers' confidence and positive attitude are strong motivators for them to seek further

knowledge in PBL. Schools can provide opportunities for teachers to attend relevant courses and develop PBL modules that align with their needs.

In terms of theory, the study found that the current theory used to support teachers' knowledge of PBL doesn't fully match the findings. It suggests that more practical exposure is needed for teachers to effectively implement PBL. Therefore, it is recommended to provide teachers with practical training and support to improve their procedural knowledge.

LIMITATION AND SUGGESTIONS TO FURTHER STUDY

In this study, a survey and correlation method were employed to explore the connection between personal factors and the execution of the Project-Based Learning (PBP) approach in classrooms. Although limited to survey data, the study offers valuable insights into factors influencing PBP implementation among physics educators.

The study focused on knowledge, self-efficacy, and attitudes towards PBP. While other factors may play a role, these three were deemed sufficient for evaluating the extent of PBP strategy adoption among teachers. This aligns with Bryant's educational model, adapted to incorporate self-efficacy in place of skills, as seen in Yoon et al.'s (2012) research highlighting its influence on teaching practices.

While STEM subjects warrant various teaching strategies, the study exclusively spotlights PBP due to its 21st-century relevance (Anaelka, 2018) and endorsement by the Organisation for Economic Co-operation and Development (OECD). PBP not only fosters teamwork and research skills but also cultivates lifelong learning attributes among students (KPM, 2018).

Based on the implications of the study, several recommendations have been proposed. One of them is to expand this research to include other subjects so that specific programs can be designed based on the knowledge level, self-efficacy, and attitudes of subject teachers towards the PBL approach. The researcher also suggests expanding the study by incorporating demographic factors such as gender and teaching experience as variables in the research. Additionally, this study also recommends conducting research related to knowledge about the PBL approach using different theories and constructs.

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The Selection Factors of STEM Major Among B40 Matriculation Graduates at University Malaya

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ABSTRACT

In Malaysia, the number of students that chose STEM major in higher education institutions showed a significant decrease including the enrolment of matriculation graduates in the local university. This trend is seen to negatively impact not only the success of the Malaysian Education Development Plan, but also the economic sector, where the decline in participation in STEM will prevent national aspirations to improve the socioeconomic status of B40 household. Guided by Social Cognitive Career Theory (SCCT), the purpose of this research is to: (1) study student perceptions related to outcome expectation, self-efficacy, environmental factors and perceptions of STEM careers in the selection of STEM majors in university among B40 matriculation graduates; (2) to investigate the relationship between factors (outcome expectation, self-efficacy, environment factors and perceptions of STEM careers) with the selection of STEM majors in university. The participants consisted of 30 matriculation graduates who are currently taking STEM majors at Universiti Malaya. All respondents were chosen through random sampling. The data presented were from pilot test study. The correlational research design is in the form of a survey where quantitative data is collected. Data was collected through an online questionnaire and analyzed using Pearson's correlation analysis. The findings showed that: (1) in general, students positively perceived between outcome expectation, self-efficacy, environmental factors and perception of STEM career as factors when choosing STEM fields in the university ; (2) there was a significant positive relationship between outcome expectation, self-efficacy, environmental factors and perception of STEM career, which is in line with the SCCT model.

KEYWORDS: B40, Environmental factors, Outcome expectation, Perception of STEM careers, Self-efficacy, STEM

INTRODUCTION

The demand for STEM workforce is increasing not only in Malaysia but globally, along with the rapidly growing technology industry (Badhrulhisham et al., 2019). A career in the STEM field makes an important contribution to improving the standard of living and economic growth of the country (Sidin et al., 2020). Malaysians are categorized into three different income groups; Top 20% (T20), Middle 40% (M40) and Bottom 40% (B40). Majority of Malaysians are in B40 household income (DOSM, 2021). According to The Malaysian Ministry of Education through the Matriculation Division (BMKPM) has a vision and mission to develop the potential of Bumiputera students in the fields of science, technology and professionally through quality pre-university education. The Ministry of Education (MOE) through the Cabinet Meeting dated 29 May 2019 has agreed to give students from B40 households the opportunity to enroll into the Matriculation Program in line with the government's desire to empower the B40 group (Abd Mutalib, 2019).

The government has allocated a quota of 60% of Matriculation Program placement to B40 students while 40% is for M40 and T20 students. The purpose of this policy is to balance educational opportunities while helping B40 students in a targeted manner (Abd Mutalib, 2019). Apart from that, the main objective for BMKPM is to produce students who meet the needs of higher education institutions in the fields of science, technology, and professionals. Therefore, BMKPM strongly encourages matriculation program students to venture into the field of STEM at university and further make STEM a career capable of improving the country's socioeconomics (Termize et al., 2021).

Based on statistics from the Department of Statistics Malaysia, majority of households in Malaysia are in the B40 income category. This makes most students in the national education system came from B40 families (Hasan et al., 2021). According to the highlights of previous studies, B40 students, especially those who come from extremely poor families, have a high motivation to succeed in academics to change the fate of the family for the better (Xiao & Song, 2022). However, there are studies that give different views on the relationship between socioeconomic status and student motivation. For example, poor students tend to enter the field of employment instead of achieving success in the academic field (Allang et al., 2019).

This study focuses on several variables that were outlined in the Social Cognitive Career Theory (SCCT) model. SCCT explains that the development of an individual's career starts from interest in the academic field up to the work field (Zola et al., 2022). SCCT also explains that the selection of certain fields is influenced by individual input such as gender and family background. The contextual factors include interest, self-efficacy, environment and perception of the field and career (Brown & Lent, 2013). This study focuses on four blocks that build up the SCCT model, which includes outcome expectations, self-efficacy, environmental factors, and perception of STEM career.

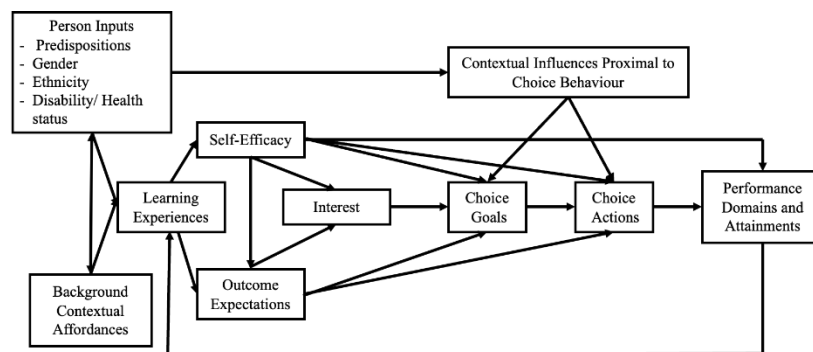


Figure 1 The choice model of social cognitive career theory (adapted from Lent et al., 2013)

In general, the SCCT model is divided into two areas. The first one, which focuses on the left side of the model relates to generate interest or educational goal. Based on this study, students recognize their abilities, skills and potential (i.e., person inputs) and at the same time, influenced by the environment (i.e., background contextual affordances). For example, B40 students may see the impact that their parents' socioeconomic background has on their choices about education or work and may decide to change the situation by investing in education through learning experience or vice versa.

The second area on the right side of SCCT model explains the behavioral and action required to achieve the goal, which is the focus of this study. Interest itself is not generated alone by learning experience but by the combination of few variables that leads to the goal attainment. For instance, if students' self-efficacy beliefs are positive, this will lead to positive outcome expectations and generate interest in goals. There are three models that made the SCCT framework, namely interest model, choice model and performance model (Lent & Brown, 2019). Since this study focuses on the STEM major choices among Matriculation students, the choice model is the most suitable model to be applied.

Matriculation program graduates tend to choose STEM fields at university because they already have STEM education background. However, the choice of this field may change if there is an influence of the proximal environment (contextual influences proximal to choose behaviour), that is, support and obstacles when making a choice (Brown & Lent, 2013). Students who come from B40 households tend to engage in work and are less interested in trying to obtain excellent results in academics (Hasan et al., 2021). Alternatively, students can make life changing choices if they receive support from other individual, family and positive social environment.

2.0 LITERATURE REVIEW

2.1 Outcome Expectation

Outcome expectations is defined as one's belief on the consequences of his or her behaviour. For example, belief about extrinsic reinforcement (rewards for positive performances) and intrinsic reinforcement (choosing STEM field because it is fun rather than choosing it to get a high paid job) (Lent & Brown, 2019). Outcome expectations can be positive or negative. Albert Bandura suggested several different classes of outcomes expectations, such as the expectation of physical, social and self-evaluative outcomes that may affect students' decision on pursuing degree in the STEM field (Lent & Brown, 2019).

According to SCCT choice model, people develop goals to continue studying at higher level courses that are in line with their self-efficacy and interest. Interest has a big impact on how motivated students are at school. In a study conducted by Zainuddin and Kutty (2021), it was explained that high motivation has a positive impact on student academic achievement. There are other studies that also showed the same findings, namely that there is a significant relationship between motivation and student academic achievement (Yusof & Naw, 2021). The justification is that even though the STEM curriculum is seen as very heavy and burdensome for students, if students have a high determination to succeed, in other words, have positive motivation, then students may obtain excellent academic achievements and then choose STEM majors at the next level of their study.

Meanwhile, a different study conducted by Luo et al. (2021) emphasized the relationship between outcome expectations and students' view of STEM careers, in other words, stereotypes. STEM stereotypes or labels significantly predicted their STEM self-efficacy, which in turn predicted their choice goals. For example, a student who is interested in the medical field but held negative stereotypes of surgeons will have negative outcome expectations of being a surgeon. Consequently, this will affect their choice and goals.

2.2 Self-Efficacy

Self-efficacy is defined as belief on how individuals act to achieve a goal (Lent & Brown, 2019; Mau et al.,

2020; Mohtar et al., 2019). The basic principle of self-efficacy theory is that an individual's motivation and achievement are influenced by their confidence and belief in themselves (Lent & Brown, 2019). In the context of this study, self-efficacy is students' beliefs about their ability to perform tasks and skills related to STEM subjects.

High self-efficacy is closely related to student achievement (Mukhid, 2009). In other words, self-efficacy means self-perception of the ability to do something such as generate excellent academic achievements (Yanuardianto, 2019). Excellent academic achievement in STEM subjects leads to the selection of the STEM major at university because students are said to be more confident and capable of mastering the subject they have studied before.

Studies conducted on student self-efficacy have focused on school students who are interested in entering the STEM major as opposed to focusing on students who are currently entering the STEM field, especially students who have graduated from matriculation programs. Therefore, it is very important for studies related to self-efficacy among matriculation program graduates to be conducted so that this factor can be explained comprehensively, and not focused on one group of students only.

In the context of the SCCT theory, which is the basis of this study, it states that the choice of STEM major depends on the interaction between the individual and the environment which includes demographics and environmental factors (such as support and encouragement from parents, friends, friends as well as support and obstacles at school and at home) (Sahin & Waxman, 2020). Environmental factors are a parameter in determining the direction of STEM major selection. Students who have positive interactions with the environment are said to be more positive towards their learning, beliefs, and academic achievements (Ahmad & Lajium, 2020).

Learning takes place in a social context. For example, learning will occur when they see and observe the desired example, provided it is compatible with their abilities (Yanuardianto, 2019). There are many studies that have been conducted related to the factors that influence the selection of students to pursue science subjects in upper secondary schools or in institutions of higher learning (Muda & Azmi, 2017). Among them are factors such as past learning, their perception of science subjects, socioeconomics, differences in subject selection according to gender and the popularity of the chosen subject (Palmer et al., 2017).

The influence of the family, especially the parents, cannot be denied as a factor that determines the decision of students to make a choice (Xiao & Song, 2022). However, how family influence students' decision is still not explained in detail (Kao & Shimizu, 2019). In a study conducted by Termize et al. (2021), it was explained that students have high motivation and actively engage in learning if there is environmental support. Support and encouragement from parents, teachers and peers is often associated with student motivation, where students are more motivated when they receive positive support. Even so, the relationship between parents, teachers and peers regarding student motivation needs to be explained more comprehensively, especially motivation towards STEM majors from the perspective of SCCT.

Low-income families directly or indirectly affect children's development (Arshat et al., 2018). The opportunity to get a better job for this group is low due to having limited financial resources and low education (Arshat et al., 2018). A comfortable learning environment, coupled with the support of social influence increases student engagement in academics (Termize et al., 2021). Excellent academic achievement leads to the selection of majors of interest, and in the context of this study, STEM majors. The selection of a major and career is a dynamic process including the involvement of several parties (Luo et al., 2021). The same study also suggested that the role of family, educators, friends, and school be studied in more depth by involving students of various ages because social interactions differ according to age.

Learning experience is a learning process through past experiences (Mohtar et al., 2019). According to

several studies, fun, interest, and self-efficacy when learning science major are the main reasons why most students are interested in studying this subject at school (Kaleva et al., 2019). Since students spend more time at school, teachers, and the school environment play an important role in fostering students' interest and motivation to learn (Yusof & Nawi, 2021).

According to SCCT model, learning experience is affected by person input such as gender, race, personality and predispositions, background contextual affordances such as social class and lastly, performance domains and attainments such as academic performances and awards received. A positive learning experience will encourage students to choose a major of interest and vice versa. Family financial factors also play an important role in the selection of students choosing majors at university. SCCT explains that students tend to choose majors they are interested in from school to university level. However, if there are obstacles in the proximal environment such as financial and health constraints, the choice of major will change according to the appropriateness at that time.

Media refers to communication and knowledge channels such as the internet, newspapers, magazines, books, films, and television programs. Media channels can influence students' interest in STEM majors and careers involving STEM (Halim et al., 2018). In addition to being visual, information can also be delivered more quickly through media channels and at the same time making STEM exploration more meaningful (Halim et al., 2018).

There are previous studies conducted on using social media as a medium to promote STEM education to a more diverse population (He et al., 2016). The same study also stated the importance of conducting research on college students because at this age level, students can make their own decisions. This coincides with this study which involves pre-university graduates, i.e., graduates of matriculation programs, to study their perception of the media's influence on the selection of STEM majors at university.

2.4 Perception towards STEM career

The development of Industrial Revolution 4.0 causes a high demand for the need to venture into STEM majors and subsequently choose a career that matches the field studied (Kamsi et al., 2019). However, it cannot be denied that students have a negative impression or perception towards science and mathematics subjects at the school up to the university level (Sukri & Nachiappan, 2021). As a result, students consider the subject difficult to learn and decide not to choose that stream (Sukri & Nachiappan, 2021).

Interest, perception, and a positive attitude towards STEM majors lead to the choice of a STEM career (Zhang et al., 2022). Previous studies have reported a lot about high school students' perceptions of STEM subjects and careers, but mostly from the perspective of students in western countries (Zhang et al., 2022). Therefore, this study examines the perception of students graduating from matriculation programs in Malaysia towards STEM careers to provide guidance to other researchers about the trends that are happening in Malaysia.

This study is intended to contribute toward filling a current gap in the literature through the development of understanding the perception of B40 matriculation graduates when choosing STEM field in the university. Therefore, this study is motivated by the following research questions:

What is the overall perception of matriculation graduates regarding outcome expectation, environment, self-efficacy, and perception of STEM careers in the selection of STEM majors?

What is the relationship between the following factors (outcome expectation, self-efficacy, environmental factors, and perceptions of STEM careers) in the selection of STEM majors?

3.0 METHODOLOGY

3.1 Research Design and Instrument

A survey research design was chosen to allow the researcher to examine the relationship between the dependent variable and the independent variable without manipulating the independent variable (Chua, 2020). The questionnaire was made bilingually, namely Malay and English. There are 5 categories of questions asked: (a) student demographics, (b) outcome expectation (c) self-efficacy, (d) environmental factors, and (e) perceptions of STEM careers. Refer to Appendix 1.

3.2 Participants

This study is quantitative, and the study sample is selected through random sampling technique. This sampling technique allows each member of the population to have the same opportunity and probability to be selected as a respondent (Chua, 2020). The sample selected as respondents is thirty B40 students who have graduated from the matriculation program and are studying for a bachelor's degree in the STEM major. The respondents consisted of 24 (80%) female and 6 (20%) male students at University Malaya. 22 (73.3%) respondents were Malay, followed by 3 (10%) Indian and 3 (10%) Others and 2 (6.7%) Chinese.

This study focuses on 4 faculties that offer various STEM majors to students. The faculties in question are (1) 6.7% Faculty of Medicine (including pharmacy and dentistry); (2) 3.3% Faculty of Engineering; (3) 66.7% Faculty of Science; and (4) 13.3% Faculty of Computer Science / Technology and (5) 10% other STEM courses. The selected sample is students from Year 1 to Year 4 who are majoring in STEM at one of the faculties mentioned.

3.3 Validity and Reliability

Table 1: The Cronbach's Alpha value for each variable

No	Variables	Item	Alpha Cronbach
1	Outcome expectation	10	0.875
2	Self-efficacy	10	0.942
3	Environment	25	0.960
4	Perception towards STEM career	10	0.857

To measure consistency in a construct, the Cronbach Alpha value is used as a reference. The data from the pilot study obtained was collected and the level of reliability was measured using the Cronbach Alpha statistical test in the Statistical Packages for Social Science (SPSS) version 29 software. Cronbach's Alpha values range from 0 to 1, where if the value is close to 1 it indicates very high reliability (Chua, 2020). The Cronbach's Alpha value table for each construct provides Cronbach's Alpha value information for each variable, ranging from 0.857 (Perception of STEM careers), 0.876 (Outcome expectation), 0.942 (Self-efficacy) to 0.960 (Environmental factors). In general, this value shows that the constructed instrument is good (because the value exceeds 0.65) and can be used to measure the respondents' opinion about the issue.

3.4 Data Collection Method

This study uses an online questionnaire that contains 55 items. This questionnaire was given to students majoring in STEM from year 1 to year 4 at University Malaya. This questionnaire was conducted to obtain feedback from matriculation graduates in relation to the factors that influence the selection of STEM majors at the university. The questionnaire, titled " The Selection Factors of STEM Major Among B40 Matriculation Graduates at University Malaya" was conducted online and built using Google Form (Refer to Appendix 1). The Google Form link was given to respondents via the Telegram platform and was open for two days to obtain enough respondents for this study.

There are 5 categories of questions asked: (a) student demographics, (b) motivation, (c) self-efficacy, (d) environmental factors, and (e) perceptions of STEM careers. The construction of items for each construct involves two steps. The first step is for the researcher to adapt some appropriate items from the existing instruments related to the selection factors of STEM majors. This research instrument has been adapted to suit the scale that was developed and validated (Halim et al., 2018; Sahin & Waxman, 2020). Some items were modified to suit the objectives of the study (Cresswell, 2008). This study uses the construct related to STEM career selection factors in the study conducted by Halim et al., (2018) and adapts it into this study which focuses on STEM major selection factors.

4.0 RESULT AND DISCUSSION

4.1 Students' perception regarding outcome expectation, environment, self-efficacy, and perception of STEM careers in the selection of STEM majors

Table 2 above shows the summary of mean and standard deviation for each variable. A small standard deviation means that the values in a statistical data set are close to the mean of the data set and tightly clustered (Chua, 2020). By referring to Table 2, all variables have small standard deviation, which means that the data were very close in value to mean. However, parent, which is the sub variable for environment has moderate standard deviation. This means that the data points are moderately spread out, which suggests that respondents have mixed view related to this sub-variable. This finding is interesting because many past studies emphasize that family is the foundation of student academic success (Xiao & Song, 2022).

Table 2: Mean score, standard deviation and interpretation of each variable

Variable	Mean	Standard Deviation (SD)	Interpretation
Outcome expectation	4.30	.46	Low
Self-efficacy	4.31	.55	Low
Environment	4.27	.55	Low
Parent	3.99	.85	Moderate
Friend	4.38	.58	Low
Lecturer	4.31	.59	Low
Media	4.29	.59	Low
Past learning experience	4.41	.61	Low
Perception of STEM career	4.72	.59	Low

4.2 Outcome expectation when selecting STEM majors

Figure 2 shows a summary of students' outcome expectations when selecting STEM majors. The findings indicated that most students 96.6 % students agreed and strongly agreed that they were interested in operating the machines in the workshop and intended to apply the learned skills in their future career.

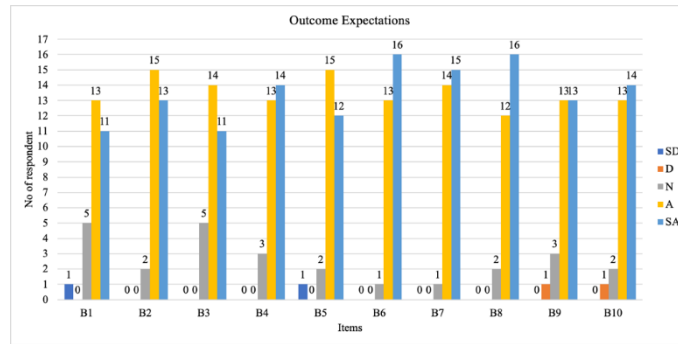


Figure 2: Students' outcome expectation when selecting STEM majors

In addition, the findings also indicated that most students (93.3%) agreed and strongly agreed that they get excited each time they conduct activities related to STEM (B2) and they enjoy being able to handle apparatus/ equipment/ software in the laboratory/workshop (B8). These two statements are examples of self-evaluative outcomes, in which students made their honest opinions on their performances. The findings of this study concurred with previous studies in which positive outcome expectation will nurture students' interest in choosing certain field they desired, which in this study, refers to STEM field (Lent & Brown, 2013).

4.3 Students' perceptions on the self-efficacy

Self-efficacy refers to belief in one's abilities to handle various situations. In the context of this study, self-efficacy refers to students' belief and ability to choose a STEM major at university. Overall, respondents gave positive feedback for all 10 items for this construct (Figure 2). The findings indicate that 96.7% agree and strongly agree that they are confident that they can record data accurately (C8). Recording data is part of the skill needed for STEM field. STEM self-efficacy has been shown to influence student decision to choose STEM major in university.

According to SCCT, students are more likely to pursue majors in which they are confident of their capabilities the most (Halim et. Al, 2018). In this case, students choose STEM major in university because they are confident with their skills that include recording data, operating machines, equipments, apparatus, as well as able to memorize concepts, principles, formulae and equations easily.

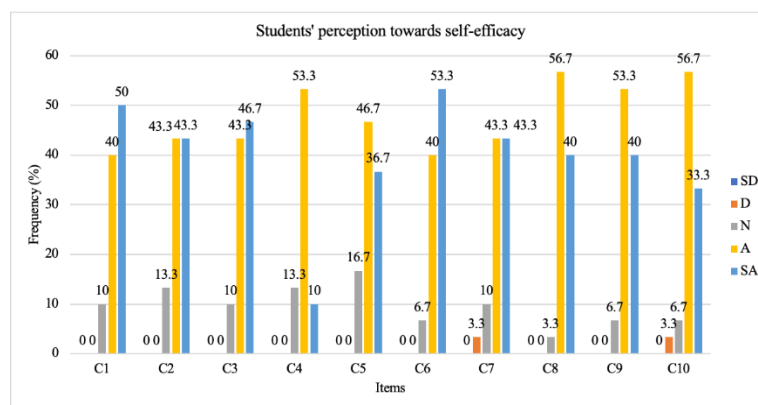


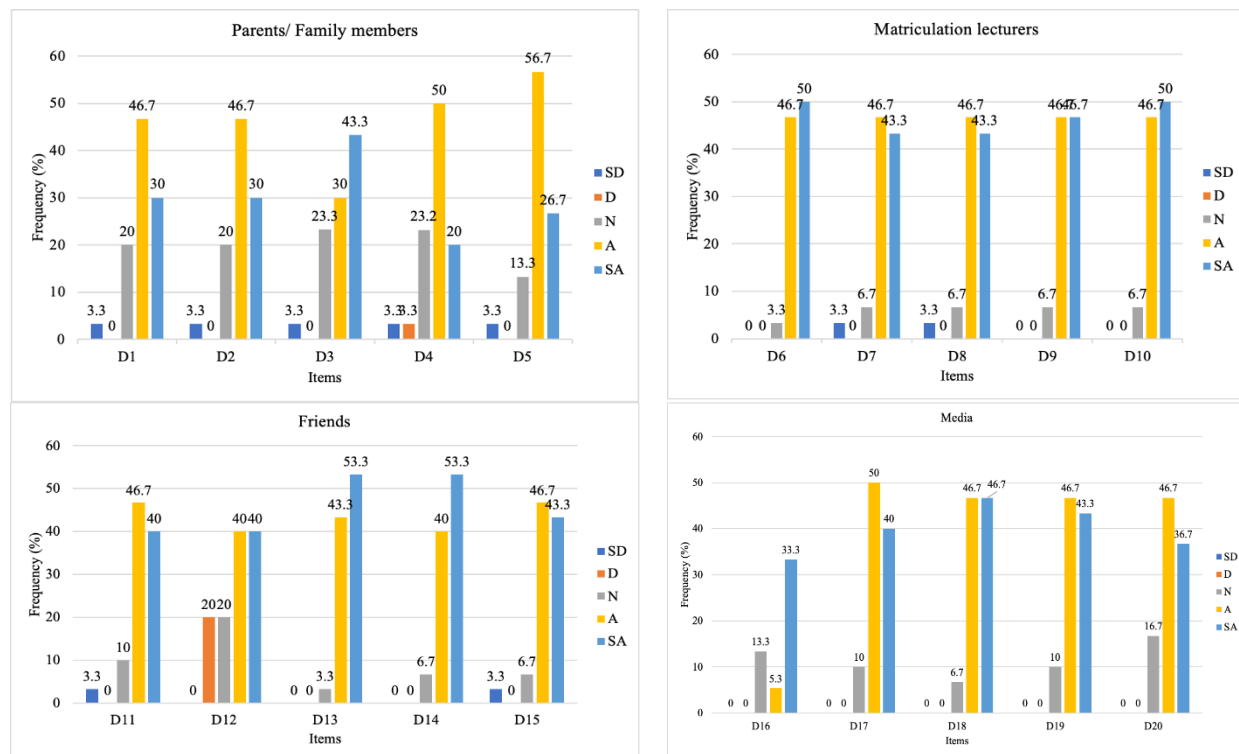
Figure 3: Students' self-efficacy

4.4 Students' perceptions on the environment factors

According to SCCT which is the basis of this study, the choice of STEM major depends on the interaction between the individual and the environment which includes demographics and environmental factors (such as support and encouragement from parents, friends, friends as well as support and obstacles at school and at home) (Sahin & Waxman, 2020). Environmental factors are a parameter in determining the direction of STEM major selection. Students who have positive interactions with the environment are said to be more positive towards their learning, beliefs and academic achievements (Ahmad & Lajum, 2020).

Referring to Figure 3, for social influence involving parents, even though more than half respondents agree and strongly agree that parents influenced their decision for choosing STEM field. However, a significant number of students (23.3%) are not sure whether their parents always have discussions related to their study with them (D3) and whether they want to follow family members' footsteps in majoring in the STEM field at the university (D4).

Secondly, for social influence involving matriculation lecturers, 96.7% agree and strongly agree that their lecturer encouraged them to score in mathematics or science subjects while studying at matriculation college (D6). In addition, 96.7% also agreed and strongly agreed that their matriculation lecturer is a creative and innovative teacher (D10). Thirdly, for social influence involving friends, 96.6% agreed and strongly agreed that their friends helped them to improve the academic results (D13).



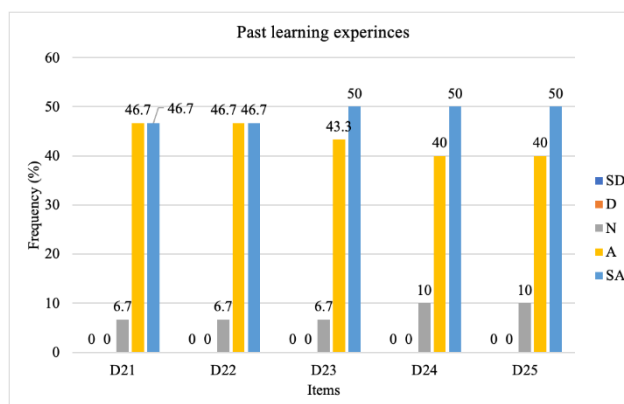


Figure 4: Environment factors

Overall, the findings of this study concurred with previous studies conducted by Termize, Mohd and Zamri (2021) which explained that students have high motivation and actively engage in learning if there is environmental support. Support and encouragement from parents, teachers and peers is often associated with student motivation, where students are more motivated when they receive positive support.

Next, for media influence, 93.4% agreed and strongly agreed that they like to watch STEM programs on the television (D18). The findings of this study were also consistent with previous study (Halim et al., 2018) which found that the use of interesting illustrations and presentations through media plays a vital role in attracting students' interest in choosing STEM field. Lastly, for past learning influence, 93.4% agreed and strongly agreed that the notes provided by the matriculation lecturers are easy to understand and the teaching contents delivered by the matriculation lecturers are easy to understand (D22).

4.5 Students' perceptions of the STEM career in the selection of STEM majors

In this study, perception of STEM refers to the perception of job prospects in STEM fields and the skills needed by workers in STEM fields. Previous studies have reported numerous about high school students' perceptions of STEM subjects and careers, but mostly from the perspective of students in western countries (Zhang et al., 2022). Therefore, this study examines the perception of students graduating from matriculation programs in Malaysia towards STEM careers to provide guidance to other researchers about the trends that are happening in Malaysia. Overall, by referring to Figure 4, most respondents (96.6%) agreed and strongly agreed that working in STEM field require creative problem-solving skills and involving repairing goods/ products (E9).

However, 16.7% respondents stated that they are not sure whether the income in STEM fields are high or not (E3). There are also 16.7% respondents are not sure whether workers in STEM fields can help lives of the others (E8). In addition, 26.7% respondents stated that they are not sure whether those in STEM fields can get job easily even though they are currently studying in the STEM field (E4). In today's era, where information is available at their fingertips, students may obtain information related to career prospects in STEM fields and the skills required in these fields through internet or social media. Additionally, students are indecisive regarding certain items might be due to lack of information about STEM career (Halim et al., 2019). Thus, there is a need to build better understanding of STEM career through appropriate programmes, activities or interventions that help students gain better in-depth understanding about STEM career.

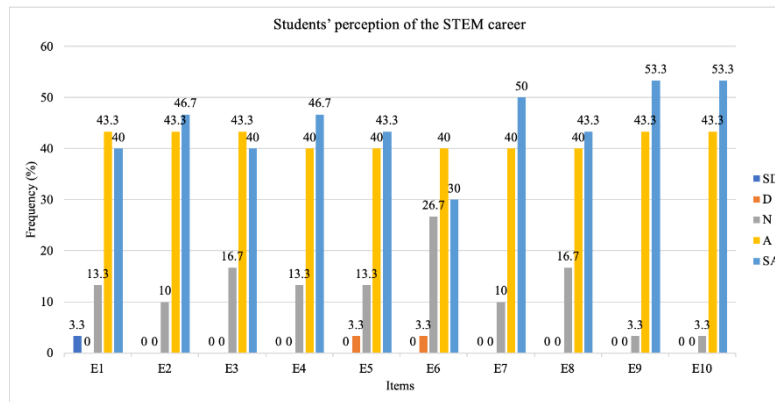


Figure 5: Students' perception of the STEM career

4.6 Relationship between variables

Pearson correlation analysis is used to test the relationship between four quantitative variables: outcome expectation, self-efficacy, environment factors and perception on STEM career. As discussed previously, individual's career development can be explained in detail using Social Cognitive Career Theory (SCCT) (Ahmad & Lajium, 2020; Rasdi & Ahrari, 2020; Sahin & Waxman, 2020). According to SCCT theory, interest in a career is influenced by four main domains, namely self-efficacy, expected outcomes, interest and environment (Mohtar et al., 2019).

The result displayed in Table 3 indicates that there was a significant positive relationship between outcome expectation and perception of STEM career. This shows that positive students' expectations lead to positive perception on STEM career which then became one of the factors why students choose STEM field. In addition, there are also positive correlations between self-efficacy and environment factors with perception of STEM field. The findings of this study are in line with previous studies which stated that in SCCT theory, perception of certain career field depends on self-efficacy and past learning experiences (Lent & Brown, 2019).

Table 3: Correlations between outcome expectation, self-efficacy, environment factors and perception on STEM career

	Outcome expectation	Self-efficacy	Environment factors	Perception of STEM career
Outcome expectation	-	0.757**	0.744**	0.900**
Self-efficacy		-	0.720**	0.818**
Environment factors			-	0.798**
Perception on STEM career				-

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.00 level (2-tailed)

5.0 CONCLUSION

In this study, it was found that outcome expectation, self-efficacy, environmental factors, and perception towards STEM careers significantly correlate with one another. Based on the literature review and the SCCT model, interaction of all factors mentioned influence students' choice. This proves that positive outcome expectation, self-efficacy, environmental factors, and perception of STEM careers play a vital part

in motivating students' decision in choosing fields of study.

For future research, additional studies on students in other STEM fields such as agriculture, sport science and home economics should be conducted so that interest towards STEM field can be explained widely. Secondly, a mixed-methods methodology should be used to examine in more detail on reasons students are interested in STEM field. Next, the participation of students from different year of study should be the same so that social interaction between different classes of age can be explored because according to SCCT, students make more mature choices as they age.

Apart from that, further research could involve interviews with workers in the STEM fields that might help to divulge on how and why students make the decision to choose STEM fields and careers. Halim et al. (2019) in their report stated that passion for science and curiosity about how world works are the important factors that influence students' decision on choosing certain path. Thus, in the future, researching into other factors (apart from the one mentioned in SCCT) that contribute to students' decision choosing STEM may be able to provide better understanding of how students interact with their experiences and choose STEM field.

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7.0 APPENDICES

Item and description for outcome expectations

Item	Description
B1	I will get a high salary if I choose STEM major
B2	I get excited each time I conduct activities related to STEM
B3	My parents are happy if I choose a STEM major at university
B4	There are many career options if I choose STEM major
B5	I learned a lot of things related to technology/engineering which can help me to get a job
B6	I intend to apply the learned skills in my future career
B7	I am interested in operating the machines in the workshop
B8	I enjoy being able to handle apparatus/ equipment/ software in the laboratory/workshop
B9	I want to be praised by my family for getting a degree in STEM major
B10	I will get promoted to higher rank when I work in the future

Item and description for self-efficacy

Item	Description
C1	There are many career options in the future
C2	I am confident in my abilities
C3	I obtained excellent results in one of the STEM subjects
C4	I can solve problems related to science or math concepts well
C5	I can identify problems in everyday life and use STEM to design ways to solve problems
C6	I am confident that I can finish my studies within the given time
C7	I already planned my life for 5 years ahead
C8	I am confident that I can record the data accurately
C9	I can operate machines / technological equipment / apparatus easily
C10	I can memorize concepts, principles, formulas, or equations in STEM subjects easily

Item and description for environmental factors

Item	Description
D1	My parents encouraged me to choose a STEM major
D2	My parents encouraged me to join activities that related to STEM while studying at matriculation
D3	Parents always have discussions with me related to my study
D4	I want to follow my family members' footsteps who majored in STEM at the university

Item	Description
D5	Parents played an active role in helping me choosing STEM major
D6	My lecturer encouraged me to score in mathematics or science subjects while studying at matriculation
D7	My matriculation lecturer encouraged me to choose a STEM major
D8	My matriculation lecturer provided a lot of information that related to STEM majors
D9	My matriculation lecturer applied an interesting learning approach during lectures while studying at matriculation/foundation programme
D10	My matriculation lecturer is a creative and innovative
D11	My friends influenced me to choose a STEM major
D12	Many of my friends chose STEM majors at the university
D13	My friends help me to improve my academic results
D14	My friends always give support to me
D15	My friends and I have the same goal
D16	I like to read books that related to STEM
D17	I love to listen about STEM on the radio
D18	I like to watch STEM programs on the television
D19	I like to surf the internet to get information that related to STEM
D20	Trending on the social media
D21	The notes provided by the matriculation lecturers are easy to understand
D22	The teaching contents delivered by the matriculation lecturers are easy to understand
D23	My matriculation lecturers help me throughout the teaching and learning process
D24	The syllabus of STEM subjects in matriculation and foundation are suitable for students
D25	My matriculation lecturers always diversified the teaching methods

Item and description for perception towards STEM career

Item	Description
E1	I will feel satisfied if I can work in a STEM related field
E2	Careers in STEM are prestigious
E3	The income of workers from STEM fields are high
E4	People who majored in STEM can get the job easily
E5	The STEM fields can provide more job opportunities
E6	Those in STEM fields can get jobs easily
E7	Workers in STEM fields have enough time with their families
E8	Workers in STEM fields can help the lives of others
E9	Jobs in STEM fields involve repairing goods/products
E10	Working in STEM fields require creative problem-solving skills

Use of Artificial Intelligence (AI) in University of Santo Tomas - Legazpi: Issues and Prospects

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ABSTRACT

The emergence of the Fourth Industrial Revolution has brought about significant societal and educational changes leading to the development of Education 4.0, which underscores personalized and adaptive learning experiences. To achieve these goals, AI tools have become indispensable for enhancing traditional teaching methods, creating personalized learning environments, and streamlining administrative tasks. However, the use of AI tools in higher education institutions presents challenges and issues. This study aimed to examine the extent of AI tools usage at the University of Sto. Tomas – Legazpi (UST-L) by faculty and students and identify the associated issues in delivering learning content. The study aimed to guide the responsible use of AI tools in classrooms to maximize their pedagogical potential. The study employed the Technological Pedagogical Content Knowledge (TPACK) Framework, the Self-Determination Theory, and Technology Acceptance Model (TAM) to ensure a comprehensive understanding of using AI tools in higher education. A quantitative research method was used to gather data. The results indicated that AI tools were used to a moderate extent across different dimensions, highlighting their potential benefits. In conclusion, the study provides insights into the current utilization of these tools in education. It emphasizes the importance of aligning these technologies with pedagogical practices, promoting ethical use, and continuously evaluating and improving them to enhance teaching and learning experiences. By recognizing the transformative potential of AI tools, educators, policymakers, and researchers can make well-informed decisions to leverage these tools effectively in higher education institutions.

KEYWORDS: AI Education, AI Tools UST – Legazpi, Issues, Prospects

INTRODUCTION

The Fourth Industrial Revolution pertains to the continuous digital revolution that has transpired since the mid-20th century. The revolution is characterized by the convergence of technologies that is causing a blending of the boundaries between the realms of the tangible, virtual, and organic. The Fourth Industrial Revolution significantly impacted education, giving rise to Education 4.0 -- a shift towards learner-centric approaches and personalized and adaptive learning experiences. The current educational paradigm represents a crucial change in disseminating, acquiring, and utilizing knowledge, emphasizing on analytical reasoning, innovation, teamwork, and flexibility. This facilitates the ability of individuals to excel in a society heavily influenced by technology.

AI tools are a critical enabler and catalyst of Education 4.0. AI is a technological innovation that empowers machines to simulate a range of intricate human abilities (Sheikh, Prins, & Schrijvers, 2023). It can enhance and augment traditional teaching methodologies, create personalized learning experiences and streamline administrative tasks. These tools gained prominence for their potential to revolutionize teaching and learning experiences. Furthermore, exploring the pedagogical prospects of AI tools in higher education institutions is crucial to understanding their impact on teaching and learning practices. That said, there are essential issues associated with their use.

This research paper focuses on the use of AI tools in a higher education institution, specifically the University of Sto. Tomas – Legazpi (UST-L) Graduate School, where learners engage in advanced academic pursuits and research. By examining the extent of the use of these tools in the learning and teaching process, this study aims to provide educators, policymakers, and researchers with valuable insights into their transformative potential.

RESEARCH OBJECTIVES

The study determined the use of AI tools in UST – Legazpi Graduate School. Specifically, it sought answers to the following:

- (1) Examine the extent of the use of AI tools
- (2) Determine the issues attendant to their use, and
- (3) Determine the pedagogical prospects for the use of AI tools

FRAMEWORK OF THE STUDY

This study draws on three theories and concepts to examine the use of AI tools in higher education institutions: The Technological Pedagogical Content Knowledge (TPACK) Framework, Self-Determination Theory, and the Technology Acceptance Model (TAM).

Punya Mishra and Matthew J. Koehler believe the TPACK framework integrates technology, pedagogy, and content knowledge (Technology Integrate Framework, n.d.). This supports the researchers in evaluating how AI tools align with pedagogical practices and specific content areas, assessing their effectiveness in enhancing teaching and learning experiences. The framework ensures that adopting AI tools is pedagogically sound and supports the goals of instruction.

On the other hand, the self-determination theory developed by Edward Deci & Richard Ryan, focuses on individuals' intrinsic motivation, autonomy, and competence (Lopez-Garrido, 2021). This enables the researchers to examine the impact of these tools on students' motivation and sense of control, assessing whether these tools empower students, facilitate self-directed learning, and enhance motivation.

Davis's Technology Acceptance Model (TAM) is widely recognized for understanding users' acceptance and adoption of technology. It posits that the utilization of technology depends on an individual's behavioural intention, which determines the acceptance of the technology (Lai, 2017). TAM provides a valuable framework for exploring members of the faculty and students' acceptance of AI tools. Researchers examined the usefulness and ease of use of AI tools and their impact on teaching and learning experiences, addressing factors influencing their acceptance and adoption, such as faculty and student readiness, training, and support.

Integrating these three frameworks provides a comprehensive approach to studying the use of AI tools in UST- Legazpi Graduate School. The TPACK framework ensures technology integration with pedagogy and content knowledge, self-determination theory focuses on learners' motivation and autonomy, and the TAM focuses on user acceptance and adoption factors. This combined approach enables the researchers to evaluate the extent of AI tool usage, identify potential issues, and explore the prospects for leveraging AI tools to enhance teaching and learning. The conceptual framework is illustrated in Figure 1.

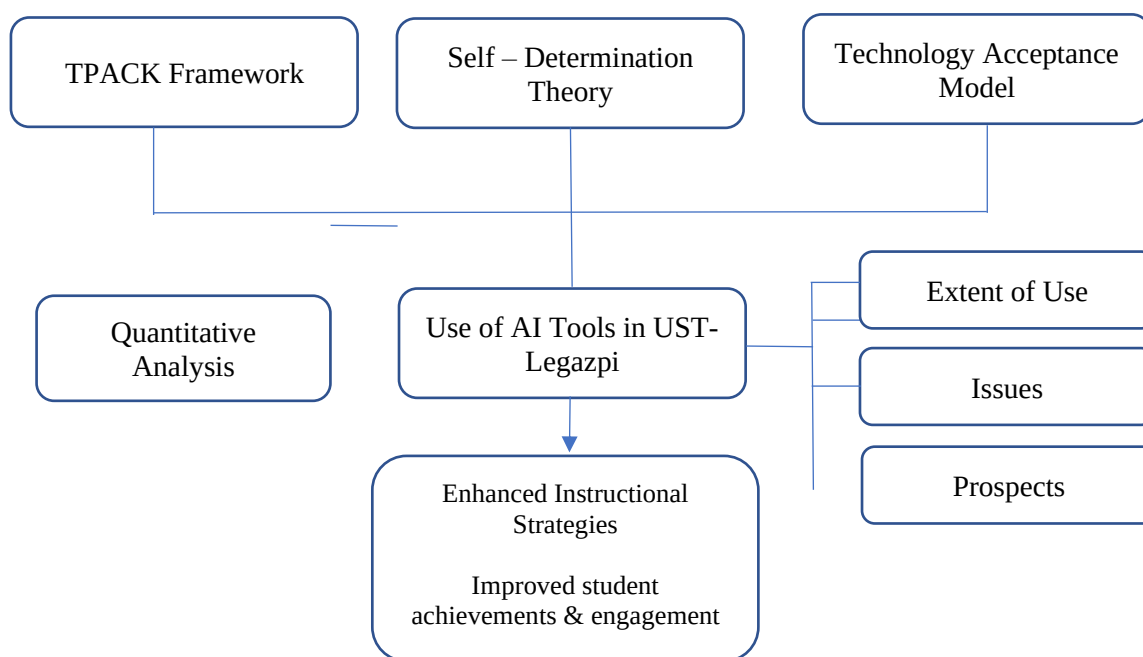


Figure 1: Conceptual Framework

RESEARCH METHODOLOGY

The study utilized a quantitative method of research. The data was collected through a questionnaire administered to 147 students and 18 faculty members of the Graduate School of UST – Legazpi using Google Forms and printouts. The retrieval rate for students was 95.23 % or 140 out of 147 and 83.33% or 15 out of 18 for members of the faculty. Interviews and personal observations were implemented as verification devices to support and clarify the results obtained from the survey.

The researchers utilized three theories to explore the utilization of AI tools in UST-Legazpi. The TPACK framework facilitated an assessment of how AI tools align with teaching practices, while the Self-Determination Theory helped in understanding the impact of these tools on students' motivation and sense of control. The TAM model assisted in examining attitudes toward AI tools. The researchers employed the

variables *usefulness*, *ease of use*, *social good*, and *confidence*, and these were incorporated by gathering respondents' opinions on *attitudes*, *confidence*, and *perceptions of social benefits* through a questionnaire. This comprehensive approach allowed the researchers to evaluate the extent of usage, identify issues, and explore the potential of AI tools to enhance teaching and learning.

The TAM Theory addresses the importance of *usefulness* and *ease of use* as critical factors influencing the acceptance of AI tools among faculty and students. Moreover, the Self-Determination Theory, which revolves around intrinsic motivation and autonomy, extends its scope to embrace the concept of *social good* by highlighting how AI tools have the potential to contribute to educational advancement.

The research tool was a self-made questionnaire based on several studies and literature. The questionnaire underwent validation via pilot testing, wherein feedback and recommendations gathered during the process were considered in the instrument's finalization.

The research utilized the statistical methods of frequency and weighted mean to evaluate the extent of the use of AI tools. The mean responses were interpreted using the scale as follows:

Table 1: Interpretation Rating

Rating	Interpretation	Adjectival Description	Range Scale
4	To a great extent	AI tools are used heavily or to a considerable degree	3.51 – 4.00
3	To a moderate extent	AI tools are used not extremely or excessively	2.51 – 3.50
2	To a less extent	AI tools are used barely or to a limited extent	1.51 – 2.50
1	Not at all	AI tools are not used	1.00 – 1.50

Furthermore, frequency and percentage were applied to identify the issues associated with the use of AI tools.

RESULTS AND DISCUSSION

The study revealed the following results:

1. The extent of use of AI tools revealed that the respondents rated usefulness (3.29), ease of use (3.28), and social good (3.30) “to a moderate extent. These findings suggest AI tools have the potential for further development and improvement, but user education and awareness of their capabilities and benefits are needed to enhance user experience. The technology Acceptance Model (TAM) theory posits that usefulness significantly determines individuals’ technology acceptance and usage. This notion is reinforced by Garos’s research, which underscores the critical importance of usefulness in adopting technologies (Garos, 2020).

Students respondents provided feedback such as “*Great tool in aiding students learning*,” “*AI drives digital transformation; AI revolutionizes education and promotes flexibility; AI may affect human creativity and expertise*,” “*Personally using AI tools for grammar check and additional information for studies*,” and “*Good learning experience*.” Some student respondents said they utilize AI generative tools such as ChatGPT, Quillbot, Grammarly, and Midjourney. Students use AI-powered writing tools for translation, spelling, rewriting, paraphrasing, and summarizing (Burkhard, 2022). It indicates that the respondents recognize AI tools’ advantages and benefits in learning and teaching. Hence, positive perception and acceptance of using AI tools.

Additionally, the respondents expressed a moderate level of attitude (3.22) and confidence (3.16) in using AI tools. This suggests that there is a need to establish a sense of trust and assurance among users with

respect to the application of these tools. To achieve this, developers and organizations should emphasize such technologies' dependability, accuracy, and safety, provide additional support and guidance, and refine them based on user feedback and preferences. According to Garos, trust-related factors and behavioural uncertainty are predictors of AI Acceptance (Garos, 2020). Higher levels of technological trust and lower levels of behavioural uncertainty are more likely to result in the acceptance of AI tools. In contrast, lower levels of technological trust and higher levels of behavioural uncertainty may lead to resistance.

Some of the feedback provided by the respondents includes statements such as “Students may rely on AI software and don't have time to work hard like reading some materials,” “The AI tools are very useful but must be used with due care and due diligence,” “Encourage laziness,” “It helps students to some extent, but it should not be abused so as not to sacrifice the ability of the student to learn on her own and have his or her own style, especially in technical writing,” “AI tools can provide answers to problems, but they may not teach critical thinking skills, which are essential for everyday problem-solving.” This feedback highlights the importance of exercising prudence and carefulness in the use of AI tools to ensure a balanced use and maintain academic integrity. Educating users about these technologies' proper utilization and constraints can facilitate their ability to make informed judgments.

Additionally, considering the widespread availability of AI-powered writing and AI-generative tools on the internet, it may be necessary to explore innovative approaches for integrating them into the academic curriculum, taking into account potential violations of established regulations by students. This would help mitigate the limitations of these tools and optimize their advantages.

In general, the respondents rated the extent of use of AI tools (3.25) as “to a moderate extent”, indicating a recognition of the potential benefits of AI tools in UST – Legazpi Graduate Schools. However, adopting these tools may be challenging, including ethical implications and a lack of familiarity and comfort with AI technology. Furthermore, there is room for further integration of AI tools into pedagogical practices, with a focus on aligning them with educational objectives and complementing traditional teaching methods rather than replacing them. Continuous evaluation and improvement of AI tools are crucial, as developers and researchers should actively seek feedback from faculty members and students to understand their needs, challenges, and suggestions. Table 2 presents the result on the extent of the use of AI tools.

Table 2: Results on the Extent of Use of AI Tools

Variables	Students	Faculty	Mean Score	Interpretation
Usefulness	3.22	3.37	3.29	To a moderate extent
Ease of Use	3.24	3.32	3.28	To a moderate extent
Social Good	3.20	3.39	3.30	To a moderate extent
Attitudes Towards Using AI Tools	3.23	3.20	3.22	To a moderate extent
Confidence in Using AI Tools	3.15	3.17	3.16	To a moderate extent
		Grand Mean	3.25	To a moderate extent

2. The survey identified several issues regarding the use of AI tools, as perceived by the *students*:
 - a. Promotes over-reliance on technology (94%). Results suggest that students may become excessively dependent on AI tools, potentially neglecting critical thinking and problem-solving skills essential for their development.
 - b. Students developing ways for cheating on exams & bypassing plagiarism checks (86%). The survey highlights concern about students utilizing AI tools to cheat or bypass plagiarism detection systems.
 - c. Use of automatic text summaries or math solvers to complete homework (76%). Students perceive using AI tools for generating summaries or solving math problems automatically as problematic.

These perceptions by students are supported by the study that examined the negative impact of AI on academic integrity and cheating (Hussain, et al., 2022). Malekos emphasizes that while AI can revolutionize how students learn by providing personalized, engaging, and accessible education, it cannot replace human interaction, as doing so may result in social detachment (Malekos, 2023). Dr. Palegeorgiou further emphasizes the need to acknowledge the potential disadvantages, such as information overload, fake news, and a lack of critical thinking skills (Malekos, 2023). Another study conducted by Ma, et al., suggests that AI writing assistants, like ChatGPT, may contribute to plagiarism and academic misconduct. In addition, It is crucial to recognize that AI-generated scientific text lacks valuable insights and external consistency (Ma, et al., 2023). Therefore, AI-generated texts should be used as tools rather than authoritative sources. Faculty members must exhibit awareness of these concerns and prioritize the responsible use of AI tools, fostering a perception among students that these tools are supplementary rather than sole reliance. Additionally, the research results underscore the necessity of implementing academic integrity policies and safeguards to mitigate the possible abuse of AI tools. Faculty members should actively promote ethical practices and educate students on appropriately utilizing these tools, emphasizing the importance of maintaining originality and integrity in their academic work. Table 3 illustrates the issues attendant to the use of AI tools as perceived by students.

Table 3: Issues Attendant to the Use of AI Tools *Perceived by Students*

Indicators	Frequency	Percentage
1. Promotes over-reliance on technology.	131	94%
2. Students/users develop ways for cheating on exams & bypassing plagiarism checks.	121	86%
3. Use of automatic text summaries or math solvers to complete homework.	107	76%
4. Replace sources with AI-generated content summaries or study materials.	103	74%
5. Copyrighted educational resources are redistributed without permission.	82	59%
6. AI tools are used to generate text or content to manipulate perceptions.	56	40%
7. AI-generated content, tools, or technologies encourage the falsification of academic records or credentials.	53	38%
8. AI-powered voice and video manipulation to conceal identity.	51	425%
9. The application of AI-generated text creation or chatbots to imitate teachers or schoolmates in digital communication has become commonplace.	50	36%
10. Exploitation of vulnerabilities of AI-powered educational applications or assessment tools is a reality.	42	30%

Indicators	Frequency	Percentage
11. Text can be rewritten with a push of a button.	40	29%
12. Promote digital peer pressure and social harm.	37	26%
13. Peers or faculty members are impersonated in virtual class sessions.	33	24%
14. AI technologies facilitate breaches of the school's data security system.	32	23%
15. Breach of school data security system.	19	14%

Table 4 presents the perceived issues attendant to the use of AI tools, as reported by the *faculty respondents*. These include:

1. AI tools cannot correctly evaluate text structure, content logic and coherence (67%)
2. AI algorithms must be more reliable to provide teachers with useful information (60%).
3. AI tools promote over-reliance on technology (60%); and
4. Technological knowledge is needed for AI-based teaching (54%).

These results highlight the importance of maintaining human intervention in educational assessments. While AI tools can provide valuable insights, it is crucial for faculty members to acknowledge the necessity of human judgment when evaluating complex skills such as critical thinking, creativity, and effective communication.

Table 4: Issues Attendant to the Use of AI Tools Perceived by Faculty

Indicators	Frequency	Percentage
1. AI tools cannot correctly evaluate text structure, content logic and coherence.	10	67%
2. AI algorithms must be more reliable to provide teachers with useful information.	9	60%
3. AI tools promote over-reliance on technology.	9	60%
4. Technological knowledge is needed for AI-based teaching.	8	53%
5. AI tools provide comprehensive adaptive & personalized feedback.	7	47%
6. AI tools do not have enough capability to process specific features.	6	40%
7. AI feedback may take longer than expected.	6	40%
8. Technical infrastructure in schools is limited for AI-based teaching.	5	33%
9. AI systems cannot operate in multiple learning strategies.	4	27%

Additionally, recognizing the need for technological knowledge in AI-based teaching highlights the importance of providing professional development and training for faculty members. Faculty respondents expressed concerns such as, “*Older professors are less adaptive to AI tools, thus finding it hard to use it to the fullest,*” and “*There may be a steeper learning curve for instructors who have yet to adapt to the rapid*

development in technology.” Educational Institutions must ensure faculty members have the necessary knowledge and skills to integrate AI tools into their teaching practices effectively. The TPACK framework supports this perspective by highlighting the significance of understanding how to incorporate technological tools into instructions. Institutions should offer opportunities for professional development, workshops, and resources to assist faculty members in developing the competencies required to maximize the benefits of AI tools in the classroom.

Furthermore, additional input from faculty respondents was that “*Internet and power interruption tends to hamper the effectivity of AI tools.*” According to Mercader & Gairin, identifying and considering existing obstacles can help teachers focus on developing necessary skills and familiarizing themselves with facilitating factors and strategies to overcome obstacles and achieve full integration of digital technology (Gairin & Mercader, 2020). The use of AI tools relies on stable internet connectivity and an uninterrupted power supply. To effectively utilize AI tools in teaching, learning, and other processes, organizations and educational institutions need to prioritize robust infrastructure and contingency planning. This ensures seamless operation and optimization of benefits.

3. Based on the student’s perceptions of the issues related to the use of AI tools, the following prospects were identified:

- a. *Promoting Balanced Technology Integration:* The perception that AI tools promote over-reliance on technology suggests the prospect of encouraging a balanced approach to their use. Faculty members can promote digital literacy, critical thinking, and problem-solving skills to help students understand the limitations of AI tools and use technology as a supportive tool rather than solely on it. This prospect aims to foster a healthy balance between human intellect and technological assistance.
- b. *Strengthening Academic Integrity:* The finding that students use AI tools to cheat on exams and bypass plagiarism checks highlights the importance of addressing academic integrity concerns. Institutions can implement robust policies, educate students about ethical practices, and enhance plagiarism detection systems to ensure AI tools' responsible and ethical use. Promoting a culture of academic honesty can improve academic integrity.
- c. *Encouraging Critical Thinking and Skill Development:* The reliance on these tools to complete homework tasks, such as math problem-solving or text summarization, indicates the need to develop students' critical thinking and problem-solving abilities. The prospect lies in designing assignments and activities that require higher-order thinking skills, analysis and creativity. Faculty members can guide students to use these tools as aids for learning rather than relying solely on them, fostering the development of essential cognitive skills.

These issues present prospects for faculty members and higher educational institutions to address the challenges associated with using AI tools among students. By promoting balanced technology integration, strengthening academic integrity, and encouraging critical thinking, educational stakeholders can guide students to maximize the benefits of AI tools while developing essential skills necessary for lifelong learning. These prospects contribute to creating a learning environment that leverages AI tools responsibly and ensures the holistic development of students.

Based on the *faculty members’* perceptions of the issues related to the use of AI tools, the following prospects were identified:

- a. *Improving AI Evaluation:* The finding that AI tools struggle to evaluate text structure, content logic, and coherence accurately indicates the need for improvement in AI algorithms. Continued research and development can lead to advancements in natural language processing, enabling these tools to provide better feedback on the quality and coherence of written work. This prospect holds the potential for a more accurate and practical evaluation of student assignments.

- b. *Enhanced Reliability of AI Algorithms:* The perception that AI algorithms should be more reliable to provide teachers with useful information suggests prospects of refining and strengthening the algorithms used in AI tools. Ongoing research and advancements aim to ensure that the outputs and recommendations generated by these tools are trustworthy and dependable. Addressing algorithmic bias, error rates, and transparency issues can improve the reliability of AI tools.
- c. *Balancing Technology Reliance:* Recognition that AI tools can promote over-reliance on technology calls for a balanced approach to their implementation. The prospect lies in creating strategies that encourage a healthy integration of AI tools while emphasizing students' continued development of critical thinking, problem-solving, and human interaction skills. By promoting the balanced use of AI tools as complementary aids rather than complete replacements, faculty members can ensure that students gain the necessary skills while leveraging the benefits of AI technology.
- d. *Building Technological Knowledge:* The perception that technological knowledge is needed for AI-based teaching highlights the prospects for enhancing faculty members' digital literacy and technological competencies. Providing professional development opportunities, training programs, and resources can support faculty members in developing the skills required to effectively incorporate AI tools into their teaching practices. Equipping faculty members with the knowledge and skills for AI-based teaching can leverage these tools to enhance pedagogy and student learning outcomes.

The research findings offer prospects for improvement and advancement in the use of AI tools in education. By addressing the identified issues and focusing on enhancing AI evaluation, reliability, technology reliance, and technological knowledge, education stakeholders can harness AI tools' full potential to enhance teaching, learning, and assessment processes.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. There is a significant potential for adopting and integrating AI tools in UST – Legazpi Graduate School. The respondents recognized AI tools to be highly useful, easy to use, and have the potential for social good. Therefore, AI tools are seen as valuable assets that can enhance the learning and teaching process.
2. AI tools bring numerous benefits to education; however, it is crucial to address the associated issues. By addressing these issues, we ensure the responsible use of these tools, enhance the learning experience, and prepare students for the challenges and opportunities of the digital age.
3. Embracing the prospects of balanced technology integration, strengthened academic integrity, and encouraged critical thinking can enable educational stakeholders to harness the benefits of AI tools while guiding students toward holistic development. These efforts contribute to creating an educational environment that maximizes the potential of AI tools, fosters student growth, and prepares them for future endeavours.

RECOMMENDATIONS

1. Provide faculty training and professional development programs focused on integrating AI tools effectively into pedagogical practices. These programs should equip faculty members with the necessary technological knowledge and skills to leverage AI tools in the classroom. Providing workshops, seminars, and resources will enable faculty to incorporate AI tools and enhance teaching and learning experiences confidently.
2. Reinforce academic integrity policies and implement rigorous plagiarism detection systems to address concerns related to students using AI tools for cheating and bypassing plagiarism checks.
3. Foster a balanced approach to the use of AI tools by emphasizing their role as supplementary aids rather than complete replacements for traditional teaching methods. Faculty members can guide

students to develop critical thinking and problem-solving skills while utilizing AI tools as supportive resources. Emphasizing the importance of human intellect and creativity in conjunction with AI technology will promote a well-rounded education.

4. Implement educational programs that raise students' awareness about the limitations and potentials of AI tools. By educating students about the benefits and challenges of AI technology, they can make informed decisions when utilizing these tools and avoid over-reliance on technology. Encouraging students to develop essential cognitive skills and critical thinking abilities will prepare them for lifelong learning.
5. Provide robust infrastructure, stable internet connectivity, and an uninterrupted power supply to support the effective use of AI tools. Implementing contingency plans for technology-related disruptions will ensure seamless operation and optimize the benefits of AI tools in teaching and learning processes.
6. Foster collaboration among faculty members, students, administrators, and researchers to continuously evaluate and improve the integration of AI tools in the educational environment. By creating a collaborative space for exchanging ideas, sharing best practices, and addressing challenges, the Institution can make well-informed decisions to enhance the responsible use of AI tools.

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Online and Offline Assessments: A comparison study in Engineering Education

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ABSTRACT

The COVID-19 came to an end in 2023. Such an ending marks a high time for Higher Education Institutions to review the conduct of courses during the Pandemic and its effect towards students' learning. Some studies have shown that the conversion from face-to-face to online assessment has brought positive results. Nonetheless, there is a need to understand if the reverse is possible under the "New Normal" condition. This paper researches the comparison of students' performance of assessments conducted before, during and after the Pandemic to determine if the hypothesis "students' academic performance is irrelevant of the mode of assessment" is valid. The study is conducted for the Engineering Thermofluids module for Higher Institutions in Singapore. The results show that students' performance is consistent before, during and after the Pandemic, showing that regardless of the mode of assessment, the performance is consistent among the students.

KEYWORDS: Online Assessment, Face-to-Face Assessment, Engineering Education

INTRODUCTION

Engineering education has undergone a remarkable transformation in recent years, with technology playing an important role in shaping the learning experience. The COVID-19 Pandemic has also caused teaching, learning and assessment into a different ball game. As part of this digital revolution, traditional assessment methods have also evolved, where online assessments are also accepted as a viable alternative to traditional offline assessments.

Online assessments take advantage of the power of digital platforms, enabling students to engage with course materials, complete assignments, and take exams remotely. These assessments often encompass a variety of formats, including multiple-choice questions, structured questions, programming, and simulations. By harnessing the capabilities of technology, online assessments offer several advantages, such as increased flexibility in scheduling, immediate feedback, and the ability to track performance metrics.

On the other hand, offline assessments, conducted in a physical and controlled environment, have been the traditional approach to evaluating students' knowledge and skills. These assessments typically involve written exams, practical demonstrations, and hands-on projects. Offline assessments provide a tangible experience, allowing students to engage with physical materials and demonstrate their understanding through practical applications.

The Online learning mode was introduced in the 2000s when web-based blended learning was introduced to enhance students' learning using Information and communication technology (ICT) (Pappas, 2015). Online learning was incorporated into traditional face-to-face learning through online videos, forums, discussion groups, or even case studies and debates. These activities make learning more interesting and fun and improve students' academic performance.

Online assessment has become the primary mode of assessment during the COVID-19 outbreak, where Institutes of Higher Education (IHL), in line with online teaching, implemented online assessments. Various online assessments that have been used and proved to be useful are essays, written assessments, examinations/quizzes, online discussions, case studies, reflection, presentations, fieldwork, portfolio, and peer evaluation (Kearns, 2012). Most of these assessments are conducted through the Learning Management System (LMS), where most of the LMS is completed with an assessment module to set the different types of assessments. Furthermore, as the assessment is completed in the LMS, the performance and results can be captured quickly, and analyses could be performed to compare students' performance.

As COVID-19 Pandemic turned face-to-face teaching into online teaching, the assessments for the courses had also converted into online assessments. Such conversion has turned conventional face-to-face examinations into online ones too. (Sabrina, Azad, Sohail, & Thakur, 2012) reported some common online examinations for university courses, which include human-proctored tests/examinations, technology-based proctored tests/examinations, non-proctored online tests/examinations, and real-time online quiz-based tests. The authors highlighted that the closed-book examination is not feasible since such an assessment is resource intensive and less flexible. Hence, most of the examination has converted into an open-book or take-home examination, allowing students to use various resources to answer the question.

Ensuring the authenticity of students and maintaining academic integrity during online assessments has emerged as a persistent area of concern among scholars and educators. The transition to online assessment platforms has brought forth unique challenges and vulnerabilities that demand careful attention and robust measures to uphold the principles of academic honesty. Questions surrounding identity verification, cheating prevention, and safeguarding assessment outcomes' integrity have become focal points of scholarly inquiry in online education. Consequently, addressing these concerns has become imperative to establish the credibility and validity of online assessment practices within the academic community.

The students' identity authentication is always an important issue and needs to be carefully handled by IHE to avoid potential academic misconduct. Teclehaimanot, You, Franz, Xiao, & Hochberg (2018) also highlighted the legal requirement of conducting online examinations, where IHE must verify the identity of students enrolled in the course with at least one of the following ways: a secure login and password, proctored examinations and any other technology and methods that can effectively verify students' identity. (Okada, Whitelock, Holmes, & Edwards, 2019) also highlighted that IHL would need to address several concerns regarding the e-authentication of students' identity during the online examinations, including software upgrading, legal safeguards, quality assurance, and consent form to ensure both IHL and students are benefited from the online assessments.

IHL has always been relying on various software to ensure academic integrity among students. One example is using Turnitin to compare the similarities in students' essays against the database. Such software is helpful for essay-based assignments. When it comes to online examinations, Turnitin may not be as useful, especially the examination for science courses. (Ngyuen, Keuseman, & Humston, 2020) suggested some assessment strategies in the chemistry examinations that would help to reduce the potential academic misconduct among students. The competency and programmatic assessments use Higher-order thinking, multiple choice and short-answer questions. Critical thinking is crucial in this method to ensure students demonstrate higher-order learning skills in answering the questions. The study conducted by (Woit & Mason, 2003) on the online assessment of Computing Science courses reveals that, for online assessment to be efficient, the online components must be integrated throughout the course evaluations. In line with this argument, (Ngyuen, Keuseman, & Humston, 2020) suggested increasing the assessment frequency to ensure consistent student performance. Despite authors reporting the benefits of frequent assessment in combating students' academic dishonesty (Grams, 2011) (Foderaro, 2009), the frequency increase is time and cost-consuming to both IHL and students.

Online Examination for Engineering Education

Engineering education, one of the science courses, has difficulty converting from face-to-face to online examination during the Pandemic. Although the engineering education assessment could be conducted in terms of reports (laboratory works and project-based works), online multiple-choice or short-answer quizzes (for courses that require questioning technique in Bloom's Taxonomy), many engineering courses that require calculations or technical drawing were traditionally conducted in a face-to-face mode. The sudden conversion to an online examination was a big challenge to the IHL, not only to abide by the strict laws imposed by the government to contain the COVID-19 virus but also to deal with potential authentication and integrity issues arising from the online examination.

To deal with such a problem, IHL opted to transform all examinations into Open-Book Examinations. Additionally, a Scan and Upload method was employed for these assessments. Under this approach, students were required to answer the examination questions on paper, as many tasks necessitated complex calculations that were not feasible to complete online. Upon completing the examination, students would scan their solutions and upload them to the Learning Management System (LMS). During the examination, students were mandated to activate their cameras to enhance the observation of academic integrity.

Furthermore, an oral examination was conducted after the written examination to ensure academic integrity further. A random selection of students participated in 5-minute oral examinations, during which academics posed questions about their solutions to assess their understanding of the approach. Students unable to provide satisfactory answers were categorized as having "academic misconduct allegations" and were referred to the Student Academic Conduct Officer for further investigation.

With such procedures in place, it was expected that students would be given the same quality of education despite the learning environment changes. The results of such conversion should yield similar academic performance. Hence, in the analyses of the student's results, the following hypothesis was declared:

H_{01} : there is no significant difference in academic performance for face-to-face and online assessment students.

METHODOLOGY

A course, Thermodynamics, was considered to demonstrate the hypothesis's validity. As such, student performance from 2019 to 2022 was compared.

The courses were chosen based on the condition that they are taught in a face-to-face manner in 2019, an online manner in 2020 and 2021, and a face-to-face in 2022. In addition, there is no change in the assessment components and lecturers teaching in the course to eliminate potential variables in the analyses. Hence, it is assumed that all content and assessments were identical, with only the delivery and learning mode changed from face-to-face to online. All assessments were conducted online, including class tests and final examinations in 2020 and 2021.

Table 1: Enrolment number for Thermodynamics for years 2019, 2020, 2021 and 2022

Year	Number of Students
2019	40
2020	36
2021	28
2022	31

RESULTS AND DISCUSSIONS

The analyses begin with the observation of the results. Figure 1 shows the comparison of the academic performance of students from 2019 to 2021. By comparing results, the distribution of students' performance is consistent, and no abnormal distribution was observed. The number of students is said to perform similarly for all grade ranges, and no obvious out-of-range patterns were reported when comparing online and offline examinations.

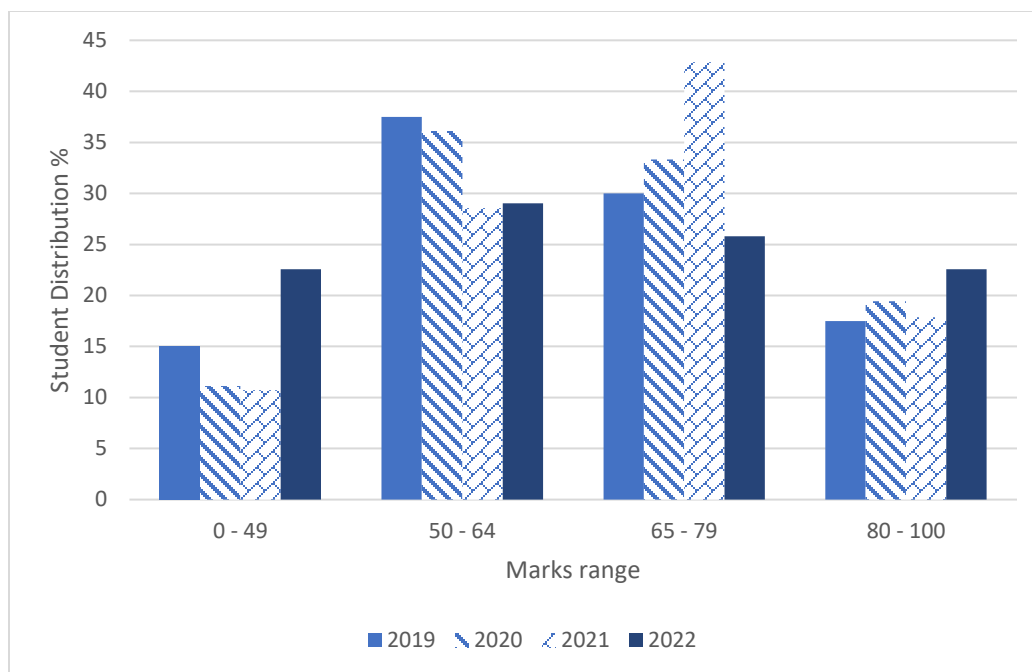


Figure 1: The comparison of students' performance for face-to-face teaching (2019, 2022) and online teaching (2020, 2021).

In order to have a valid null hypothesis H_{01} , there should not be differences reported when comparing students' average scores. Table 2 shows the mean and standard deviation for the marks obtained by students from 2019 to 2022. The detailed standard deviation of marks is shown in the mean obtained by the cohort that went through online learning is similar to those who went through face-to-face learning.

Table 2: The mean and standard deviation for the marks obtained by students for face-to-face teaching (2019, 2022) and online teaching (2020, 2021).

Year	Mean	Standard Deviation
2019	61.72	18.07
2020	64.90	15.79
2021	63.49	19.10
2022	59.84	22.66

Table 3: The mean and standard deviation for the marks obtained by students for face-to-face teaching (2019, 2022) and online teaching (2020, 2021) based on the mark range

Mark Range	2019		2020		2021		2022	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
0 - 49	32.81	16.93	32.84	7.17	19.88	15.18	25.23	14.05
50 - 64	54.44	4.59	57.45	4.83	56.40	4.48	57.44	4.12
65 - 79	71.98	4.67	72.17	3.86	69.98	5.16	69.85	5.39
80 - 100	84.51	2.99	84.56	4.01	85.44	1.97	86.07	3.67

Analysis of the results obtained is performed to determine the null hypothesis for this research, where the face-to-face assessment (2019) and online assessment (2020) were performed through the two-sample t-Test assuming unequal variances at the 95% confidence level. To test the reverse, the exact two-sample t-Test assuming unequal variances at the 95% confidence level was completed for online assessment (2021) and face-to-face assessment (2022). Tables 4 and 5 show the t-Test scores for face-face teaching and online teaching for the conversion from face-to-face to online assessment and from online assessment to face-to-face assessment. Both results show no significant difference between the scores of the two tests ($p > 0.05$); hence, H_{01} is accepted.

Table 4: t-Test scores for face-to-face assessment (2019) and online assessment (2020).

	2019	2020
Mean	61.7218	64.89636
Variance	335.0696	256.3134
Observations	40	36
t Stat	-0.80643	
P(T<=t) two-tail	0.42258	
t Critical two-tail	1.992543	

Table 5: t-Test scores for online assessment (2021) and face-to-face assessment (2022).

	2021	2022
Mean	63.48849	59.83613
Variance	378.2002	530.3991
Observations	28	31
t Stat	0.660075	
P(T<=t) two-tail	0.511864	
t Critical two-tail	2.002465	

The null hypothesis H_{01} proposed that there is no significant difference in academic performance between students who undergo face-to-face assessments and those who undergo online assessments.

Academic performance encompasses various indicators such as grades, test scores, completion rates, or qualitative assessments of knowledge and skills. Depending on the specific assessment methods employed, the outcomes may vary in their ability to capture the true academic abilities of students. One assumption of the null hypothesis is that the face-to-face or online assessment mode does not influence the assessment process's fairness, validity, or reliability. However, it is essential to acknowledge that the mode of assessment can introduce differences in the testing environment, access to resources, or the ability to demonstrate knowledge or skills. These factors may affect the comparability of results between the two assessment modalities.

Furthermore, the null hypothesis assumes that the two groups of students, those undergoing face-to-face assessments and those undergoing online assessments, are equivalent in terms of their demographics, prior academic performance, motivation, and engagement levels. Any disparities in these factors between the groups could confound the results and impact the validity of the comparison.

Another critical consideration is the context in which the assessments take place. Online assessments often rely on digital platforms, which may introduce technical challenges like internet connectivity issues or computer literacy barriers. These challenges could potentially impact students' performance during online

assessments, leading to differences in outcomes compared to face-to-face assessments.

Moreover, the null hypothesis assumes that the design and implementation of the online assessments are comparable in rigour and quality to the face-to-face assessments, where the online assessment adopts the open-book examination. In contrast, the face-to-face assessment uses the restricted open-book examination. Ensuring that online assessments adequately measure the intended learning outcomes and provide an unbiased evaluation for all students is crucial. Issues such as test security, cheating prevention, and the authenticity of students' work must be carefully addressed to maintain the integrity of online assessments.

Despite the results demonstrating no differences between the online and face-to-face assessments, academics and students still prefer face-to-face examinations, mainly for ease of conduct. Students do not need additional time to scan and upload the solutions to the LMS, which is less stressful during the examination period. Academics, on the other hand, would prefer to mark the paper on hard copies, as soft copy of the submission sometimes can be hard to read, and marking on the pdf is not as smooth as marking on paper, especially when the academic prefers the marking by questions instead marking by students.

The findings of this study suggest that the mode of assessment, whether face-to-face or online, does not significantly impact students' academic performance. Therefore, educational institutions and instructors can confidently incorporate online assessment methods without compromising the quality and rigour of the evaluation process. This implies that online assessments can be considered viable alternatives to face-to-face assessments, offering flexibility and convenience while maintaining academic standards. However, based on the preference of students and academics, the final examination or assessments that require heavy calculations are best to be performed in a face-to-face manner to reduce potential operational costs.

CONCLUSION

The research was carried out to confirm no differences between the online and face-to-face assessments for engineering education. The analyses of the result from 2019 to 2022, where two online and two face-to-face assessments were carried out, reveals that the null hypothesis H_{01} , "There is no significant difference in academic performance for students who do a face-to-face assessment and online assessment", was accepted.

While both online and offline assessments have their respective strengths and limitations, the study suggests that a balanced approach incorporating elements from both modalities can benefit engineering education. Integrating online assessments for knowledge-based assessments and offline assessments for practical and design-oriented evaluations can provide engineering students with a comprehensive and well-rounded assessment experience.

Educational institutions and instructors need to consider the specific learning objectives, the nature of the engineering discipline, and the needs of the students when selecting and implementing assessment methods. The findings of this research contribute to the broader conversation on effective assessment practices in engineering education and guide educators and policymakers in designing assessment strategies that align with the demands of the field and promote meaningful learning outcomes.

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A Comparative Study of Online and Offline Learning among Students in STEM in Malaysia: Student Learning Experiences in Computing

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ABSTRACT

This comparative study explores the effectiveness and acceptance of online and offline learning methods among students in STEM (Science, Technology, Engineering, and Mathematics) education, particularly the Technology Domain. The study adopts the Technology Acceptance Model (TAM) to investigate students' perceptions, attitudes, intentions, and usage of online and offline learning platforms. Data were collected through a survey administered to a sample of students, and the differences and relationships between the two learning modalities were examined. The findings reveal that students perceive online learning as more useful and easier for Technology education than offline learning. Moreover, students exhibit a more positive attitude toward online learning and express a higher intention to use online platforms for their Technology education. These findings highlight the potential benefits of online learning in STEM education and suggest the need to integrate online platforms into educational practices.

KEYWORDS: Online Learning, Offline Learning, Technology Acceptance Model

INTRODUCTION

The Online learning mode was started as early as the 2000s when web-based blended learning was introduced to enhance students' learning using Information and communication technology (ICT) (Pappas, 2015). The combination of face-to-face teaching using online videos, forums, and discussion groups that provide flexible learning to students had provided great additional support and variety to the conventional face-to-face teaching. It was seen that such a blended mode was welcomed by Medicine and Psychology students (Grabe & Christopherson, 2008), (Beale, Tarwater, & Lee, 2014), but not among Engineering students (Chan & Koh, 2008).

Online and Offline Learning

Since its first development, various online learning modes have been developed to cater to different teaching and learning needs. Online learning can be understood in two major categories: concurrency of conduct and teaching and learning activities.

Concurrency of Conduct

The first category, concurrency of conduct, describes the mode of the lecture, whether the online and face-to-face lectures are conducted simultaneously. Martínez, Aguilar, & Ortiz (2020) outlined a similar idea through the term "asynchronous" (lecture capture) and "synchronous" (on-campus or live broadcasted lecture). The former was a recorded lecture where students could easily access the lecture recordings. This is helpful for students who wish to revise the lecture content and wish to relisten or rewatch the lectures. Podcasted lectures, one example of the asynchronous lecture practised in the early days, were influential in teaching nursing courses (Abate, 2013). The latter type, synchronous lecture, is conducted with the help of ICT facilities, such as broadcast software, Zoom, Microsoft Teams, Webex, or even Google Meet (TeachThought, 2023). This type of teaching provides great mobility flexibility to students to attend the lecture anywhere convenient while maintaining the original benefits of face-to-face teaching in the classroom.

During the Pandemic, when people's movements were greatly restricted to contain the virus successfully, 89.4% of the world's learners were forced to use a primary mode of online learning (Marinoni, van't Land, & Jensen, 2020). Such an online mode is also categorised as synchronous teaching, where the lecturer and students access the same space from various locations, and the lecture is conducted.

It should be noted that to date, there is no clear delimitation towards the use of "hybrid", "blended", and "hyflex", where researchers are using them interchangeably (McGee & Reis, 2012). Hence, the main idea one should have when coming to online or face-to-face teaching is that "hybrid", "blended", and "hyflex" could be the combination of both online and face-to-face teaching. In some cases, additional activities are introduced to enhance students' learning experience.

Types of Teaching and Learning Activities

The teaching and learning activities types can be further divided into three sub-categories: face-to-face, online and supported offline. Face-to-face is the conventional teaching and learning activities conducted in the class, which have been well-researched and practised by academics. Various activities to make learning happen among students (Sim, 2021) outlined a few tips for designing special class activities that help students learn better: activities to reinforce learning, engaging the imagination, difficulty and challenge, and satisfaction and shock. Designing classroom learning activities based on these principles would create a fun yet practical learning experience among students.

The broadcast or Zoom video conferencing (for example) lecture was not the only teaching activity in Blended learning. To further demonstrate the idea of asynchronous learning mentioned earlier, students can access online activities at any time and anywhere. Activities such as online discussions, self-assessments, blogs, case studies, virtual visits, and experiments are some examples that are commonly used in online teaching and learning environments (Hoic-Bozic, Mornar, & Boticki, 2009). These activities can be embedded in the university's Learning Management System (LMS) or linked to external resources.

Supported offline learning mode gained popularity between the 1970s and 1980s when companies b Learners used video or television to learn at home and address their questions through mails. Such a mode of learning was then popularised through the creation of CDs and DVDs in the next decade, where the LMS was invented to engage learners at home further to obtain resources from a central management system.

Online Teaching and Learning in STEM

As mentioned earlier, blended learning was initiated mainly in the Science Domain: Medicine, Nursing and Psychology areas, where its effectiveness was shown, and the university welcomed the mode of learning. One observation that was reported by (Suwannaphisit, Anusitviwat, Tuntarattanapong, & Chuaychoosakoon, 2021) was that students significantly matured students, or those with different sleeping patterns, had better management of their time to make sure that they learned most effectively. (Makhdoom, Khoshhal, Algaidi, Heissam, & Zolaly, 2013) reported that students' engagement was increased through blended learning, and their perception of the education environment was improved. The researchers also suggested that a cultural change in the learning practice might not be easy for everyone, as their results also showed decreased social perception among the students.

Like medicine studies, (Sáiz-Manzanares, Escolar-Llamazares, & Arnaiz González, 2020) reported the success of blended learning in nursing studies. In addition to the flexibility, the excellent design of the LMS was also an essential issue towards the success of blended learning. As LMS was the source for students to access when there was no lecture or face-to-face interaction available, the excellent design of LMS facilitated the personalisation of students' learning and motivated them in their study.

The Technology Domain speaks a slightly different language than the Science Domain. In their article, (Monk, Guidry, Pusecker, & Ilvento, 2020), suggested that replacing more than one-third of the traditional face-to-face class time with online activities would affect the final grade outcomes of the students' assessments. In other words, blended learning would help enhance students' learning, but face-to-face lectures must still be the primary mode of conduct. One study (Wenceslao & Felisa, 2021) reported that 65% of students believed online learning was less effective than traditional face-to-face classroom interaction. The study also reported that 60% of the academics preferred blended learning while 65% of students preferred traditional classroom teaching. Students who preferred classroom teaching mainly suffered from technological difficulties, assessment issues, limited social interaction and personal challenges.

Understanding Technology and Engineering is not feasible to be entirely online taught, and this research seeks to understand, from students' perspective, if they enjoy online learning and would appreciate its benefits. This paper presents the outcome of the Technology Domain, and the outcome of analyses performed in the Engineering Domain is not presented in this paper. The result of the study contributes to the developing body of knowledge about the Pandemic on engineering and technology education.

RESEARCH FRAMEWORK

The research is designed and analysed through the Technology Acceptance Model TAM developed by (Davis, 1989). TAM outlined two factors determining whether a computer system will be accepted by its potential users in terms of perceived usefulness and ease of use. The key feature of this model is its emphasis on the perceptions of the potential user. This means that the technology product or service designers may believe that the product or service is useful and user-friendly, and this will only be true when the users share the same opinions. Figure 1 shows the earliest Technology Acceptance Model developed by (Davis, 1989).

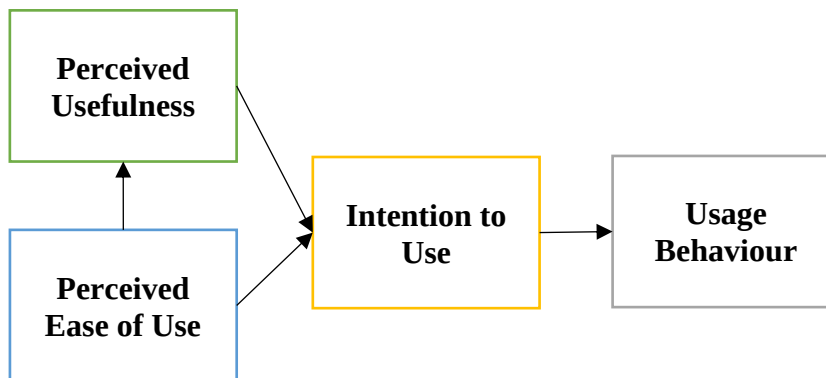


Figure 1: The earliest Technology Acceptance Model developed by (Davis, 1989).

The TAM framework is widely used to understand individuals' acceptance and usage of technology, and it can be adapted to investigate the effectiveness and acceptance of online learning platforms compared to traditional offline learning methods in the context of STEM education.

The following hypotheses and variables in measurements are described based on the TAM.

- **Perceived Usefulness**
 - Hypothesis: Students perceive online learning as more beneficial for STEM education than offline learning.
 - Variables to measure: Students' perceptions of the usefulness of online and offline learning for STEM education.
- **Perceived Ease of Use:**
 - Hypothesis: Students perceive online learning as more straightforward for STEM education than offline learning.
 - Variables to measure: Students' perceptions of the ease of use of online learning and offline learning for STEM education
- **Intentions to Use:**
 - Hypothesis: Students are more likely to choose online learning over offline learning for STEM education based on their perceived usefulness, ease of use, and attitudes.
 - Variables to measure: Students' intentions to use online or offline learning for STEM education.
- **Actual Usage and Performance:**
 - Hypothesis: Students who use online learning for STEM education will have comparable or better performance outcomes than those using offline learning.
 - Variables to measure: Students' actual online and offline learning usage for STEM education and their academic performance outcomes.

METHODOLOGY

The research is conducted in Malaysia, where the responses from a Private Institute of Higher Education (IHE) are collected. The sampling technique employed was stratified random sampling. The target population consisted of undergraduate students enrolled in the IHE during the survey period. Stratification was based on the STEM Domain (e.g., Computing, Technology, and Engineering), allowing for a proportional representation of different student categories. The survey instrument consisted of a questionnaire comprising Likert scale questions. Likert scales are commonly used in social science research to measure attitudes, opinions, and perceptions. The Likert scale utilised in this survey consisted of a six-point scale ranging from "Strongly Disagree" to "Strongly Agree". To avoid a neutral response as much as possible, the usual neutral midpoint labelled "Neither Agree nor Disagree" is replaced by "somewhat agree" and "somewhat disagree" to indicate respondents' behavioural tendencies.

Data collection was completed through Microsoft Form, an online survey platform. Such collection was to ensure convenience and easy access by the respondents. The survey was administered to the selected sample of students with a clear explanation of the research objectives, confidentiality of responses, and voluntary participation. Respondents were given a specific period to complete the survey, and reminders were sent to the respondents to maximise the response rate. Upon completion of the data collection, the responses were exported for analyses using descriptive statistics such as frequencies and statistical tests.

It is essential to acknowledge some limitations of the study. Firstly, the survey relied on self-reported data, which may be subject to response biases. Additionally, the survey was conducted among students from a specific institution, limiting the generalizability of the findings to other populations or contexts. Finally, the study's cross-sectional design does not allow for causal inferences or the examination of changes over time.

RESULTS AND DISCUSSIONS

A total of 46 valid responses were collected. The respondents were undergraduates aged 18 – 24, studying technology-related courses at the university. The male-to-female respondent ratio was reported to be 22:24, representing a gender balance among the respondents. 70% of the respondents use computers for more than 4 hours daily, with 25% using as high as 6 to 8 hours a day.

When asked about the overall online learning experience, on a scale of 1 to 10 (10 being excellent), an average score of 7.30 was obtained, with 74% of respondents scoring 7 and above. 19% answers 5 and below. The results show that students' experience with online learning is still good.

Figure 2 shows the results on the Perceived Usefulness. Positive feedback was obtained from the respondents on the usefulness of online learning, and they felt that the learning environment was peaceful. The questionnaire was also designed to receive "strongly disagree" as supporting statements to the perceived usefulness: "Online learning was stressful". As predicted, more disagree statements were obtained for this item, showing that respondents could manage online learning without stressing themselves out. Hence, the hypothesis that "Students perceive online learning as more useful for STEM education than offline learning" is confirmed.

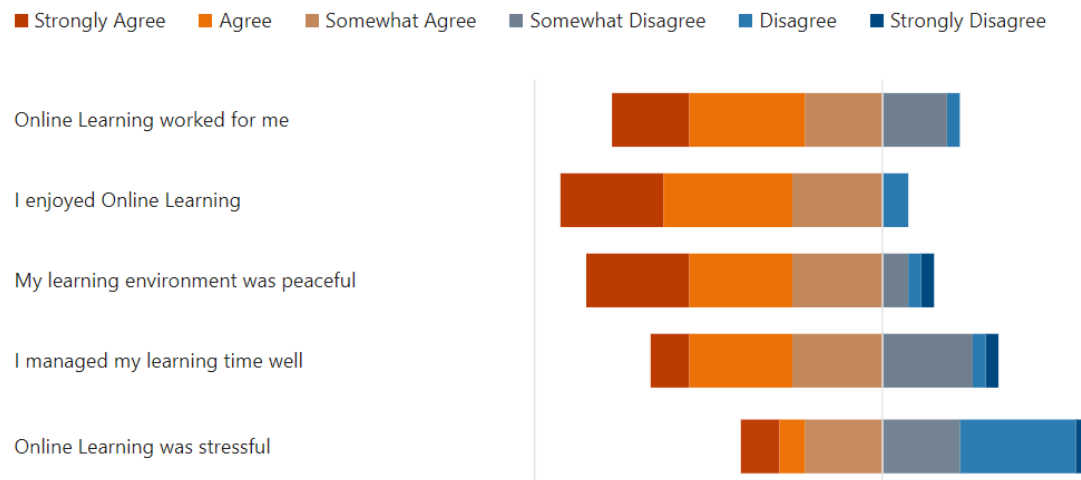


Figure 2: Responses collected based on the TAM “Perceived Usefulness” Domain

Figure 3 shows the responses collected using the TAM “Perceived Ease of Use” Domain. Technology and software were always the first problem faced by learners, and the survey result shows that respondent did not face too many problems in using technology to support learning. Worth mentioning that lecturers and tutors helped guide the sessions, making students’ learning effective. Again, one negative-response question was posted in this group, where the result obtained was also as expected. With the ease of internet connection, there was not much issue for students to connect to the internet for online learning. Hence, the hypothesis “Students perceive online learning as easier to use for STEM education than offline learning” was confirmed.

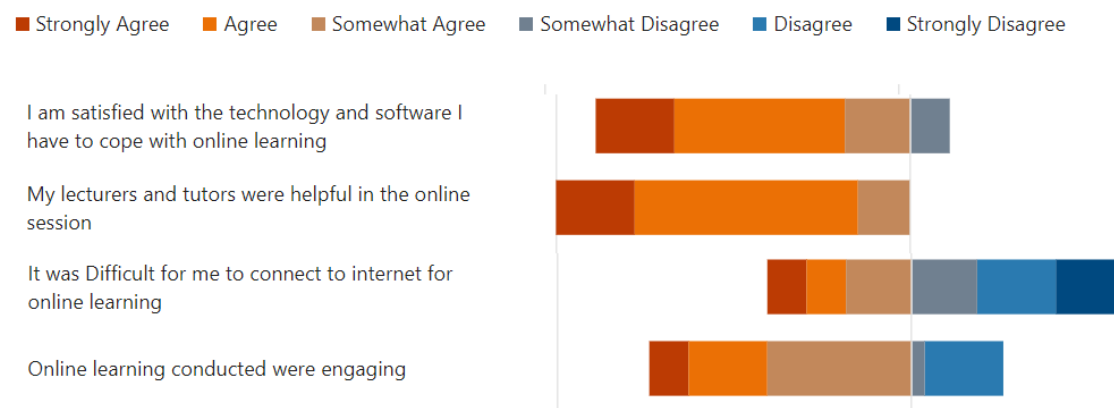


Figure 3: Responses collected based on the TAM “Perceived Ease of Use” Domain

Perceived ease of use and perceived usefulness capture the expectations of positive behavioural outcomes and the belief that behaviour will not be labour-consuming (Davis, 1989). Hence, with positive responses obtained for the first two domains, the respondents are expected to be more likely to choose online learning.

To answer the question of intention of use, the researcher asked the respondent a “yes” or “no” question to capture a straighter forward response. The question “Do you think the school learning should be available in the online format?” were posted to the respondent, and 59.26% of the respondents felt that the online format was acceptable. The hypothesis “Students are more likely to choose online learning over offline learning for STEM education based on their perceived usefulness, ease of use, and attitudes” were

confirmed through the responses.

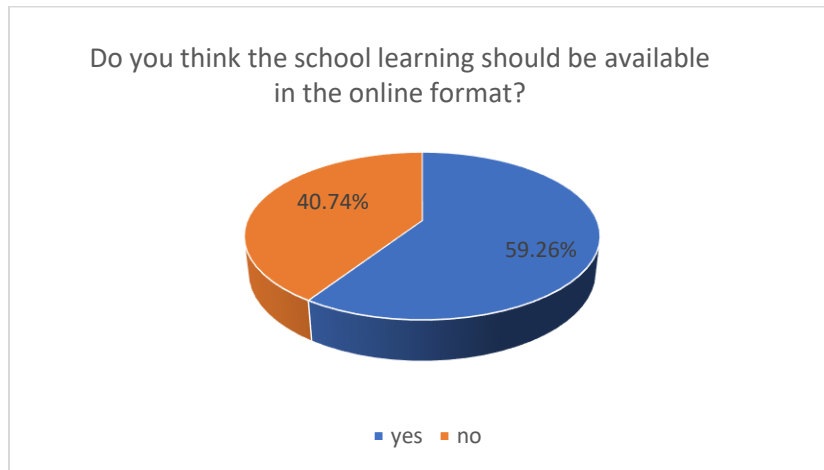


Figure 4: Responds obtained when asked if the school learning should be available online.

The results are said in line with the literature reported by (Monk, Guidry, Pusecker, & Ilvento, 2020) and (Wenceslao & Felisa, 2021), where a small portion of the online learning environment helps the learning process, but in the dominating state. As presented in Figure 5, only just over half the number agreed with the statement when asked if respondents learned better in online learning. The other half does not seem to agree with the statements and would still prefer offline or face-to-face learning to occur in their learning journey.

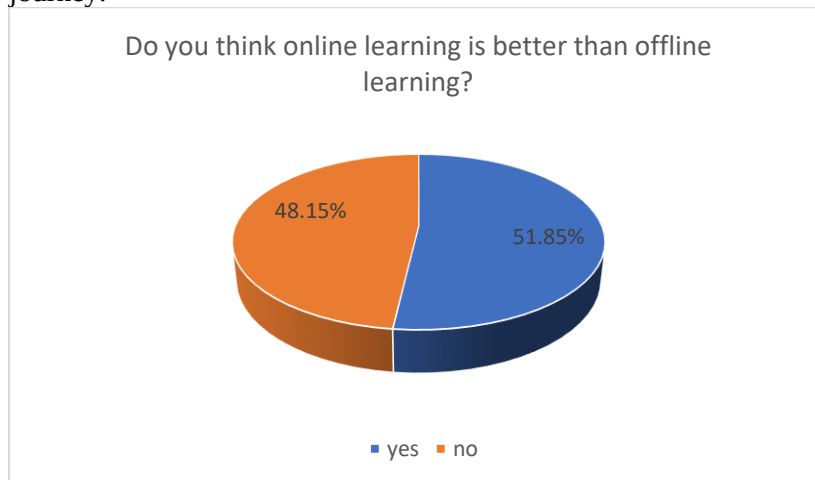


Figure 5: Response to the question, “Do you think online learning is better than offline learning?”

They were testing on the last domain, where students would perform better in online learning than in offline learning. The respondents were asked if they have benefited from online learning, and Figure 6 shows the response to this question. More than three-quarters of students responded that they benefited from online learning. When further asking the respondent to rate the effectiveness of online learning, an average score of 7.11 (10 being excellent) was obtained from the respondents. Hence the hypothesis “*Students who use online learning for STEM education will have comparable or better performance outcomes than those using offline learning*” was confirmed.

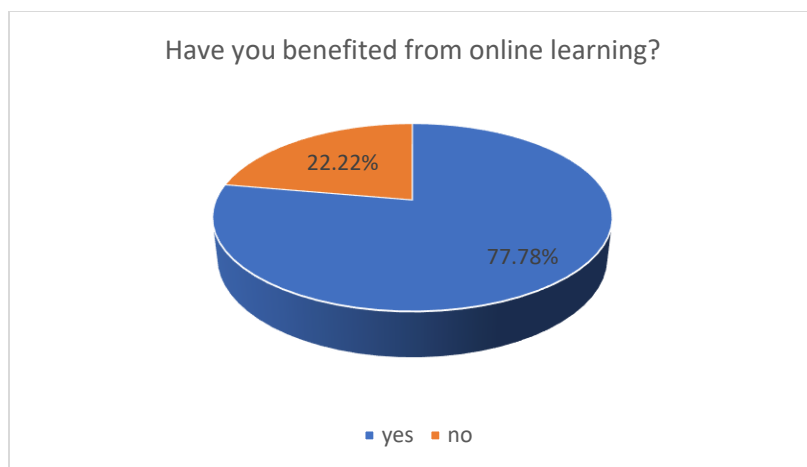


Figure 6: Response to the question, “Have you benefited from online learning?”

The study found that students perceived online learning as more beneficial for Technology Education than offline learning. This result suggests that students recognise the benefits of online learning, such as flexibility, access to diverse resources, and interactive tools that enhance their understanding. The findings also revealed that students perceived online learning as easier for Technology Education than offline learning. The convenience of accessing learning materials online, the ability to learn at one's own pace, and the intuitive interfaces of online platforms likely contributed to this perception. In contrast, time management is a challenge among students to cope with completing materials, completing, and submitting assessments.

The results demonstrated that students held a more positive attitude toward online learning for Technology Education than offline learning. The flexibility and convenience offered by online platforms likely contributed to this positive perception. Moreover, the interactive and multimedia elements provided by online learning might have increased students' interest and motivation. The study observed that students who used online learning for Technology Education achieved comparable or better performance outcomes than those using offline learning. This finding indicates that online learning platforms can effectively support students' learning and may provide additional resources and opportunities for skill development.

The study's finding has implications for educational institutions, instructors, and policymakers. In line with the earlier literature, to continue incorporating online learning in education but not dominating the learning process, students still enjoy face-to-face learning in the university. More dialogues with students should be conducted to find the correct number of online educational elements for the best learning experience and performance.

Training and supports are to be provided to the students and academics to ensure that both parties can handle the online learning environment well. For academics, more training would also be needed in the assessment item setting to ensure that online assessment would measure students' achievement of learning outcomes effectively.

CONCLUSION

This study explored the effectiveness and acceptance of online and offline learning methods among STEM education – Technology Domain students. The study was conducted based on the Technology Acceptance Model (TAM) to investigate students' perceptions, attitudes, intentions, and usage of online and offline learning platforms. The result of the study reveals that students perceived online learning as more valuable and more accessible compared to offline learning. Furthermore, students showed a more positive attitude

toward online learning and expressed a higher intention to use online platforms for learning. In line with the literature presented, online learning in STEM education can be an excellent avenue to support conventional face-to-face teaching but not take over as the primary teaching method, as students still find face-to-face teaching more engaging and interactive.

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Enhancing the Quality of Higher Education Through AI-Assisted Formative Assessment: A Prototype Leveraging NLP Techniques

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ABSTRACT

Artificial intelligence (AI) has been studied in various subject areas especially in science, technology, engineering, and mathematics (STEM). Artificial intelligence (AI) has been extensively studied in these subjects; however, there remains a disparity in depth and overall quality between AI-generated and human-written scientific content. To bridge this gap, the proposed prototype utilizes Natural Language Processing (NLP) techniques, such as semantic analysis and a large language model (LLM), to generate assessment questions and evaluate student answers. Formative assessment, an integral part of the learning process, plays a crucial role in providing students with feedback and identifying areas for improvement. By employing the conceptual framework of formative assessment, the prototype offers a user-friendly and scalable solution for educators in higher education. It enables the generation of differentiated assessments tailored to individual students' needs, accommodating their varying capabilities and facilitating performance analysis across different levels. Through rigorous evaluation and benchmarking, leveraging semantic analysis, the prototype ensures that the assessment questions and sample answers meet the standards set by the HLP (High-Level Performance). This integration of AI and NLP techniques represents a transformative advancement in STEM education. The AI-assisted formative assessment system presented in this study effectively provides accurate and timely feedback, enhancing the efficiency and efficacy of formative assessment practices. As further advancements are made, this system holds significant potential for significantly improving the quality of STEM education by delivering scalable and personalized formative assessment experiences. By leveraging AI and NLP, educators can access a range of assessment options tailored to meet students' individual needs, thus enhancing their learning outcomes and overall educational experience.

KEYWORDS: AI-Assisted Formative Assessment, Natural Language Processing (NLP), Higher Education, Large Language Model (LLM), Formative Assessment

INTRODUCTION

Formative assessment is a process of providing feedback to students on their progress in learning. It is an essential component of effective teaching and learning in STEM fields, as it allows students to identify areas where they need additional support and to make adjustments to their learning accordingly. Traditionally, formative assessment has been conducted by teachers through a variety of methods, such as quizzes, tests, and class discussions. However, these methods can be time-consuming and labour-intensive, and they can be difficult to scale to large classes. Artificial intelligence (AI) has the potential to revolutionize formative assessment in STEM fields by providing a more efficient and scalable way to provide feedback to students. AI-assisted formative assessment systems can automatically grade student work, identify areas where students need additional support, and provide personalized feedback to help students improve their learning. In this paper, we present a prototype AI-assisted formative assessment system that leverages natural language processing (NLP) techniques. Our system is designed to be used in STEM courses, and it can be used to grade short-answer questions, essays, and other types of student work. We evaluated our system with a group of lecturers involved in STEM education. The results of our evaluation showed that our system was able to provide accurate and timely feedback to students, and it helped students to improve their learning outcomes. We believe that our system has the potential to improve the quality of STEM education by providing a more efficient and scalable way to provide formative assessment to students. We are currently working on developing our system further, and we plan to make it available to a wider audience in the future.

LITERATURE REVIEW

Digital Formative Assessment

Digital formative assessment is an integral part of modern education, enabling teachers to gather real-time feedback and monitor student progress in an efficient and effective manner (Irons & Elkington, 2021). This literature review aims to explore the concept of digital formative assessment and highlight the various tools and technologies available to facilitate its implementation in educational settings. Formative assessment involves gathering information about students' learning progress to provide timely feedback and adjust instructional strategies accordingly. Digital formative assessment takes advantage of technology to enhance this process, providing opportunities for interactive, personalized, and immediate feedback. Research suggests several benefits of implementing digital formative assessment in classrooms (Kaya-Capocci et al., 2022). Firstly, it promotes active student engagement by incorporating interactive elements such as quizzes, polls, and discussions. Secondly, it enables teachers to monitor individual student progress and identify areas of improvement more efficiently. Thirdly, digital formative assessment supports differentiated instruction, allowing educators to tailor their teaching to meet the specific needs of each student. Lastly, it provides students with timely and constructive feedback, fostering a growth mindset and enhancing their learning experience. In the pursuit of enhancing support for the development of adaptive learning environments, learning science has garnered the interest of computer scientists for over a decade. Researchers from the fields of education and computer science have been striving to optimize the intricate and time-consuming design of adaptive learning environments through the utilization of advanced data mining, machine learning, and deep learning techniques. Their objective is to provide Intelligent Tutoring Systems (ITS) with enhanced capabilities to assist students more effectively. Numerous endeavours have been witnessed in the development of ITS for various subjects such as mathematics (Koedinger & Anderson, 1998; Razzaq et al., 2005), programming (Figueiredo & García-Peñalvo, 2020; Mitrovic, 2003; Sykes & Franek, 2004; Weragama & Reye, 2013), languages (Evens et al., 2001; Ferreira & Atkinson, 2009; Slavuj et al., 2015; Swartz & Yazdani, 1992) and more. Efficiently and effectively guiding students in their learning process remains a recurring topic in educational research of the 21st century.

Tools for Digital Formative Assessment

- **Learning Management Systems (LMS):** LMS platforms like Moodle, Canvas, and Schoology offer features for creating online assessments, tracking student performance, and providing feedback. These systems often include built-in grading tools, discussion boards, and analytics, enabling teachers to monitor student progress comprehensively (Salah & Thabet, 2021; Zhang et al., 2020).
- **Quiz and Polling Tools:** Tools like Kahoot, Quizizz, and Mentimeter facilitate the creation of interactive quizzes and polls. These tools engage students in a gamified learning experience, encouraging participation and enabling instant feedback (Raju et al., 2021).
- **Online Survey Tools:** Survey tools such as Google Forms and Microsoft Forms provide educators with the means to collect data from students, gauge their understanding, and assess their learning progress. These tools offer a variety of question types and data analysis features (Mansor, 2012).
- **Digital Whiteboarding Tools:** Whiteboarding tools like Jamboard, Miro, and Explain Everything enable collaborative and interactive formative assessment. Teachers can create visual presentations, interactive exercises, and virtual whiteboards to facilitate student engagement and feedback (Ng, 2022).
- **Video Assessment Tools:** Video assessment tools, such as Flipgrid and Edpuzzle, allow students to record their responses, presentations, or explanations. Teachers can review and provide feedback on these videos, promoting self-reflection and communication skills (Ipek & Ustunbas, 2021a, 2021b; Manipatruni & Kumar, 2022).

Artificial Intelligence as a tool for formative assessment

There has been a growing interest in the use of AI for formative assessment in recent years. Several research studies have been conducted to evaluate the effectiveness of AI-assisted formative assessment systems (Lloyd et al., 2022; Sein Minn, 2022). The results of these studies have been mixed, but overall, they suggest that AI-assisted formative assessment systems can be effective in improving student learning outcomes. One of the challenges of using AI for formative assessment is that it can be difficult to develop systems that are accurate and reliable. Another challenge is that AI-assisted formative assessment systems can be expensive to develop and deploy. Despite these challenges, the potential benefits of AI for formative assessment are significant. AI-assisted formative assessment systems have the potential to improve the efficiency and scalability of formative assessment, and they can provide personalized feedback to students that can help them improve their learning. The use of AI for formative assessment is still in its early stages, but it has the potential to revolutionize the way that students are assessed. This could lead to significant improvements in student learning outcomes. Here are some examples of how AI is being used for formative assessment:

- **Grading student work:** AI-assisted formative assessment systems can automatically grade student work, such as essays and short-answer questions. This can free up teachers' time so they can focus on providing feedback to students.
- **Identifying areas of need:** AI-assisted formative assessment systems can identify areas where students need additional support. This information can be used to provide targeted interventions to help students improve their learning.
- **Providing personalized feedback:** AI-assisted formative assessment systems can provide personalized feedback to students. This feedback can help students to identify their strengths and weaknesses, and to develop strategies for improving their learning.

Large language models (LLMs)

Large language models (LLMs) are large neural networks trained on enormous amounts of text data, sometimes at the petabyte scale. They could generate text that's far more fluent and coherent than previous language models, and they can also be used as a strong foundation for other NLP tasks. LLMs represent a major advancement in AI, with the promise of transforming domains through learned knowledge (Bender

et al., 2021). A bibliometric review of LLMs research has shown that LLMs are a class of language models that have demonstrated outstanding performance across a range of natural language processing (NLP) tasks and have become a highly sought-after research area, because of their ability to generate human-like language and their potential to revolutionize science (Fan et al., 2023). Large Language Models (LLMs) are advanced software systems, like GPT-3 and GPT-4, trained on massive word datasets. They grasp word relationships, generating human-like text. Examples include LLaMA, PaLM2, and BERT. GPT-3 covers 95+ languages, BERT 104, BLOOM 46+13, and NeMo 530 billion parameters. LLMs fuel chatbots, translation, question answering, and more. In this context, it is believed that LLMs can be used in assisting educators in formative assessment by providing feedback to students and modifying their teaching based on the information derived from assessments (Schildkamp et al., 2020).

Table 1: Comparison of Different Large Language Models.

Model (Year Founded)	Type of license	Supported features	Common applications	Limitations	Advantages
MarianMT (2017)	Open Source	Language translation	Translation services, multilingual applications	Limited support for other NLP tasks	Free and open source
BERT (2018)	Open Source	Language understanding, text classification	Natural language processing, sentiment analysis	May require large amounts of labelled training data	Strong performance in various NLP tasks
MegatronLM (2019)	Open Source	Text generation, language translation, Q&A, chatbots	Research, training large-scale models	Requires significant computational resources	Optimized for training large-scale models
RoBERTa (2019)	Open Source	Language understanding, text classification	Natural language processing, sentiment analysis	Limited support for fine-grained text generation	Pretrained on large corpus for improved accuracy
CTRL (2019)	Open Source	Text generation, language translation, Q&A, chatbots	Content creation, customer service	Less optimized for large-scale language tasks	Fine-tuned for content creation and chatbots
T5 (2020)	Open Source	Text generation, language translation, Q&A, chatbots	Content creation, research, language understanding	Less emphasis on model customization and fine-tuning	Unified architecture for diverse language tasks
GPT-2 (2019)	Proprietary	Text generation, language translation, Q&A, chatbots	Content creation, customer service, research	Limited fine-grained control over model behaviour	Strong text generation capabilities
Turing-NLG (2021)	Open Source	Text generation, language translation, Q&A, chatbots	Content creation, customer service, research	Limited availability and support	Innovative model architecture
GPT-Neo (2021)	Open Source	Text generation, language translation, Q&A, chatbots	Content creation, research	Less optimized for commercial deployment	Open-source alternative to GPT models
GPT-3 (2020)	Proprietary	Text generation, language translation, Q&A, chatbots	Content creation, customer service, research	Limited fine-grained control over model behaviour	State-of-the-art performance in various tasks

Model (Year Founded)	Type of license	Supported features	Common applications	Limitations	Advantages
GPT-4 (2022)	Proprietary	Text generation, language translation, Q&A, chatbots	Content creation, customer service, research	Limited fine-grained control over model behaviour	Improved performance and capabilities
OPT (OpenAI) (2022)	Proprietary	Text generation, language translation, Q&A, chatbots	Content creation, customer service, research	Limited fine-grained control over model behaviour	Latest model with enhanced features and quality

METHODOLOGY

In this section, we will provide a detailed explanation of the methodology employed in developing the AI-assisted prototype, which utilizes NLP techniques to enhance educators' capabilities in the context of formative assessment (as illustrated in Figure 1). The proposed solution incorporates the utilization of the OpenAI API key. The OpenAI API is an Application Programming Interface (API) that provides access to advanced AI models developed by OpenAI. It empowers our proposed system to comprehend natural language and generate responses that closely resemble human-like outputs (Odunayo, 2023).

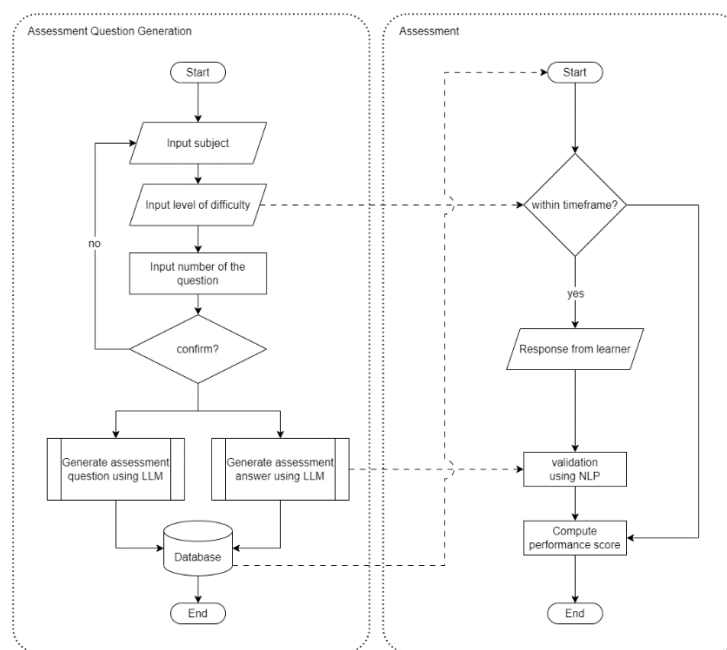


Figure 1: Proposed solution architecture.

OpenAI offers a wide range of models with varying degrees of power, suitable for different applications. Additionally, it provides the flexibility to customize unique models tailored to our solution's needs. This API is particularly valuable for applications requiring the generation of text with a high degree of accuracy, leveraging authoritative sources of information such as firm paperwork and knowledge bases. Regarding preprocessing and additional features, our solution incorporates NLTK (Natural Language Toolkit), a powerful Python library for natural language processing tasks. NLTK provides various functionalities to process human language effectively and efficiently. In addition, we use the Twinword Text Similarity API to compare learner answers to correct answers. This API is a semantic keyword research tool that ranks keywords based on their relevance to a user-specified topic. It can be used to compute the similarity between two pieces of text, such as learner-provided answers and corrected answers generated by OpenAI GPT-3.

This can be used for automated grading of open-ended questions, as the system can compare the learner's answer to the correct answer and assign a score based on their similarity. This can save time for educators, provide immediate feedback to learners, and provide a more objective evaluation of learner performance. Table 2 shows the development setup for this proposed solution.

Table 2: Experiment setup for proposed solution.

Experimental Setup	Version/Specification
<i>Software</i>	
Python	3.9
Tkinter	8.6
OpenAI API	2.0
Operating System	Windows 11
<i>Hardware</i>	
CPU	12th Gen Intel(R) Core(TM) i7
Memory	40 GB
Storage	1 TB

This software development environment was chosen because it is well-suited for developing small-to-medium-sized software projects. Python is a powerful and versatile programming language that is easy to learn and use. Tkinter is a simple and easy-to-use GUI library for Python. The OpenAI API is a powerful tool for generating text, including questions and answers. Git is a reliable and efficient version control system. This software development environment allowed the project to be developed quickly and efficiently. The use of Python and Tkinter made it easy for the developers to create a user-friendly interface. The OpenAI API allowed the developers to generate questions and answers quickly and easily.

RESULT

Assessment Question Generation

The graphical user interface (GUI) was developed utilizing the Tkinter Python library. The interface offers a range of functionalities centred around 10 distinct subjects, as visually represented in Figure 2(a). Each subject is accompanied by a dedicated radio button option, enabling educators to make a selection based on the desired teaching material. For certain subjects, an additional GUI window will be triggered, granting educators the ability to specify subtopics, as exemplified in Figure 2(b). This feature enhances the AI-Assisted system's capacity to generate targeted questions and answers that align with the educational syllabus.

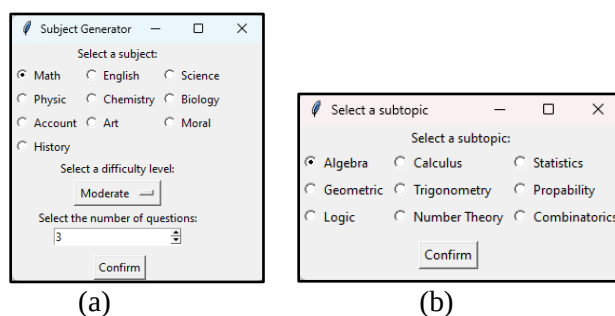


Figure 2: Educator's input to generate assessment question. (a) Input subject; (b) Select Subtopic

As shown in Figure 3, educators are required to choose the desired difficulty level after selecting a subject. The available difficulty levels include Easy, Moderate, Hard, and Extreme Hard, which determine the allocated time for the set of questions (explained in Table 4). These levels cater to students' varying levels of learning and ability, promoting differential learning. Students who find the material easy can be presented

with more challenging questions to maintain their engagement and motivation. Conversely, students who struggle with the material can be given easier questions to bolster their confidence and facilitate learning at their own pace.

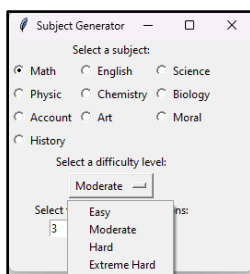


Figure 3: Different difficult levels of the assessment to promote differential learning.

Educators also have the option to specify the number of questions they wish to generate (Figure 4). A spinbox with a range of values from 1 to 10 allows educators to tailor the quiz or test according to their students' specific needs.

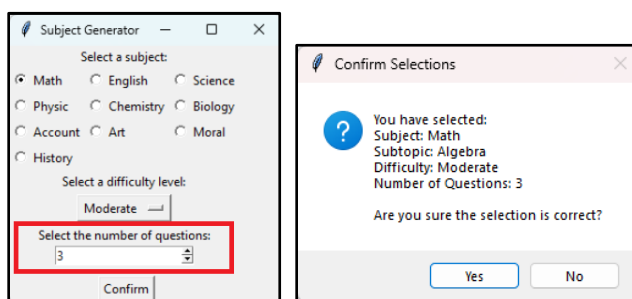


Figure 4: Number of questions to be generated by AI and the confirmation screen.

Once all selections have been made, a confirmation message will be displayed through a Tkinter-based graphical user interface (GUI). This ensures that the educators' choices are validated and accurate. If all three options have been selected, a message box will appear to confirm the selections. Clicking "Yes" will close the main window and continue to generate the assessment question. After confirming their selections, the system proceeds to generate the questions and corresponding answers based on the chosen criteria. A confirmation message is essential in human-computer interaction as it serves multiple purposes in enhancing user experience and ensuring accuracy. It aligns with several principles and theories in the field of human-computer interaction, such as the theories of feedback and confirmation (Ashlock et al., 2003; Constantine et al., 2003; Constantine & Lockwood, 1999; Herring, 2010; Karner & Drosehl, 2002; Knight, 2017). Confirmation messages in user-computer interaction serve as feedback, validating users' selections and informing them that their actions have been acknowledged. They reduce errors, increase user confidence, and provide a checkpoint to review and correct any unintended choices before irreversible actions are taken (Long et al., 2022). By fostering trust, satisfaction, and error prevention, confirmation messages enhance the overall user experience (MacDonald et al., 2022).

Table 3: Sample output 1 (user selection: two questions).

	Assessment Question	Sample Marking Scheme
1	What is an algebraic expression?	An algebraic expression is a combination of numbers, variables and operations that are written out in a mathematical statement.

	Assessment Question	Sample Marking Scheme
2	What is the difference between an equation and expression?	An equation is a statement that two expressions are equal, while an expression is composed of numbers and symbols that represents a mathematical statement.
3	How do you solve an algebraic equation?	To solve an algebraic equation, isolate the variable on one side of the equation then use inverse operations to get the variable alone on the other side of the equation. Once the variable is isolated, substitute the value for the variable into the equation.

Speech-to-Text (STT) is an integral component of an assessment system designed to facilitate learners' spoken responses to assessment questions, which are then transcribed into written text. Through the use of speech recognition technology and algorithms, the system captures and converts spoken answers, enabling analysis and evaluation of learners' responses. This feature, with its focus on accessibility and inclusivity, particularly benefits individuals who face typing challenges or prefer verbal communication. By incorporating the STT function, the assessment system provides a flexible and user-friendly experience that aligns with the principles of education engineering, accommodating diverse learner abilities and preferences while leveraging automated evaluation capabilities (Lewis et al., 2014). To present the questions to students, a GUI window is employed, featuring text fields for each question. This format enables students to answer all the questions provided. In the case of the "English" subject selection, the system generates a comprehension paragraph as a case study, with questions tailored to the specific topic covered in that case study. Upon completing the assessment and reviewing their answers, students can press the "Submit" button, allowing teachers to evaluate their performance.

The screenshot shows a window titled "Answer Sheet" with a timer at 05:04. It contains a paragraph of text about technology in the classroom. Below the text are three questions, each followed by a text input field and a microphone icon for speech input. A "Submit" button is at the bottom.

The most important advantage of using technology in the classroom is that it ensures every student learns at their own pace. By using software, such as digital textbooks, interactive whiteboards, and virtual reality, students can learn through different methods and move through complex material at their own speed. Digital textbooks, for example, can provide students with interactive diagrams that highlight key points, videos and audio to provide topics in different forms, and quizzes that can help assess their skills. Technology can lend a helping hand to those who have trouble keeping up in class due to lack of focus or a slow learning speed, allowing them to keep up with the rest of the class.

How can technology help students who have difficulties in the classroom?

What examples of technology are used to help students learn?

What is the most important advantage of using technology in the classroom?

Figure 4: Sample output 2 (Case study generated using “English” as the subject).

Table 4: Total time granted for each level of difficulties.

Subject	Difficulty Level	Time Given (sec)	Total Time Limit
All subject (^excluding English)	Easy	30	Number of Question * Time Given
	Moderate	45	
	Hard	60	
	Extreme Hard	90	
English	Easy	30 + 180	Number of Question * Time Given + 180 sec (3 mins)
	Moderate	45 + 180	
	Hard	60 + 180	
	Extreme Hard	90 + 180	

Assessment Scoring

The assessment system calculates student scores by comparing submitted answers to system-generated correct ones using Twinword's similarity feature. Predefined thresholds gauge accuracy. This aids educators in tracking progress, evaluating teaching methods, and pinpointing areas needing support. It motivates students by showing improvement and encouraging ongoing learning.

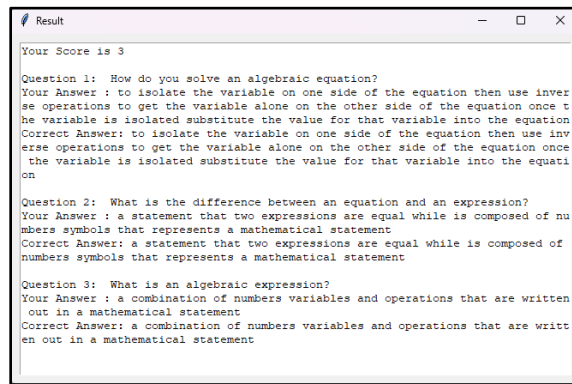


Figure 4: Automated assessment marking.

DISCUSSION & BENCHMARKING

Evaluation and benchmarking of the assessment system can be conducted by comparing its automated grading system, which utilizes AI and Natural Language Processing (NLP) with the Twinword semantic similarity feature, against the standard of Human Level Performance (HLP). HLP (as shown in Table 5) serves as a reference point, representing the level of grading accuracy and understanding achieved by human assessors. Through this evaluation, the system's performance can be assessed by comparing its grading results with those of human assessors.

Table 5: Benchmarking with HLP.

Test Plan				Performance	
Subject	Level	Question Generated	Suggested Answer	HLP on Question Generated	HLP on Answer Generated
Mathematics	Easy	Q1. What is Algebra?	A1. Algebra is a branch of mathematics that uses symbols and equations to represent numbers, relationships, and objects.	Yes	Yes
		Q2. What are variables in Algebra?	A2. Variables are letters or symbols that stand for a particular number in an equation.	Yes	Yes

	Moderate	Q1. What is a Linear Equation?	A1. A linear equation is an equation of a straight line, written in the form $ax + b = 0$; where 'a' and 'b' are constants and 'x' is a variable.	Yes	Yes
		Q2. How do you solve a System of Linear Equations?	A2. A system of linear equations can be solved using various methods such as Substitution Method, Elimination Method, and Gaussian Elimination.	Yes	Yes
	Hard	Q1. Solve for x in the equation: $3x - 6 = 12$	A1. $x = 8$	Yes	Yes
		Q2. Divide the polynomial $4x^3 + 27x^2 - 73x + 60$ by $2x + 5$	A2. $4x^2 + 17x - 43$	Yes	Yes
	Extreme Hard	Q1. Prove that the product of two odd numbers is always an odd number.	A1. Let a and b be two odd numbers. This means $a = 2n + 1$ and $b = 2m + 1$, where n and m are integers. Thus, their product $a \cdot b = (2n+1)(2m+1) = 4nm + 2(n+m) + 1$. Since n and m are both integers, the whole expression is an integer plus one - thus it is always an odd number.	Yes	Yes
		Q2. Prove that $(2x^2 - 5x + 3)$ is a prime number for any integer value of x.	A2. Let x be any integer. Then, $2x^2 - 5x + 3$ can be written as $(2x - 3)(x + 1)$. Since at least one of the factors is always a non-zero integer, the expression $2x^2 - 5x + 3$ is not prime for any integer value of x.	Yes	Yes
Physics	Easy	Q1. What is the speed of sound?	A1. The speed of sound is approximately 343 meters per second (1,125 feet per second) in dry air at sea level and 0 degrees Celsius.	Yes	Yes
		Q2. What is frequency?	A2. Frequency is the number of complete wave cycles passing a fixed point per second measured in hertz (Hz).	Yes	Yes
	Moderate	Q1. What is the speed of sound?	A1. The speed of sound is approximately 340 m/s in dry air at 20°C (68°F).	Yes	Yes
		Q2. What is the frequency of sound?	A2. The frequency of sound is the number of complete sound waves or cycles in one second, measured in hertz (Hz).	Yes	Yes
	Hard	Q1. How can sound be described in terms of a wave?	A1. Sound can be described in terms of a wave with displacement, frequency and wavelength being the parameters used to describe it.	Yes	Yes
		Q2. What is the frequency range of human audible sound?	A2. Human audible sound is typically considered to be in the range of 20 Hz to 20 kHz.	Yes	Yes
	Extreme Hard	Q1. What is the effect of temperature on sound velocity?	A1. The speed of sound is affected by the temperature of the medium from which the sound is traveling. As temperature increases, the speed of sound increases, while as the temperature decreases, the speed of sound decreases.	Yes	Yes

		Q2. What are the properties of a standing wave?	A2. The properties of standing waves include nodes, antinodes, wavelength, and frequency. Nodes are the points at which the string is neither vibrating nor moving, antinodes are the points at which the string is vibrating at its fullest, the wavelength is the distance between two successive nodes or antinodes, and the frequency is the number of vibrations per second.	Yes	Yes
		Q2. What is the difference between moral and ethical behavior?	A2. The difference between moral and ethical behavior is that moral behavior is how one acts in accordance with cultural norms, while ethical behavior is how one acts in accordance with accepted principles of right and wrong.	Yes	Yes
	Extreme Hard	Q1. How do we examine the morality of an action?	A1. The morality of an action can be examined by determining whether it satisfies certain ethical principles. These principles are based on values such as the promotion of happiness, the avoidance of harm, and respect for autonomy. Ultimately, the decision of a moral action depends on the particular values of the actor and the societal context in which the action takes place.	Yes	Yes
		Q2. What are the limitations of ethical frameworks in helping us determine moral decisions?	A2. Ethical frameworks provide general guiding principles, however may not always be able to provide definitive answers when faced with a particular moral dilemma. Additionally, ethical frameworks may not always be relevant to all contexts, so local customs and legal requirements must be taken into account when making a moral decision.	Yes	Yes

The AI and NLP algorithms are suggested for evaluating student responses via the Twinword semantic similarity feature, gauging correspondence with correct answers. Comparing against HLP establishes the system's automated grading precision. This approach assesses the system's comprehension and accurate appraisal akin to human assessors, spotlighting strengths, and areas for improvement. Such AI/NLP-guided evaluation empowers educators and developers to refine the system, aligning it with human-level grading while utilizing AI and NLP's potential. Notably, the proposed solution successfully meets HLP evaluation criteria and attains grading accuracy comparable to human assessors, affirming its reliability and effectiveness in delivering high-quality automated assessments.

CONCLUSION

In summary, the integration of artificial intelligence (AI) into formative assessment is pivotal for enhancing STEM education. Traditional methods like quizzes and tests have limitations in scalability and efficiency. The proposed AI-assisted formative assessment system, showcased in this study, utilizes natural language processing (NLP) techniques and large language models (LLMs) to offer transformative feedback to students. Through rigorous evaluation involving STEM educators, the system has exhibited its prowess in delivering precise and timely feedback. This aids in improving learning outcomes by identifying areas requiring attention and providing personalized assistance. By automating grading, the system optimizes efficiency, while integration with technologies like the Twinword Text Similarity API enhances objectivity in scoring. Despite challenges like development costs, the system's potential benefits in scalability and personalization are profound. It empowers educators with comprehensive insights and students with

immediate feedback. As the system evolves, ongoing refinement and wider accessibility are focal points. Leveraging AI and NLP, the system can continually align with human-level grading standards, enriching formative assessment practices, and yielding improved STEM education outcomes. In conclusion, the amalgamation of AI and NLP techniques marks a paradigm shift in formative assessment within STEM education. The AI-assisted formative assessment system, presented as a trailblazing example, holds promise in revolutionizing the quality, scalability, and personalization of STEM education through its impactful feedback mechanisms.

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Design, Development, and Evaluation of Video Lesson in Adverb for Grade IV English

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ABSTRACT

Adverb for English IV among pupils in a district of a public school in Iloilo City is one of the least mastered topics that resulted to the low score of pupils in the formative and summative test during the pandemic. This descriptive and action research study aimed to describe the design, development, and evaluation of the video lesson in adverb in English for Grade IV. The designing of the video lesson involves selection of the model to be used. The development of the video lesson involved making of the activities under the 7Es model. During the evaluation, the English teachers from grades IV to VI evaluated the video lesson using the Rating Sheet for Non-Print materials from the Department of Education. The design of the video lesson allowed the 7Es (engage, elicit, explore, explain, elaborate, evaluation, extend (enrichment) model and the development of the video lesson contained what the pupils did in the 7Es. Based on the evaluation, the video lesson on adverb was rated excellent in all areas (content quality, technical quality, instructional quality and other findings). This video lesson can be used by the English teachers as instructional learning material for Grade IV pupils on adverb topic when implemented to the pupils.

KEYWORDS: Adverb, Video Lesson, 7Es, Constructivism, Iloilo City

INTRODUCTION

The Coronavirus (Covid-19) pandemic has caused a dramatic disruption in the delivery of education and health services (Cho et al., 2021). This leads to the near-total closure of schools. Our government decided to temporarily close schools to reduce or stop the spread of virus. Millions of children are at risk of logging behind due to this school closure. But then, learning must continue. Our government through the Department of Education issued a DepEd Order No 018 series 2020, Policy Guidelines for the Provision of Learning Resources in the Implementation of the Basic Learning Continuity Plan (DepEd, 2020).

According to UNICEF (2020) more than 1 billion children are at risk of falling behind due to school closure aimed at containing the spread of covid-19. Because of this, the government find ways so that education must continue despite this threat.

Moreover, due to this pandemic, different learning modalities were created to cater the needs of both teachers and learners to continue the learning process of our educational system. One of which is the blended learning. Blended learning refers to a learning delivery that combines fact-to-face or a mix of, modular distance learning, online distance learning, and television /radio-based instructions. This is where video lessons were developed and used for supplementary purposes (Llego, 2021).

The call for the design, development and evaluation of the video lesson is created because the grade IV English teacher found out that the scores of the pupils were low during the conduct of formative and summative tests on the adverb. Identifying the adverbs and its kind as well as using them in a sentence are one of the least learned skills encountered by the grade IV learners in English IV. Therefore, to help the grade IV pupils master these skills, a developed video lesson in adverb was designed and developed using the Inquiry Based Learning specifically 7Es model.

RESEARCH OBJECTIVE

This study aimed to describe the design, development, and evaluation of the video lesson in adverb in English for Grade IV.

7Es Model

The design of the developed video lesson followed the 7Es (elicit, engage, explore, explain, elaborate, evaluate and extend) model.

It is a constructivist design because the students need to connect their new knowledge to their previous experiences (Dewey, 2011).

Sadeq (2003) defined the 7Es Learning Cycle as an educational pattern consist of seven teaching and learning steps, used by the teacher with his students inside the classroom, aiming, at enabling the student to build his scientific knowledge acquisition by himself. Also, it aims at developing a lot of other scientific concepts and skills, depending on motivation, reconnoitering, curiosity, explanation, exploration, and expansion, connecting concepts together and amending some student's wrong concepts.

The 7Es Learning Cycle pays more attention to the students' previous knowledge and experiences, and it is interested in selecting and organizing the content skills, by which it made it easy for the learners to absorb and process the learning material in his cognitive structures, beside forming new cognitive structures (Khashan, 2016).

The knowledge to be learned is structured into subjects, tasks, and performance objectives in the design phase are written in part. The design also specifies what the learners will be able to do as a result of the instruction (Heaster-Ekholm et al., 2020).

SIGNIFICANCE OF THE STUDY

The results may be beneficial to the following:

Teachers. The results of this study will be the basis for recommendation for use of the video lesson on adverbs for teachers and the grade four (4) pupils.

Pupils. It may serve as a tool to help learners in gaining deeper understanding of the content of adverb and master the least learned skill.

Future Researchers. This study will be of help to those who would like to undertake similar research.

RESEARCH METHODOLOGY

Research Design

This descriptive and action research study described the design, development and evaluation of the video lesson on adverb for grade IV English. The researchers used but modified evaluation rating sheet for non-print materials from the Department of Education, Philippines. The primary aim of this questionnaire is to evaluate the content quality, instructional quality, technical quality, and others of the video lesson on adverb for grade IV English using 7Es model.

The design of the developed video lesson followed the 7Es (elicit, engage, explore, explain, elaborate, evaluate and extend) model. The evaluators viewed and evaluated the video lesson on adverb for grade IV English for 20 minutes using the Rating Sheet for Non-Print materials from the Department of Education and followed up with a one-on-one interview to substantiate the data derived from the rating sheet. Their comments and suggestions were also taken into consideration. The statistics that were used are mean and standard deviation in the evaluation of video lesson on adverb for grade IV English.

It has to be noted however, that in this study, some parameters were not considered in the final analysis due to several factors beyond the control of the researchers.

Research Participants

The evaluators were the three teachers ages 42, 43, 52, regular and tenured teachers handling English subject in grades IV to VI in a public elementary school in Iloilo City, Philippines, school year 2021-2022.

RESULTS

1. Designing of the video lesson

The design of the video lesson was based on the lesson plan using 7Es instructional model of constructivism. This instructional model was developed by Elsenkraft (2003) as an expansion of the 5Es Model. The 7Es stands for elicit, engage, explore, explain, elaboration, evaluation and extend (enrichment activity).

2. Development

During the development, all aspect of 7Es were written.

In the **elicit** part of the lesson, a word drill exercise was given for the pupils for them to be familiarized with the common words used in the entire video lesson. Words were flashed in the video, then pupils read the words after the teacher.

In **engage** part, a guessing game was given to engage the pupils' interest and curiosity of the topic. A blurred picture of an angel was flashed on the screen then pupils were asked to guess the image formed in the picture. Three (3) differentiated activities were provided to the pupils

In the **explore** part of the video lesson. Filling in the gaps with the correct adverb to complete the sentences, constructing sentences based on the pictures given were the activities provided to the pupils. Pupils were asked to choose only one (1) activity which was suited to their capability. A rubric was used to evaluate the work of the pupils.

During the **elaboration**, Covid 19- is integrated in the lesson. Pupils were asked to elaborate health protocols to be observed in times of pandemic using the different kinds of adverbs they have learned in the lesson. A paper and pencil test in the evaluation part were given to measure if the objective of the lesson was attained or not.

At the end of the lesson, **enrichment activity** for pupils was given wherein they are asked to write sentences using the different kinds of adverb base on the given picture

3. Evaluation

The English teachers were asked to evaluate the developed video lesson using the Rating Sheet for Non-Print materials from the Department of Education. They will also write their comments and suggestions.

RESULTS OF EVALUATION

Based on the evaluation validated by three teachers teaching English the developed video lesson in adverb for Grade 4 English. All the areas of evaluation were rated excellent according to the Rating Sheet for Non-Print materials from the Department of Education.

M=95.9% , SD=1.59

Note: Passing percentage is 75%. The means were interpreted as follows: 90-100= excellent; 85-89=good; 80-84=average; 75-79 = fair;74 and below = poor

Area of Evaluation	Mean Score	SD	Percent Score	Description
A. Content (40)	38	2.89	95%	excellent
B. Instructional Quality (40)	39	1.73	97.5%	excellent
C. Technical Quality (52)	50	1.15	96.15	excellent
D. Other Findings (16)	15	0.58	93.75	excellent

DISCUSSIONS

Design

The design of the developed video lesson followed the 7Es (elicit, engage, explore, explain, elaborate, evaluate and extend) model.

It is a constructivist design because the students need to connect their new knowledge to their previous experiences (Dewey, 2011).

Sadeq (2003) defined the 7Es Learning Cycle as an educational pattern consist of seven teaching and learning steps, used by the teacher with his students inside the classroom, aiming, at enabling the student to build his scientific knowledge acquisition by himself. Also, it aims at developing a lot of other scientific concepts and skills, depending on motivation, reconnoitering, curiosity, explanation, exploration, and expansion, connecting concepts together and amending some student's wrong concepts. The 7Es Learning Cycle pays more attention to the students' previous knowledge and experiences, and it is interested in selecting and organizing the content skills, by which it made it easy for the learners to absorb and process the learning material in his cognitive structures, beside forming new cognitive structures (Khashan, 2016).

The knowledge to be learned is structured into subjects, tasks, and performance objectives in the design phase are written in part. The design also specifies what the learners will be able do as a result of the instruction (Heaster-Ekholm et al.,2020).

Development

In the development of the developed video lesson in adverb that followed the 7E's format. The first stage of the 7E's model elicit part. The pupils were asked to read the words after the teacher. The elicit stage is closely followed by the engage stage, the main goal of which in either 5E's or 7E's model, is to capture the students' attention (Eisenkraft, 2003).

In the engage part, the pupils were asked to guess the blurred image shown to them. They were asked also to identify the pictures of an angel. They were asked if the they believe that each of us has an angel or not. In the explore part, pupils were asked to listened to a story. They were also asked to answer questions to check their comprehension. In this part also, pupils were asked on what they will do if they saw someone slept in the pavement. They were asked also on what to do if someone breaks its leg.

In the explain part, the pupils learned on the concept of adverb through teacher's discussion in the video lesson. The 7E's model affords students opportunities to design and plan experiment s, record data, and develop hypothesis during then explore stage (Eisenkraft, 2003).

In the explore part of the video lesson, the pupils were given three differentiated activities to perform. They were asked to choose only one activity that suits their capacity. They were also asked to work collaborate with their parents on their chosen activity. The submission of the output was via grade level group chat or it was sent directly to the English teacher. A rubric was used to evaluate their outputs.

"Elaboration" is the phase during which students apply their understanding to other situations (Bybee, 2014).

In the elaborate part, the pupils find practical application of concepts and skills in daily living. In this part concepts about covid-19 are integrated. The pupils were asked to identify health protocols to be observed in this pandemic time.

In this part also, generalization took place wherein pupils were asked to elaborate the concepts they have learned in the video lesson. "Evaluation" allows for summative assessment by the teacher while encouraging students' self-assessment of their understanding and abilities (Bybee, 2014).

In the evaluate part, the paper and pencil test was given. Pupils were asked to write one sentence for each given adverb. There were five adverbs given by the teacher. They were asked to submit the test via messenger.

In the extend (enrichment) part, pupils were asked to write five sentences using adverb based on the picture given. The development of the developed video lesson in adverb followed the lesson plan in English 4 using 7E's model.

Evaluation

The results showed that the developed video lesson was generally excellent (mean=95.9%, sd=159) (Table 1). As to the content quality, the evaluators found that the video lesson was excellent. It means that they were generally very satisfied with the content with topics/skills found in the DepED Learning Competencies for the subject and grade/year level it was intended; concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives; content is accurate; content is up-to-date; content is logically developed and organized; content is free from cultural, gender, racial, or bias; content stimulates and promotes critical thinking; content is relevant to real-life situations; language (including vocabulary) is appropriate to the target user level; and content promotes positive values that support formative growth.

In the area of instructional quality, the evaluators rated the video lesson excellent. It means that they were very satisfied with purpose of the material is well defined; material achieves its defined purpose; learning objectives are clearly stated and measurable; level of difficulty is appropriate for the intended target user; graphics / colors / sounds are used for appropriate instructional reasons; material is enjoyable, stimulating, challenging, and engaging; material effectively stimulates creativity of target user; feedback on target user's responses is effectively employed; target user can control the rate and sequence of presentation and review; and instruction is integrated with target user's previous experience.

In terms of technical quality, the evaluators rated the video lesson excellent. It means that they were generally very satisfies with audio enhances understanding of the concept; speech and narration (correct pacing, intonation and pronunciation) is clear and can be easily understood; there is complete synchronization of audio with the visuals, if any; music and sound effects are appropriate and effective for instructional purposes; screen displays (text) are uncluttered, easy to read and aesthetically pleasing; visual presentations (non-text) are clear and easy to interpret; visuals sustain interest and do not distract user's attention; visuals provide accurate representation of the concept discussed; the user support materials (if any) are effective; the design allows the target user to navigate freely through the material; the material can easily and independently be used; the material will run using minimum system requirements; and the program is free from technical problems.

In the area of other findings, the evaluators also rated the video lesson excellent. It simply shows that they were very satisfied with the conceptual errors; factual errors; grammatical and/or typographical errors; and other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.).

Therefore, the evaluators found the content quality, instructional quality, technical quality and other findings to be excellent according to the Rating Sheet for Non-Print materials from the Department of Education.

LIMITATION OF THE STUDY

The result of the study was limited only when 7E's model was used in developing the video lesson, English teachers from grades VI to VI in a public school were the evaluators.

IMPLICATION TO PRACTICE

The production of the developed video lesson can be used by the English teachers as instructional learning material for Grade IV pupils on adverb topic when implemented to the pupils. This video lesson on adverb will enhance the learning experience of the pupils and empower English teachers in a public school.

SUMMARY

The design of the video lesson followed the 7Es model.

The development of the video lesson contained what the pupils did during the 7Es model. The developed video lesson started with a word drill as the elicit part where in pupils were asked to read the words flashed in the screen after the teacher. Pupils participated in the guessing game in the engage part of the video lesson. In the explain part, the pupils learned on the concept of adverb through teacher's discussion in the video lesson. In the explore part, the pupils were given the freedom to choose among the given activities that suits their capability. In the elaborate part, the pupils find practical application of concepts and skills in daily living by asking them the different health protocols observed in the pandemic time. In this part also, generalization took place wherein pupils were asked to elaborate the concepts they have learned in the video lesson. In the evaluate part, pupils were asked to write one sentence for each given adverb. In the extend (enrichment) part, pupils were asked to write five sentences using adverb based on the picture given.

The English teachers evaluated the video lesson excellent in all areas.

CONCLUSIONS

The study produced the 7Es designed and developed video lesson on adverb for Grade IV English lesson. With excellent rating in all areas in terms content quality, technical quality, instructional quality and other findings. This can be use as supplementary instructional materials for adverb among teachers and pupils in grade subject for implementation.

RECOMMENDATIONS

1. The teachers may use the developed video lesson to improve the mastery skills of pupils in adverb.
2. Pupils can use this video lesson subject for pre-test and post-test.
3. Curriculum planners may consider the design video lesson as additional source of instructional learning materials for English IV.
4. School heads may recommend to other public school the use of video lesson after implementation.

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Developing and Evaluating Little Periodic for Enhancing Conceptual Understanding of Chemical Representations in the Periodic Table of Elements Using the ADDIE Model

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ABSTRACT

Learning the periodic table of elements can pose a challenge for students due to the complex organization and relationships between the different elements. Game-based interventions have been shown in past studies to be one of the feasible ways to overcome this challenge. In this research, a tabletop game, called "Little Periodic," was developed to improve students' chemical representation and conceptual understanding. The ADDIE model involves five phases (Analysis, Design, Development, Implementation, and Evaluation) was applied. The study first analyzed the needs of students and identified key concepts that students needed to master. Three teachers were interviewed to see the appropriate content that will be included in the tabletop game based on the *Dokumen Standard Kurikulum dan Pentaksiran(DSKP)*. A tabletop game was designed and developed that could be used in physical learning environments. To evaluate the effectiveness of the developed tabletop game, validation forms and questionnaires were administered to three validator experts. The results indicated that the tabletop game was valid and effective, with high scores for content suitability, potential effectiveness, and overall satisfaction. The feedback received from chemistry teachers indicated a significant level of satisfaction with the tabletop game. The developed tabletop games can be employed in various learning situations, including in-person learning and the effectiveness of tabletop games need to further to be investigated, to ensure and enhance students to achieve deeper learning outcomes.

KEYWORDS: game-based learning, tabletop games, periodic table of elements, little periodic, chemistry education

1.0 INTRODUCTION

1.1 Background

Chemistry is the scientific field concerned with the study of substances and their interactions. It encompasses a broad range of topics, from the composition and structure of matter to the properties, changes, energy, and dynamics of chemical reactions. Chemistry, at its core, revolves around comprehending the behavior of atoms and molecules and gaining insight into how they interact with each other, leading to the creation of novel substances with unique properties (Fahlman, 2023; Napes & Sharif, 2022). This knowledge forms the foundation of numerous scientific fields and plays a vital role in advancing our understanding of the natural world (Sun et al., 2022).

One of the key features of chemistry is its use of chemical representation to help explain chemical phenomena. This representation can be divided into three levels: macroscopic, symbolic, and microscopic (Rahmawati et al., 2022). The macroscopic level deals with observable phenomena that can be seen with the naked eye through experiments. The symbolic level uses diagrams, pictures, and formulas to represent chemical phenomena, while the microscopic level deals with the observation of particles, including their interactions, chemical bonding, and movements, which are too small to be seen without the aid of specialized tools.

The periodic table of elements is an essential tool in the study of chemistry, serving as a visual representation of the connections between the three levels of representation: macroscopic, microscopic, and symbolic (Camara Olim et al., 2023). This chart organizes all known elements in ascending order of their atomic numbers and electron configurations, providing chemists with a predictive framework for understanding the chemical behavior of elements and their compounds. The periodic table's significance to the scientific community cannot be overstated, as it serves as the foundation for the classification, prediction, and exploration of matter at the atomic level, leading to numerous technological advances and groundbreaking discoveries in various scientific fields (Bylikin et al., 2023).

The periodic table also provides a macroscopic representation of elements, as it shows their physical properties such as melting and boiling points, densities, and atomic radii. These properties can be observed and measured through experiments (Eichler, 2019). The periodic table also provides a symbolic representation of the elements through their atomic symbols and a microscopic view of the elements through their electronic structures and bonding (Eichler, 2019). However, the integration of these levels of representation can pose a challenge for both students and teachers of chemistry. Students may find chemistry challenging due to the complex interplay of these levels, while teachers need to fully grasp and communicate the concepts to their students (Narod & Narrainsawmy, 2022).

To identify challenges in chemistry education, a preliminary study was conducted interview exclusively with experienced chemistry teachers, followed by a needs analysis. The findings stemming from this investigation unveiled that students frequently grapple with mastering the subject due to inherent complexities tied to comprehending chemical representations. Teachers have also faced difficulties in effectively visualizing and explaining representations of the periodic table during their teaching sessions. The complex relationships and patterns between the various elements can be challenging to convey to students in a way that is both clear and engaging.

The findings supported by past study which hinder students' ability to develop a deep conceptual understanding of the periodic table and its importance in chemistry (Bierenstiel & Snow, 2019). The main issue identified was the confusion caused by the complexity of chemical representations, which hindered students' understanding of the chemistry subject. While the macroscopic properties of the elements, such as their physical states, melting points, boiling points, and densities, are often easier for students to grasp as they can be observed and measured directly, it can still be challenging for students to understand how

these properties relate to the organization of the periodic table (Narod & Narrainsawmy, 2022; Tóthová et al., 2021; Traver et al., 2021).

On the other hand, the microscopic properties of the elements, such as their electron configurations and chemical reactivity, can be more difficult for students to visualize and understand. This is because they require an understanding of the interaction and behavior of atoms and molecules, which is not always intuitive. Therefore, students may struggle to understand how the organization of the periodic table relates to these microscopic properties. In addition to this, the symbolic notation used to represent the elements and their properties, such as atomic symbols, electron configurations, and valence electron counts, can be challenging for students to learn and memorize. This can make it difficult for students to connect the symbols to the macroscopic and microscopic properties of the elements and to understand the organization of the periodic table (Bierenstiel & Snow, 2019; Salame et al., 2011).

Based on the identified challenges in learning the periodic table of elements, it can be concluded that the difficulties in understanding chemical representations arise from the limitations on learning materials. There are several suggested approaches to learning the periodic table of elements, ranging from traditional teaching styles to more modern and interactive methods. The traditional approach often involves memorization of the elements' names, symbols, atomic numbers, and other properties, which can be challenging and tedious for some learners (Rahmawati et al., 2022). These materials often fail to cover the essential concepts of chemical representation and lack interactive and engaging features that can help students to master the subject. However, the use of 3D modeling and visualization tools can help make the elements more tangible and easier to understand (Selco, 2020; Selco et al., 2012). Another approach is to adopt parallel metaphors, such as storyline telling (Collins, 2021) or analogies, to help students relate the elements to familiar concepts (Collins, 2021; Üce & Ceyhan, 2019). Inquiry-based learning, which involves asking questions and exploring topics in-depth, can also be effective, especially when using a periodic-universe teaching model that highlights the connections and patterns between the elements (Gholam, 2019; Li, 2021). Finally, problem-based learning can be used to engage students in real-world applications of the periodic table, challenging them to use their knowledge to solve problems and make connections (Virtue & Hinnant-Crawford, 2019).

Educators and researchers are turning to Game-Based Learning (GBL) as a means of enhancing the teaching and learning of science subjects in creative and engaging ways (Cardinot & Fairfield, 2022; Napes & Sharif, 2022). The popularity of using games in the classroom has grown, as studies have demonstrated their potential to facilitate learning and bring about positive changes to the school curriculum. Furthermore, GBL has been found to be effective in promoting social development and teamwork skills in students, further adding to its appeal as a teaching tool (Jonathan & Recard, 2021; Li & He, 2022; Saleem et al., 2022; Tsai et al., 2020).

As the popularity of games continues to grow, educators and researchers are becoming more convinced of their potential as effective teaching tools. By incorporating games into the classroom, students are able to engage with subject material in an interactive and dynamic way, which has been shown to improve learning outcomes. Furthermore, GBL has been found to have a positive impact on social development and teamwork skills, which are valuable in both academic and real-world settings.

2.0 RESEARCH OBJECTIVES

Given the challenges highlighted in the preceding discussion, the aim of this study is to design and develop tabletop games that are both valid and effective in enhancing students' understanding of chemical representations in the periodic table of elements.

3.0 RESEARCH QUESTION

How can the design and development of tabletop games be optimized to ensure both validity and effectiveness in enhancing students' understanding of chemical representations in the periodic table of elements?

4.0 RESEARCH METHODOLOGY

4.1 Research design

The current study employed the Research and Development (R&D) approach, utilizing the ADDIE Model as a procedural guide. According to Bond & Dirkin (2020), the ADDIE model is a widely used model in the field of instructional design, serving as a framework for creating effective designs. The ADDIE model consists of five phases, namely Analysis, Design, Development, Implementation, and Evaluation. Each phase plays a crucial role in the overall success of the instructional design process (Bond & Dirkin, 2020).

The initial phase of the study involved conducting interviews exclusively with chemistry teachers to identify existing issues in chemistry learning. The goal was to analyze their needs and provide solutions to these problems. The appropriate content for development was identified through the use of content analysis based on the *Dokumen Standard Kurikulum Dan Pentaksiran* (DSKP). The interviews revealed that the teachers had a need for learning resources in the form of tabletop games that could be used in face-to-face settings. This finding highlights the potential of tabletop games as an effective learning tool in the chemistry classroom.

4.2 Interview

In the context of this interview, the dialogue delved into the realm of chemistry education through the perspectives of three expert validators. The interview commenced by acquainting the readers with the identities and roles of these experts in the field. Their collective experiences encompassed a multifaceted engagement within chemistry education, from both instructional and learning standpoints. The example of the interview question is *“Can you please introduce yourself and your role in the field of chemistry education?”* and *“Could you share your experience with learning and teaching chemistry concepts?”*

The dialogue evolved to encapsulate the experts' perceptions of challenges in comprehending chemical representations in the periodic table. A comprehensive analysis surfaces, highlighting obstacles that students commonly confront, including the abstraction of atomic structures and the visualization of periodic trends. Additionally, the experts offer personal reflections on specific aspects of the periodic table or chemical concepts that intrigue or pose challenges to their own understanding. The example of interview question is *“In your opinion, what are some challenges or difficulties that students commonly face when learning about chemical representations in the periodic table?”*

Exploring pedagogical methodologies, the experts discuss their preferred learning methods that are known to foster effective engagement. These approaches encompass a synergy of interactive techniques, visual aids, and participatory discussions, which are well-established in educational contexts. The validators further extended their insights into the potential integration of educational games for learning, despite their lack of direct exposure to such games. They speculate on how these interactive methods might impact students' learning experiences. Sample interview questions include, *“What methods of learning and engagement do you find most effective and enjoyable in traditional educational settings?”* and *“Given your expertise, how do you think the introduction of educational games could potentially enhance learning experiences, even if you haven't personally used them for learning?”*

The interview explored the realm of tabletop games, delving into their potential for both educational and recreational purposes. The participants, though not previously familiar with tabletop games, share their

perspectives on the attributes that might underpin effective learning and engagement within such games. They discuss elements such as interactivity, collaborative problem-solving, and decision-making, speculating on how these aspects could contribute to a dynamic learning experience. Furthermore, the experts express their preferences regarding game mechanics, formats, and interactivity in the context of educational games. The example interview questions include, *"What are your initial impressions or expectations of tabletop games, whether for educational or recreational use?"* and *"Based on your understanding, what aspects of tabletop games do you think could potentially contribute to effective learning and engagement?"*

The interview concluded by examining the potential benefits of tabletop games in enhancing the understanding of chemical representations within the periodic table. The experts collectively concur that these games possess the capacity to tangibly transform abstract concepts, facilitating deeper comprehension. They contemplate the aspects of tabletop games that could amplify the learning experience, such as competitive elements, thematic coherence, and immersive interactivity. Example of interview outlines *"In your opinion, how could tabletop games potentially help in improving your understanding of chemical representations?"*

In conclusion, this comprehensive interview had shed light on the multifaceted landscape of chemistry education, particularly within the context of the periodic table. Through the insights and perspectives of three expert validators, valuable understanding into the challenges, methodologies, and potential innovations that shape effective learning and engagement in this field had gained.

4.3 Game-Based Learning

Game-Based Learning is a suitable model of learning for teaching chemistry, and a fun and engaging way to promote active, constructive learning (Napes & Sharif, 2022; Nkadimeng & Ankiewicz, 2022). Designing a tabletop game centered on the periodic table of elements provides an opportunity for students to engage with the subject matter in an educational environment. Derived from the inventive concepts introduced by John Coveyou in his game 'A Game of Elements,' Little Periodic integrates his visionary approach into its design. This adaptation is meticulously crafted to offer players an engaging and enjoyable method of comprehending fundamental concepts. With a focus on atomic radius, atomic number, fluctuations in atomic mass, and shifts in ionization energy, Little Periodic provides an interactive and entertaining learning experience with the modification that suits the Malaysian Chemistry Curriculum. The modification was made by adding the term *"nucleon number"* beside the term *"atomic mass"*, *"proton number"* with *"atomic number"*, then switch *"the shift of ionization energy"* as the final periodic trend to be activated as this concept was not in Form 4 Chemistry syllabus.

The periodic trends in the Little Periodic refer to patterns that are observed in the properties of elements on the periodic table. By understanding these trends, players can better understand how the elements behave and interact with one another. In the game, players activate one of the five periodic trends. Players can choose to either spend energy tokens to activate multiple trends at once or gain energy tokens by activating only one trend. This adds a strategic element to the game, as players must carefully manage their energy tokens and decide when to activate multiple trends for a big move and activate only one trend. For example, if a player activates the increase of atomic radius trend, they may be required to move their game piece in between 1 to 5 steps to a space on the board that corresponds to an element with a larger atomic radius than the one they are currently on. By doing so, players can learn about how atomic radius changes as they move across a period or down a group on the periodic table. The game likely includes multiple stages, each of which challenges players to activate a different periodic trend. By progressing through the stages and mastering the periodic trends, players can become more familiar with the elements and their properties.

The design phase for the proposed Little Periodic tabletop game involves several key steps. First, the learning objectives of the tabletop which are mastering chemical representation and conceptual

understanding must be identified and translated into game mechanics that will effectively achieve those objectives. Little Periodic was designed to help players understand key concepts related to the periodic table, such as atomic structure, periodic trends, and atomic mass. Once the learning objectives have been identified, the rules and mechanics of the Little Periodic were established. This includes defining the actions that players can take, the types of challenges they will face, and the victory conditions for the game. Game mechanics were designed in a way that effectively tests the skills and knowledge that are central to the learning objectives. For example, the game involves activating different trends such as atomic radius, and ionization energy in order to obtain more Goal Cards. Players must strategically use their energy tokens to activate trends and collect goal cards to win the game. Additionally, the game involves the use of Agenda Cards and Awards Tiles, which allow players to perform actions and add an element of strategy and unpredictability to the game, making it more engaging and challenging for players.

The implementation phase of Little Periodic involved a thorough process of validating the game's effectiveness in achieving the identified learning objectives. The three expert validators, who were the same chemistry teachers involved in the previous needs analysis, were engaged to provide input on the game's design and evaluate its effectiveness in promoting chemical representation and conceptual understanding. The first validator expert reviewed the game's learning objectives and provided feedback on the game's alignment with key concepts in the chemistry curriculum. The expert completed a validation form assessing the suitability of the game's content in achieving the identified learning objectives. The expert also provided feedback on the game's accuracy in representing chemical concepts.

The second validator expert with a background marking SPM Chemistry Paper, evaluated the game mechanics and provided suggestions on how to improve the gameplay experience while maintaining the educational content. The expert completed a validation form assessing the potential effectiveness of the game mechanics in promoting the identified learning objectives. The expert also provided feedback on the game's overall engagement and replayability.

The third validator expert more than 15 years of teaching experience evaluated the game's effectiveness in promoting chemical representation and conceptual understanding. The expert observed gameplay sessions and collected data on players' learning outcomes. The expert completed a validation form assessing their overall satisfaction with the game's effectiveness in achieving the identified learning objectives. The expert also provided feedback on the clarity and accuracy of the game's chemical representations. Based on the feedback from the validator experts and the completion of the validation forms, the game mechanics, components, and educational content were further refined to optimize the game's effectiveness in promoting chemical representation and conceptual understanding.

The study employed purposive sampling, which is a non-probability sampling technique that involves the selection of participants based on specific criteria chosen by the researcher. The participants in this study were validator experts who were selected based on their willingness to provide feedback on a tabletop game. The data obtained from the participants were analyzed using a percentage calculation to derive the validation score. The percentage result was compared to the validation score, which is presented in Table 1.

Table 1. Validation of criteria

Percentage	The validity criteria
75.00 – 100	Valid
50.00 – 74.99	Quite Valid
25.00 – 49.99	Less valid
0.00 – 24.99	Invalid

To evaluate the feedback of the validator experts, they were given an opportunity to play and review the tabletop game then to evaluate its effectiveness. The result was obtained in percentage and compared to the criteria response of users as shown in Table 2.

Table 2. Criteria response of users

Percentage	The Validity Criteria
75.00 – 100	Very good
50.00 – 74.99	Good
25.00 – 49.99	Less Good
0.00 – 24.99	Not Good

4.4 Little Periodic

After conducting preliminary research and analysis, it was clear that there is a requirement for a tabletop game that can support the development of students' conceptual understanding of chemistry and is suitable for in-person learning. Little Periodic, a tabletop game adapted from PERIODIC: A Game of The Elements by John Coveyou, was designed to meet this need with six lessons, each tailored for face-to-face learning. Little Periodic includes engaging activities designed to foster students' conceptual understanding of the periodic table of elements through gameplay. As players move across the periodic table to collect elements, they learn about its structure and function, as well as some of the fundamental principles of chemistry. Figure 1(a) shows the gameboard used in this study.

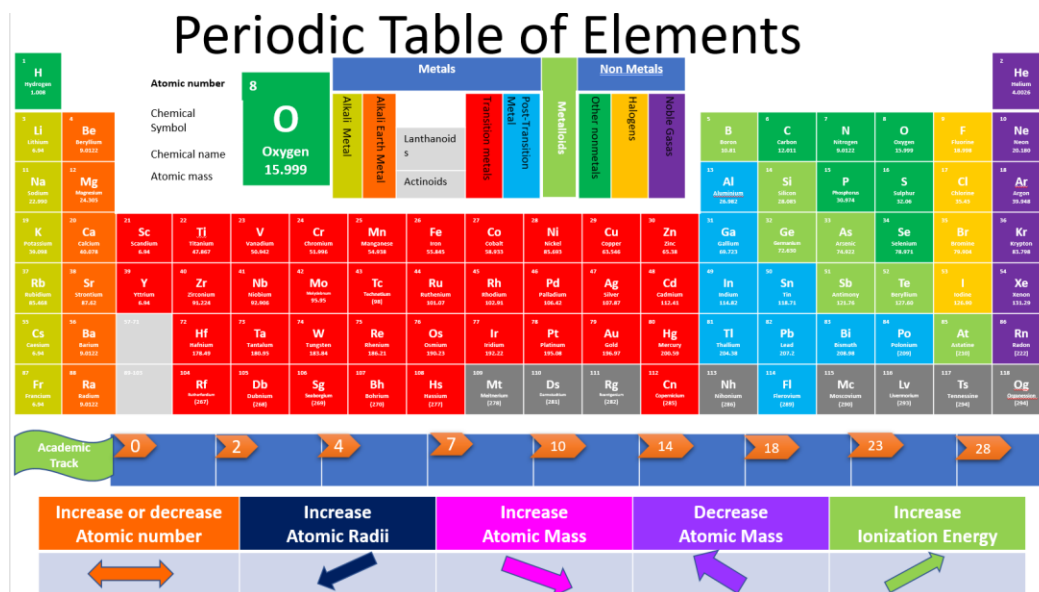


Figure 1(a). The Game Board of Little Periodic

Little Periodic will be using periodic trends to move across the periodic table to score points by researching certain elements. The periodic table is the centrepiece of the game board. Table 3 shows the explanation of chemical representation in Little Periodic.

Table 3. The explanation of chemical representations in the Little periodic

Chemical representation	Activities
Macroscopic	The periodic table has several families (columns), blocks (sets of columns) and other classifications that unite certain elements according to their similar properties. One element of the game is the “Element Group Track”. At the beginning of the game, each player places a microscope on the appropriate “Element Group Cards”. By ending the turn with any flask on any of the elements within your next element group, the player advances on the “Element Group Track” and earn points.
Microscopic	The organisation of the periodic table inspired groups and classification of elements that are listed on the “Element Group Cards”. It also helps explain the periodic trends such as atomic number, atomic mass, atomic radius and ionisation energy which are the trends the player will use to move around the game board.
Symbol representation	In Little Periodic, players research elements by landing on a specific element at the end the movement. Players will see which elements are available for research because they’re shown on face-up Goal cards. Each Goal card has a collection of elements related by some use or other fact.

Little Periodic is a tabletop game in which players navigate the Periodic Table by utilizing periodic trends to gain advantages and score points by researching elements. The objective of the game is to research specific elements listed on Goal Cards to earn points, and the player with the highest score at the end of the game wins. The gameplay can be enhanced by utilizing Agenda Cards and Award Tiles. Figure 2(a) shows the example of Goal cards with 5 points and Figure 2(b) shows the example of Goal Cards with 7 points.

Liquid at Room Temperature		Table Salts		Marie and Pierre Curie Discovered	
35 Br Bromine 79.904		11 Na Sodium 22.990		84 Po Polonium (209)	
80 Hg Mercury 200.59		17 Cl Chlorine 35.45		88 Ra Radium 9.0122	
▲ 5		▲ 5		▲ 5	

Figure 2(a). Goal cards with 5 points.

Lowest Boiling Point		Sugar		LEDs	
1	H Hydrogen 1.008			31	Ga Gallium 69.723
2	He Helium 4.0026			33	As Arsenic 74.922
10	Ne Neon 20.180			49	In Indium 114.82
 		 		 	

Figure 2(b). Goal cards with 7 points.

In Little Periodic, players not only research elements to score points but also compete with each other to end their turn within specific families of elements to earn Academic Points. Additionally, players have the opportunity to earn additional points by achieving a unique combination of objectives listed on the Agenda Cards. These objectives do not have to be completed together, and players can earn points for either or both of the objectives listed on the card. Figure 3 displays a list of the different unique combinations of objectives that can be achieved.

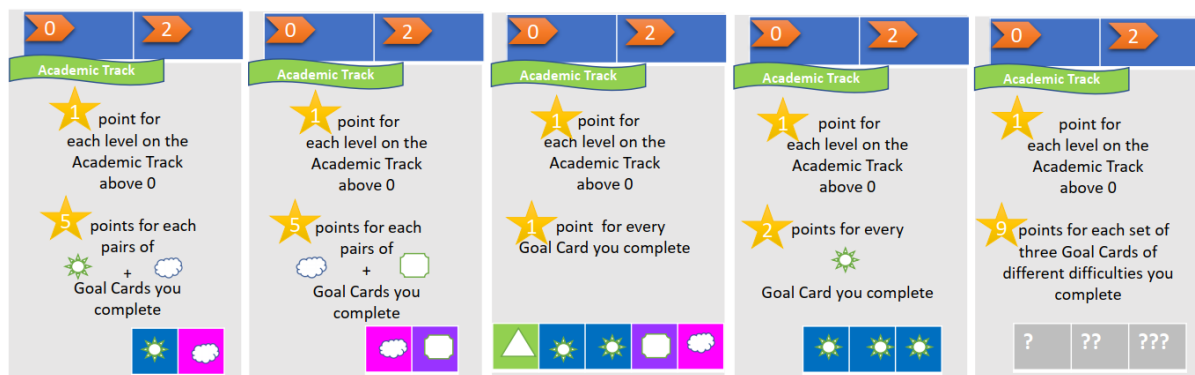


Figure 3. Agenda Cards

As players progress through the game and successfully complete Goal Cards, they are rewarded with Award Tiles which grant them one-time bonus abilities that can be used during their turn. The player can use as many of their earned Award Tiles as they wish to gain these bonuses. Figure 4 illustrates the four different types of Award Tiles available in the game.



Figure 4 Different Award Tiles.

The periodic trends are patterns that emerge in the properties of elements as player moves across the periodic table. For example, elements on the left side of the periodic table are typically more reactive than those on the right side, and elements at the top of a column tend to have similar properties. By incorporating periodic trends into gameplay, the game provides an interactive and engaging way for players to learn about the periodic table and the properties of elements. In the game, players also collect Goal Cards by collecting sets of elements that match specific criteria, such as elements with similar properties or elements from specific groups or periods on the periodic table. This adds a set collection element to the game, providing players with additional opportunities to learn about the properties and characteristics of different elements.

The game's design and mechanics make it suitable for use in a classroom setting, as it can be used to teach students about the periodic table and chemistry concepts. The game can be used as a teaching tool to supplement lectures and textbook readings, or it can be used as a fun and engaging way to reinforce concepts learned in class. On the other hand, it provides an accurate and educational game that covers elements, groups, periodic trends, and vocabulary that are commonly taught in chemistry classes. The accuracy of the game's content makes it a valuable teaching tool for science teachers, as it provides an interactive and engaging way for students to learn and reinforce their understanding of chemistry concepts. In addition, Little Periodic can be played by multiple players, which requires them to collaborate and communicate effectively with each other to achieve their goals. This can help players develop their teamwork and interpersonal skills, as well as their ability to communicate complex ideas and information clearly and effectively (Johnson et al., 1994)

5.0 RESULTS AND DISCUSSION

5.1 Validity

The aim of this study was to develop tabletop games as an intervention to enhance teachers' ability to support students' knowledge of chemical representation and conceptual understanding in the Periodic table of elements. According to Jamal. S.N.B (2019), to ensure that the developed tabletop games are appropriate and easy to comprehend for players, it is crucial to assess their validity (Jamal et al., 2019). In this study, the validity of the tabletop games was evaluated based on their content suitability, potential effectiveness, and overall satisfaction. When developing tabletop games for educational purposes, content validity is essential as it ensures that the content of the games is accurate (Ramli, A. et al., 2017). The validity result for the content aspect is presented in Table 4.

Table 4. The result of the suitability of content aspect validity of the tabletop game

Suitability of Content Aspect Items	Average of percentage from validators' Assessment	Validity Criteria
1.The composition of the learning objectives in the tabletop game is clear	91.7	Valid
2.The composition of the objectives of the tabletop game can be achieved based on the teaching activities used.	83.3	Valid
3.The composition of the objectives of the tabletop game can be achieved based on the strategies used.	100.0	Valid
4.Learning objectives are defined for each activity according to the gameplay suggested	83.3	Valid
5.Teaching objectives can achieve tabletop game objectives	91.7	Valid
6.Teaching objectives are expressed in measurable behaviour.	83.3	Valid
7. Teaching objectives that are stated to lead to the achievement of learning outcomes	91.7	Valid
8.Tabletop games content can meet the stated learning objectives.	100	Valid
9. The tabletop games content is complete in terms of evaluation.	83.3	Valid

Based on Table 4, it can be concluded that Little Periodic is valid in terms of content. For instance, validators have judged that the composition of the objectives of the tabletop game can be achieved based on the strategies used, and the tabletop game's content can meet the stated learning objectives with a 100.0% consensus rate. Additionally, the validators assessed that the composition of the learning objectives in the tabletop game is clear, teaching objectives can achieve tabletop game objectives, and teaching objectives stated to lead to the achievement of learning outcomes with a 91.7% consensus rate.

Other components such as the composition of the objectives of the tabletop game can be achieved based on the teaching activities used, learning objectives defined for each activity according to the suggested gameplay, and teaching objectives expressed in measurable behavior, as well as the tabletop game's content being complete in terms of evaluation, were also found to be valid with a consensus rate of 83.3%. Therefore, it can be concluded that all components of the tabletop game are valid in terms of content.

Potential effectiveness. Table 5 shows the result of potential effectiveness aspect validity of Little Periodic

Table 5. The result of the potential effectiveness aspect validity of Little Periodic

Potential Effectiveness Aspect Items	Average percentage from validators' Assessment	Validity Criteria
1. The learning strategy in each activity is in line with the students' level of thinking.	83.3	Valid
2. The techniques used in tabletop games can be applied effectively.	83.3	Valid
3. The teaching strategy applied is in accordance with the syntax in Game-Based Learning.	91.7	Valid
4. The learning model applied to the tabletop game challenges students to think.	91.7	Valid
5. Activities proposed to use appropriate techniques to stimulate student activity in participating in Chemistry classes.	83.3	Valid
6. The scope of topics in the tabletop game corresponds to the developmental needs of students	83.3	Valid
7. The order of topics in the tabletop game corresponds to the developmental needs of students	75.0	Valid
8. The proposed activities are in line with the material presented.	83.3	Valid
9. The content presented in the tabletop games can be used by all parties in teaching chemistry.	91.7	Valid
10. The tabletop games content is suitable for use in different contexts such as at home.	100.0	Valid
11. The tabletop games content is suitable for use in different contexts such as at school.	100.0	Valid
12. The tabletop games content is suitable for use in different contexts such as cafes.	100.0	Valid
13. The learning media provided are in accordance with the learning objectives in the lesson plan.	91.7	Valid

Based on Table 5, the result of the validators' assessment of the tabletop game was valid in terms of its form, strategy, and techniques used. Specifically, the gameplay mechanics and learning strategies in Little Periodic were found to be appropriate for students' level of thinking (83.3%), the techniques used in the game can be effectively applied (83.3%), and the teaching strategy applied is in line with the syntax of game-based learning (91.7%). The game mechanics also challenged students to think critically (91.7%) and proposed appropriate techniques to stimulate student participation in chemistry classes (83.3%). Additionally, the topics in the game corresponded to the developmental needs of students (75.0%) and the

proposed activities were aligned with the content presented (83.3%). The game's content was also deemed suitable for use by all parties in teaching chemistry (91.7%) and suitable for use in different contexts such as at home (100.0%), school(100.0%), and cafes (100.0%). On the other hand, the tabletop game provided is in accordance with the learning objectives in the lesson plan.

All the results of the game assessment based on potential effectiveness are in line with previous studies that emphasized the importance of considering students' needs, suitable strategies and students' participation. The game also takes into account students' potential, knowledge transfer, and skills from context to reality.

Overall satisfaction. the overall satisfaction of the tabletop's validation can be seen through Table 6.

Table 6. The result of overall satisfaction aspect validity of tabletop game

Overall Satisfaction Aspect Validity	Average percentage from validators' Assessment	Validity Criteria
1. Activities in the tabletop games support students' knowledge in learning Chemistry	91.7	Valid
2. The tabletop games provide multiple representations (microscopic, symbolic and macroscopic) in learning chemistry clearly.	83.3	Valid
3. Tabletop games make students directly involved in learning.	91.7	Valid
4. The activities presented in the tabletop games are in accordance with the characteristics of Game-based learning.	91.7	Valid
5. The tabletop game can help teachers to guide multiple representations of chemistry among students.	83.7	Valid

The result of validators' assessment shows that activities in the tabletop support students' knowledge in learning chemistry (91.7%), the tabletop games provides multiple representations (microscopic, symbolic, and macroscopic) in learning Chemistry clearly (83.3%), Tabletop games makes students directly involved in learning (91.7%), the activities presented in the tabletop games are in accordance with the characteristics of Game-Based Learning (91.7%), and overall, the tabletop game can help teachers to guide multiple representations of chemistry among students (83.7%). Therefore, this tabletop game can be an alternative to teachers in guiding chemical representation in learning the periodic table of elements. The summary of the results of tabletop game validity can be seen in Table 7 and Figure 4.

Table 7. The summary of result of tabletop game validity

	Percentage of Aspects			Validity Criteria
	Content	Potential Effectiveness	Overall Satisfaction	
Validator 1	100	94.2	100.0	Valid
Validator 2	86.1	88.5	85.0	Valid
Validator 3	88.9	84.6	85.0	Valid
Average	91.7	89.1	90.0	Valid

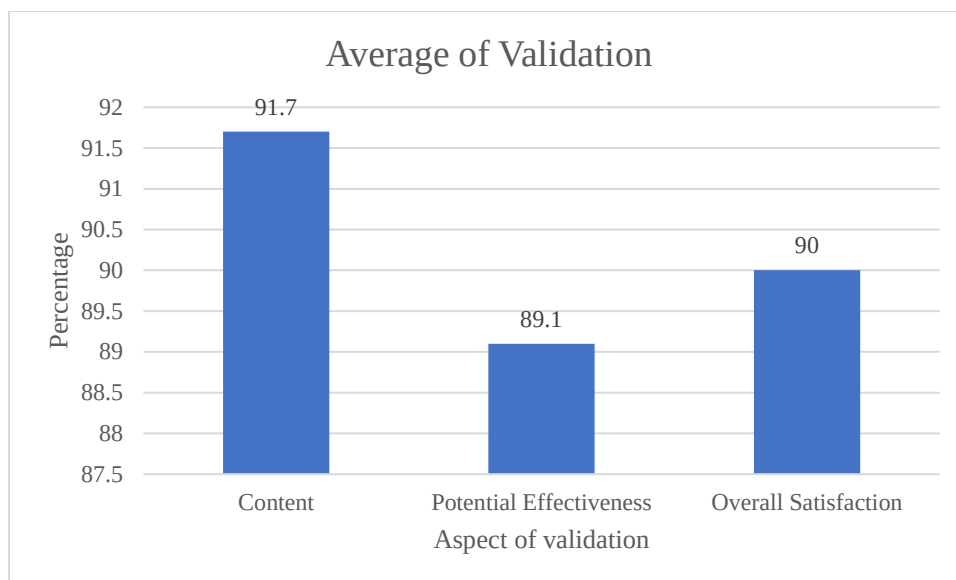


Figure 5. Bar chart of average of validation

5.2 Teacher's Responses

The valid tabletop game- Little Periodic was given to chemistry teachers to investigate their response. Table 8 shows the result of chemistry teacher's response to Little Periodic.

Table 8. The summary of Teacher's Response

Items of Teachers' Response	Average of percentage from validators' Assessment	Criteria Response of Users
1. The tabletop games can help my students to understand the Periodic table of elements clearly.	91.67	Very Good
2. Tabletop games can improve my students' conceptual understanding.	100.0	Very good
3. The tabletop games can encourage my students to know the chemical representation.	91.67	Very good
4. The tabletop games can make my teaching and learning be students-center	100.0	Very good
Average	95.8	Very good

Based on Table 8, the findings exclusively emanate from assessments conducted on the three expert validators, who had previously participated in the preceding studies. These validators expressed positive responses to the tabletop game. In detail, Little Periodic can help the students to understand the Periodic Table of Elements clearly with a success rate of 91.67%. The tabletop game was also found to improve the students' conceptual understanding 100%. Tabletop game encourages the students to learn chemical representation (91.67%) and can make teaching and learning more student-centered (100%). When the percentage of teachers' positive responses falls between 75.00% to 100%, it is considered to be a very good response. In this study, the average percentage of positive responses from expert validators was 95.8%, indicating that the tabletop game received a very positive response. Therefore, this tabletop game is recommended for use in teaching and learning chemistry as it follows a student-centered approach,

encouraging students to learn by doing and providing new experiences (Ramli et al., 2017). Moreover, it can be used as an alternative to help teachers who face challenges in preparing lesson plans, as stated by Ramli et al. in their research (2017). Thus, Little Periodic is a intervention tool for teachers to improve teaching and learning outcomes.

6.0 RECOMMENDATION, LIMITATION AND FUTURE STUDIES

6.1 Recommendation

Based on the positive validation outcomes and the overarching aim of designing effective tabletop games to enhance students' comprehension of chemical representations in the periodic table of elements, several targeted recommendations emerge. First, meticulous attention should be dedicated to ensuring the accuracy and inclusiveness of content representation. Second, the integration of interactive elements, supported by the high potential effectiveness scores across validators, can further amplify the impact of the tabletop games.

Additionally, customizing the complexity and difficulty levels of the games to cater to varying learning levels and prior knowledge, along with introducing in-game feedback mechanisms, can enhance the learning experience and make it more adaptable. Furthermore, the potential for interdisciplinary integration, by incorporating elements from other scientific disciplines like physics or biology, could provide a more holistic understanding of the intersections between chemical representations and broader scientific concepts.

In line with enhancing utilization, providing comprehensive training and resources for educators to effectively integrate the tabletop games into their teaching methodologies is crucial. Lastly, establishing a mechanism for continuous improvement, fueled by ongoing feedback from students, educators, and validators, can ensure that the tabletop games remain relevant and aligned with evolving educational needs.

6.2 Limitation

While this study offers valuable insights into tabletop game design, several limitations deserve consideration. The use of a limited pool of expert validators, predominantly chemistry teachers, may restrict diverse perspectives. Additionally, the validation process's controlled settings and the short-term assessment timeframe might not fully mirror real-world classroom dynamics or capture the potential long-term impact of the games on students' learning outcomes. The narrow focus on enhancing understanding of chemical representations, coupled with the reliance on expert validators, might limit the broader applicability and generalizability of the findings.

6.3 Future studies

Undoubtedly, the current findings offer a launching pad for an array of promising avenues in future research endeavors. Firstly, the application of comparative analyses to diverse game designs holds the potential to dissect and pinpoint the paramount elements that significantly bolster students' cognitive grasp. Longitudinal investigations, spanning extended periods, could unveil the enduring impact of tabletop game integration on sustained learning outcomes and knowledge retention. Moreover, delving into students' perceptions, preferences, and engagement levels provides a compass for iteratively refining game design principles. The fusion of emerging technologies like augmented and virtual reality within tabletop games could potentially enhance interactivity and immersion.

7.0 CONCLUSION

This research aimed to develop a tabletop game called "Little Periodic" that addresses the issues encountered in learning chemistry, specifically on the topic of the periodic table of elements. Little Periodic utilized game-based learning and integrated chemical representation and conceptual

understanding to facilitate learning. Validity testing showed that the game has a content suitability score of 91.7%, potential effectiveness of 89.1%, and an overall satisfaction rate of 90%, indicating its potential as a learning tool.

However, it is worth noting that this study focused only on the periodic table of elements topic and there is a need for further research to develop tabletop games for other chemistry topics. By exploring other forms of game-based learning, future research can innovate and address issues encountered in learning chemistry across various topics, bridging the gap between traditional teaching methods and modern learning techniques.

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The Status and Prospects of UST Legazpi Case Integration of Instruction, Research, and Extension, 2016-2021

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ABSTRACT

The study intends to provide the current state of the integration of instruction, research, and extension in the College of Arts, Sciences, and Education in UST Legazpi. The study is qualitative type of research geared towards articulating the academic culture in the College of Arts, Sciences, and Education in UST Legazpi. The research employs documentary analysis and secondary data analysis as the main data gathering tools and techniques. This endeavor describes the status and prospects to be generated through the lens of organizational theory and a current model of academic culture in universities. In terms of dynamics between instruction and research, there are 24 (83%) researches where the results are utilized in instruction (Practice 3) and the remaining five (17%) researches are made given or after the instruction (is) delivered/performed (Practice 1). Practices 2, 4, 5, and 6 are not observed in the College for five consecutive years. There are some factors contributory to the lack of IRE Integration in UST Legazpi CASE Integration. These are: a. lack of capacity on the part of faculty to do the integration; b. lack of time required to do the integration; c. lack of IRE Integration Program that would actually address the specificities and other concerns for doing the integration; d. lack of policy on IRE Integration in the University level; e. lack of budget to be allotted for the IRE Integration; and f. lack of incentives attached to the integration efforts. In order to address the challenges mentioned, we need to have a clear and distinct IRE Integration Program in the College anchored on a university policy for such integration backed up by intensive and extensive capacity-building activities, inclusion of research units in the faculty load, and provision of faculty incentives.

KEYWORDS: Integration Practices, Integration Models, IRE Integration Program, UST Legazpi

INTRODUCTION

Rationale

The integration within the trifocal function in University ensures that there is dynamic interaction between and among instruction, research, and extension. This integration perspective makes higher education responsive in academic practice. The integration guarantees that the curriculum and its implementation is research-based and leads to community development. As much as possible, the programs, projects, and activities implemented are informed by research and the community involvement projects and activities confirm that both faculty and students are part of the extension leading to holistic development for students and faculty training and development as effective. This then clearly demonstrates university impact. It is crucial then to gauge the nature and level of integration. How instruction, research, and extension as three major areas of concern in higher education create impact to social development is the key to measuring impact of higher education institutions.

STATEMENT OF THE PROBLEM

The study intends to provide the current state of the integration of instruction, research, and extension in the College of Arts, Sciences, and Education in UST Legazpi. To realize such main objective, the following specific objectives are raised: 1. To determine the status of the integration of instruction, research, and extension from 2016 to 2021 through the use of Appreciative Inquiry and SWOT Analysis; 2. To describe the challenges experienced in the integration through the use of the Problem Tree and Root Cause Analysis; 3. To determine the prospects in the integration through the use of KII.

CONCEPTUAL FRAMEWORK

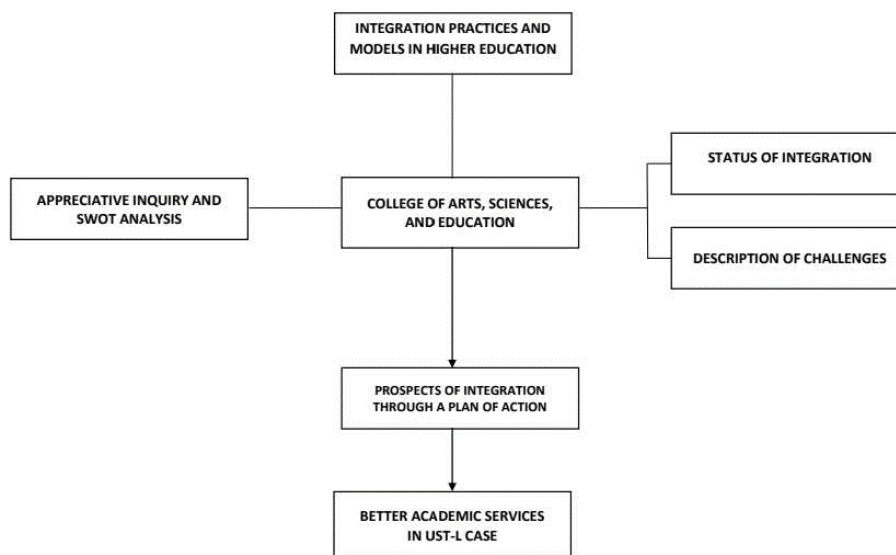


Figure 1. Conceptual Framework Model

The study is anchored on the integration practices and models utilized by the College of Arts, Sciences, and Education of UST Legazpi. It uses appreciative inquiry and SWOT analysis to establish the status of the integration and provide a description of the challenges. This leads to the articulation of the prospects of the integration by designing a plan of action leading to better academic services in the University.

METHODOLOGY

The study is qualitative type of research geared towards articulating the academic culture in the College of Arts, Sciences, and Education in UST Legazpi. The research employs documentary analysis and secondary data analysis as the main data gathering tools and techniques. This endeavor describes the status and prospects. To facilitate the analysis on the dynamics of the trifocal function of the university, typology is made to describe the integration. Given the dynamics of instruction, research, and extension in the academe, there are six practices identified and 6 integration models to describe the IRE Integration.

The six practices are:

PRACTICES	SEQUENCE	DESCRIPTION
Practice 1	Instruction-Research	Given the contents in instruction, a research is conducted.
Practice 2	Instruction-Extension	Given the contents in instruction, an extension is participated.
Practice 3	Research-Instruction	A research is made, the results are incorporated in instruction.
Practice 4	Research-Extension	A research is made, the results are incorporated in extension.
Practice 5	Extension-Instruction	Extension is realized, the experience is utilized in instruction.
Practice 6	Extension-Research	Extension is realized, a research is made.

These practices are pathways that would lead the way to possible integration. These practices showcase the interaction of two higher education areas given the trifocal function. Each interaction shows us the clear role and interplay instruction and research, research and extension, and instruction and extension. The identified six practices describe such interaction. There are three sets: Practices 1 and 3, Practices 2 and 5, and Practices 4 and 6.

The six integration models are:

INTEGRATION	SEQUENCE	DESCRIPTION
Model 1	Instruction-Research-Extension	Given the contents in instruction, a research is conducted, the results are applied to extension.
Model 2	Instruction-Extension-Research	Given the contents in instruction, an extension is participated, the experience is made into research.
Model 3	Research-Instruction-Extension	A research is made, the results are incorporated in instruction, translated to extension.
Model 4	Research-Extension-Instruction	A research is made, the results are incorporated in extension, the experience is utilized in instruction.
Model 5	Extension-Instruction-Research	Extension is realized, the experience is utilized in instruction, a research is made.
Model 6	Extension-Research-Instruction	Extension is realized, a research is made, the results are utilized in instruction.

To facilitate the integration of trifocal function of higher education institution, the designed practices and models are taken as tools to describe the dynamic interaction, integration in that sense, between and among instruction, research, and extension. These practices and models can now be used to provide the status of the integration in UST Legazpi CASE. There are six identified models to describe the integration of instruction, research, and extension. Each integration model demonstrates clear interaction of the three areas. Models 1 and 2 are Instruction-led, Models 3 and 4 are research-led, and Models 5 and 6 are extension-led. Models 4 and 6 are instruction-driven, Models 2 and 5 are research-driven, and Modules 1 and 3 are extension-driven.

DISCUSSION AND ANALYSIS

1. Status of CASE IRE Integration

There are 29 researches produced by UST Legazpi CASE from AY 2016-17 to AY 2020-21. Of this total number, ten (35%) are on philosophy, nine (31%) on social sciences, eight (28%) are on education, one (3%) on natural sciences, and one (3%) on literature. Philosophy Program and the Social Sciences, together comprising 66% of the total number, got the highest because the research leadership in the university is actually a philosophy and social sciences professor and naturally the colleagues in the discipline are highly mentored leading to the production of researches by all philosophy faculty. Based on the record of the Office of Research, from 2008 to 2021 the philosophy faculty produced philosophy, social sciences, and education researches consistently. Education having 28% shares can be justified by the fact that majority of the faculty in the college are licensed professional teachers and they are always inclined to conduct researches on teaching and learning especially in the entire period of the COVID-19 pandemic where the university implemented the Flexible Dominican Education (F-DomE) to respond appropriately to the context thereby delivering still and effectively the essential competencies for every discipline in all programs in the university. With two years of its implementation, teachers in the college intend to evaluate the implementation, describe the practices, recognize the best features, identify opportunities for improvement, and modify if necessary some aspects of F-DomE. Philosophy, Social Sciences, and Education constitute 94% of the all the researches produced in the college. The college has no reported research work along Communication, Chemistry, and Psychology programs.

Table 1. Academic Researches Completed in UST Legazpi CASE, 2016-22

YEAR	ACADEMIC RESEARCH	NATURE OF INTGRATION
2020-21, (9)	Philippine Governance in the time of COVID-19 Pandemic: A Social Critical Analysis (PH) Philippine Higher Education in the time of COVID-19 Pandemic towards a Framework on Flexible Learning (PH) Assessment of Flexible Learning in UST-L CASE (ED) Challenges encountered by 2 nd Year Students of UST Legazpi in the New Normal (ED) Proficiency Level of 1 st Year Students in Preliminary Term Competencies of Mathematics in the Modern World through Flexible Dominican Education (ED) Examining Prospective Teachers' Knowledge on Assessment of Student Learning: Basis for the Preparation for the LET (ED) Human Rights in the Philippines amidst the COVID-19 Pandemic (SS) Coping Strategies of 1 st Year College Students to Distance Learning at UST Legazpi (ED) Assessment of Blended Learning of Physical Education in UST Legazpi (ED)	Research-Instruction Research-Instruction Instruction-Research Instruction-Research Instruction-Research Research-Instruction Research-Instruction Instruction-Research Instruction-Research
2019-20, (2)	On Constants and Context Towards Reconstructing Filipino Religious Education (SS) Moral Acceptability on Leading Moral Issues of College Students in UST Legazpi (SS)	Research-Instruction Research-Instruction
2018-19, (4)	A Feminist Reading of Simone de Beauvoir's 'The Woman Destroyed' (LT) Towards a Sustainable (Healthy) Society: Justice as Fairness in Health Care Policy-Making (PH) A Revaluation of Rawls's and Habermas' Justice and Reason (PH) The Psychosocial Nature of Hyperreality as seen in Television Soap Operas (PH)	Research-Instruction Research-Instruction Research-Instruction Research-Instruction
2017-18, (10)	The Phenomenology of Sayos (SS) The Ritual bath of Santo Entierro (SS) An Basyaw (SS) An Nagtagdo (SS) The Senior High School PE Curriculum: Students' Perspective (ED) Biosynthesis of Metallic Nanoparticles using Representative Bikolano Plants (NS) Maogmang Lugar: Happiness Index of Naga City (SS) Sagugurang Asin Pagtubod: A Catalyst or Inhibitor of Growth? (SS) An Exegesis of Rawls' Idea of Justice (PH) The Role of Religion in the Public Sphere based on Marx's 'On The Jewish Question' towards Human Rights-Based Emancipation (PH)	Research-Instruction Research-Instruction Research-Instruction Research-Instruction Research-Instruction Research-Instruction Research-Instruction Research-Instruction Research-Instruction Research-Instruction
2016-17, (4)	Workplace-Oriented Instruction: A Constructivist Teaching Model for Business Communication Course (ED) Rawls' Idea of Justice as Fairness (PH) Towards a Metaethic of Supererogation (PH) On Postmodernism, Culture, and Faith Relationship and Possibilities (PH)	Research-Instruction Research-Instruction Research-Instruction Research-Instruction

In terms of dynamics between instruction and research, there are 24 (83%) researches where the results are utilized in instruction (Practice 3) and the remaining five (17%) researches are made given or after the instruction (is) delivered/performed (Practice 1). Practices 2, 4, 5, and 6 are not observed in the College for five consecutive years. This is understandable because since almost all researches conducted (83%) the results of which are utilized in instruction vis-à-vis used by teachers in the implementation of the modules and/or taken up in the actual teaching and learning. The remaining 17% can be explained by the fact that instruction is the source or basis of the objectives or problem/s in the research. Given the typology in the practices, only Practices 3 and 1 are implemented. The college did not conduct researches using the Practices 2, 4, 5, and 6. It is more likely that the teachers need to be reminded to explore other functions as higher education institution especially in the relation of instruction and research to extension.

Based on the data, none of the 29 researches is able to realize any of the six integration models. In the span of five consecutive years, no IRE Integration is conducted in the College. As a university, one crucial feature we should have is the integration in the trifocal function: instruction, research, and extension. This is a difficult task. There is a lack in the planning of researches in the university neglecting the IRE Integration and in effect the lack of the strategy in the university level to achieve such integration. Various academic departments also tend to forget the integration mandate.

2. Challenges in the CASE IRE Integration

There are some factors contributory to the lack of IRE Integration in UST Legazpi CASE Integration. These are: a. lack of capacity on the part of faculty to do the integration; b. lack of time required to do the integration; c. lack of IRE Integration Program that would actually address the specificities and other concerns for doing the integration; d. lack of policy on IRE Integration in the University level; e. lack of budget to be allotted for the IRE Integration; and f. lack of incentives attached to the integration efforts.

The faculty in the college are not trained to conduct IRE Integration in any of the six integration models. Their perspective of research is only in the periphery of instruction; that is, either instruction to research or research to instruction. Though they have to fulfill their contributions to the trifocal function, they are performed but not within the frame of the IRE Integration. Corollary to the fact of the lack of faculty training for IRE Integration is the lack of time to conduct a research along IRE Integration. In the present context, the 44-hour policy in the university provides four hours of unmonitored work weekly to be devoted to research. At the end of the academic year, the faculty is expected to finish a research. The usual research completed by faculty are publishable papers that are fundamentally basic research, academic research, and action research. It is not designed for IRE Integration. There is a lack of policy that would clearly and distinctly designate a project on IRE Integration. To realize this, it could either be part of the 21-unit load in a form of at least a minimum of six research units or it is above the workload from Monday to Friday but with a monetary compensation for the IRE Integration project/s. but of course, in order to realize it, there should be a well-defined IRE Integration Program providing the scope and limitations, responsibilities and obligations, and the expected dynamics and interactions of those who will be directly involved, which is actually such Program is missing for five years not actually in the college but actually true in the entire university. But a good IRE Integration Program even supported by a university policy is actually useless if we do not have the budget required for the IRE Integration. Office of Research, Office of the University Controller, and the Office of Academic Affairs should have solid coordination in ensuring the success of the project/s that start on the project/s budget. When all these are present, we should not forget the incentives of the researchers as much as possible in every aspect of the project/s.

3. Prospects in the CASE IRE Integration

In order to address the challenges mentioned, we need to have a clear and distinct IRE Integration Program in the College anchored on a university policy for such integration backed up by intensive and extensive

capacity-building activities, inclusion of research units in the faculty load, and provision of faculty incentives. Full Professors and Associate Professors should be given research fund to lead the IRE Integration with the academic support of the Assistant Professors and research assistantships of the Instructors and the academic department staff. There should be at least one IRE Integration project in the College annually.

The university-wide IRE Integration Program should ensure that the six practices and the six integration models are in place; that is, integration projects are identified and distributed appropriately to various academic departments. With this strategy, all practices and models are realized in the university level. Priorities have to be set of every academic head what practices and models can be realized in their respective offices for certain periods. There is a need to document all practices in all academic departments, streamline all researches in the university level, create research capsules for IRE Integration done out of workshops of academic departments spearheaded and organized by the Office of Research, and prioritize these integration project/s based on budget of the university, capacity of faculty as researchers, and determination of the academic department to meet the key performance indicators in the IRE Integration Program.

This IRE Integration Program should be a major part in the University Research Program under Research and Development section. There has to be right and proper channels to realize all the projects. Monitoring and evaluation is the key to secure the success of the integration project/s. We need to identify the research champions in every academic department and tap them to organize the people in their respective areas. These integration project/s should not be alien to the functions and dynamics of our faculty in the university. If they are involved because of their disciplinary expertise and professional experience, they will be motivated to do the project or work.

CONCLUSION

All higher education institutions have the mandate to realize the trifocal function: instruction, research, and extension. All members of the academe have to provide teaching and learning given concepts and principles in different area of studies and disciplines, conduct researches that would lead to knowledge generation and management to monitoring and evaluation, and accomplish extension activities to improve communities with the intervention of the school's programs, projects, and activities. One crucial way to fulfill this duty is to secure practices and integration along each elements in the trifocal function given the nature and processes of these practices and ways of integration. To realize these things, there is a necessity for Policy, Program, and Partnership. There should be a policy where all integration activities are anchored, program that would cover all these integration activities systematically, and partnership among colleagues, inter-disciplinary, multi-disciplinary, and cross-disciplinary harnessing collaboration and teamwork.

RECOMMENDATIONS

1. For UST Legazpi to have the integration program a policy for all academic departments.
2. For the CASE to be consistent in implementing the Integration Plan both along the integration practices and integration models.
3. For the CASE to effectively monitor and evaluate the implementation of the integration of instruction, research, and extension as instruction-led, research-led, or extension-led.
4. For academic programs to explore implementing all models integrating instruction, research, and extension given schedule of activities in the higher education institution.
5. For the faculty to actively support and engage in integration efforts as researchers, implementers, evaluators, and/or writers.
6. For the students to proactively contribute in the integration activities by engaging both co-curricular and extra-curricular activities as take-off point for the instruction-led, research-led, or extension-led integration.

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A Research Framework Model Based on Undergraduate Philosophical Researches in UST Legazpi, 2000 – 2017

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ABSTRACT

The study intends to provide a research framework model on philosophical researches generated in the undergraduate level to describe the research culture established in the Philosophy Program in the University from 2000 to 2017. The philosophy theses in the university for 18 years actually show that there is a high level in the utilization of higher order of research approaches in philosophy which are synthesis, reconstruction, and post-structuralist approaches. The research outputs are truly contributory in providing interpretation, perspective, framework, and appropriation given various themes. The papers are strong on contemporary and western philosophical frames especially on hermeneutics, phenomenology, and postmodernism leading to critiquing, challenging, and creating new, different, or alternative perspectives given the varying schools of thought in philosophy. With 18 years of tradition of doing philosophy in the university for knowledge generation, it is great to note that the UST Legazpi Philosophy Program is constantly able to hold philosophical fora, present researches in different conferences, and publish papers in different publications, in different levels. The philosophical researches in UST Legazpi from 2000-2017 have not explored extensively postcolonial philosophical studies and contextual philosophies such as indigenous thoughts and worldviews, Filipino philosophizing and doing Filipino philosophy, comparative studies of East and West philosophical frames, and concepts and principles on science/technology, health, sex/sexuality, culture/norm/humanity/civilization, and god/religion. Postcolonial philosophy, critical theory, indigenous philosophies, and Neo-Thomism/Post-Thomism are schools of thought actively offering also new or alternative philosophical reflections and insights. The WISE Project has to lead the entire UST Legazpi Philosophy Program to current and relevant philosophical researches. The Program has to continue harnessing and developing new and/or alternative interpretations, perspectives, framework, and application as its research output/outcome. The researches have to evolve on contextual, indigenous, postcolonial, and/or pragmatic areas or application in/of philosophy.

KEYWORDS: Research Framework, Philosophical Research, Undergraduate Theses, UST Legazpi

INTRODUCTION

There is a need to characterize the research tradition created in an institution. The University of Santo Tomas – Legazpi, formerly Aquinas University, is the first university in the region to offer philosophy as a program. With Aristotelian-Thomistic Tradition in the light of Scholastic Philosophy, the university is able to deliver philosophy education to seminarians, the religious, priests, academicians, and lovers of wisdom. Seeing philosophy as a take-off point and a catalyst for further education and lifelong learning, the philosophy program thrives and endures and is seen as one strong pillar in the university history. It is but wise to ascertain the philosophical tradition of Aquinas University which is now University of Santo Tomas - Legazpi.

The study intends to provide a research framework model on philosophical researches generated in the undergraduate level to describe the research culture established in the Philosophy Program in the University from 2000 to 2017. To realize such main objective, the following specific objectives are raised: 1. To describe the nature of philosophical researches in terms of the research titles, nature of key concepts used, language used in the paper, research approaches used, philosophers utilized in the paper, area of philosophy, historical relevance, realization of the objective/s as seen in the output of the paper, and the philosophical frame worked out by Philosophy students in the span of 18 years; 2. To identify strengths and weaknesses of these philosophical researches; and 3. To create a research framework model based on the outcomes in the first two objectives. The study is qualitative type of research geared towards articulating the research culture in the Philosophy Program. The research utilized documentary analysis and secondary data analysis as the main data gathering tools and techniques. This research brings forth a model to describe the philosophy tradition in the university and therefore may serve as basis for planning, directing, and organizing the future of philosophy program itself in the university.

DISCUSSION AND ANALYSIS

1. Status of Undergraduate Philosophical Researches

In terms of the nature of philosophical concepts utilized, 38 papers (59%) are on social analysis, eight (13%) on personal philosophy, seven (11%) are on cultural reflections, six (9%) on ethical issues, two (3%) on religious sense, two (3%) on epistemological aspect, and one (2%) on aesthetic perspective. Given the mentorship and influence of philosophy professors in the university who are all trained to social and political philosophy, the students are actually motivated, guided, and reinforced with the trends and issues on socio-political realms as situated in varying contexts in our contemporary society. The philosophy students are more introduced to themes and principles in social and political philosophy as shown in the Table 1, Social and Political Philosophy is ranked one in the aspect of area of philosophy with 59% (38/64). This is followed by Ethics with 22% (14/64), and Philosophy of Culture with 11% (7/64). The common themes the philosophy students usually focused on are Justice, Labor, Law, Dialogue, and Metaethics. This is also corollary to the results on philosophers chosen by the philosophy students to anchor on their philosophical thoughts as reflected in their respective theses. As seen in the Table, there are 35/64 (55%) theses that are centered on contemporary philosophers, 18/64 (28%) theses are concept-based, 7/64 (11%) theses employed modern thinkers, 2/64 (3%) theses are on medieval thinkers, and 2/64 (3%) from ancient Chinese thinkers. This is even strengthened by the findings in terms of historical relevance that there are 55/64 (86%) undergraduate philosophical researches that are contextualized on contemporary history of philosophy, 5/64 (8%) are on modern history of philosophy, 2/64 (3%) are on a combination of ancient and modern philosophy, 1/64 or (1.5%) on medieval philosophy, and 1/64 or (1.5%) also on ancient eastern philosophy.

The philosophy theses in the university for 18 years actually show that there is a high level in the utilization of higher order of research approaches in philosophy which are synthesis, reconstruction, and post-

structuralist approaches. Along the research approach employed in the philosophical papers, 41% (26/64) used reconstruction, 33% (21/64) are synthesis papers, 20% (13/64) are on appropriation, 5% (3/64) utilized phenomenology, and 2% (1/64) on deconstruction. This is in consonance with the findings on the aspects of philosophy. These approaches are actually used in social and political philosophy by the contemporary thinkers. Given these approaches, the findings are correct in presenting the common outputs of these undergraduate philosophical theses, which are interpretation (18/64 or 28%), perspective (16/64 or 25%), framework (15/64 or 23%), and application (15/64 or 23%). It is highly expected that when philosophical researches are on social and political contemporary philosophy, philosophy students will be pushed to write their papers on providing interpretation, creating a perspective, presenting a framework, and putting into application the central philosophical concepts in their respective theses. It is to be noted that since the orientation of the philosophy students in the university are on European Continental Philosophy and Anglo-American Analytic Philosophy, majority of the philosophical theses employed Western philosophical frames. Based on the Table, there are 85.9% (55/64) of the papers used Western philosophical frames, 7.8% (5/64) utilized Asian philosophical frames, 4.8% (3/64) employed Filipino philosophical frames, and only 1.5% (1/64) opted for a combination of Eastern/Western philosophical frames. Almost all major courses in the philosophy curriculum in different periods from 2000 to 2017 are actually concentrated on the Western Tradition of philosophy. Asian perspectives and post-colonial philosophical papers are not completely explored by the philosophy theses given the period. There are 60/64 (94%) papers written in English and only 4/64 (6%) are in Filipino. Philosophy students are not fully encouraged to write in Filipino or Bikol.

2.1 Strengths of Philosophical Researches

The philosophical researches in UST Legazpi from 2000-2017 are on the right track in terms of currency and relevance and on a par with the development of researches with other research agenda in universities offering philosophy programs around the world. Based on the results, the focus of UST Legazpi Philosophy Program is on social analysis with emphasis on the concepts and principles in modern and contemporary social and philosophy offered by Kant, Machiavelli, Marx, Nietzsche, Nozick, Habermas, Rawls, Heidegger, Gadamer, Baudrillard, Ricoeur, and Derrida centered on contemporary views and perspectives such as but not limited to themes of justice, law, dialogue, labor, and metaethics. What should be given due recognition is the extensive use of higher order nature of philosophical researches which are interpretive, perspectival, framing, and appropriative. The research outputs are truly contributory in providing interpretation, perspective, framework, and appropriation given various themes. The papers are strong on contemporary and western philosophical frames especially on hermeneutics, phenomenology, and postmodernism leading to critiquing, challenging, and creating new, different, or alternative perspectives given the varying schools of thought in philosophy. With 18 years of tradition of doing philosophy in the university for knowledge generation, it is great to note that the UST Legazpi Philosophy Program is constantly able to hold philosophical fora, present researches in different conferences, and publish papers in different publications, in different levels.

2.2 Weaknesses of Philosophical Researches

The philosophical researches in UST Legazpi from 2000-2017 have not explored extensively postcolonial philosophical studies and contextual philosophies such as indigenous thoughts and worldviews, Filipino philosophizing and doing Filipino philosophy, comparative studies of East and West philosophical frames, and concepts and principles on science/technology, health, sex/sexuality, culture/norm/humanity/civilization, and God/religion. The researches done on these themes are limited. The Program has not considered other areas of philosophy such as but not limited to philosophy of the mind, philosophy of language, philosophy of logic, philosophy of education, and philosophy of future. Postcolonial philosophy, critical theory, indigenous philosophies, and Neo-Thomism/Post-Thomism are schools of thought actively offering also new or alternative philosophical reflections and insights. Almost all are written in English; local language is highly encouraged to be used in philosophical researches to actually present the depth and

breadth of indigenous or cultural concepts and principles. The Program has not considered film, music, theatre, and other humanities for its philosophical research agenda. New and emerging trends in politics, environment, society, technology, law and jurisprudence, education, business/management, privacy/security, technology/ethics, axiology/criteriology, and contemporary forms of human struggles and challenges still need to be explored both by the faculty and students of philosophy in the university.

3. A Research Framework Model

The Philosophy Program remains committed to the full realization of a transformative education, a learning process that truly forms and readily transforms students as they continuously re-construct and de-construct their selves to become better members of society. To make such education become more visible, the Program is centered on harnessing and developing reasoning and inquiry, concept formation, and meaning making, which are the components of philosophical thought, to optimize their knowledge, skills, and attitudes. In sum, to make our students true lovers of wisdom. After four years of studies in Philosophy, our graduates should have: 1. Confronted philosophical questions, problems, and issues based on significant human experience of self, others, world, and God; 2. Practiced critical thinking given the framework of philosophical methodology and scholarship; 3. Read, critiqued, reconstructed, and/or synthesized the works and ideas of great philosophers and/or various schools of thought; and 4. Formulated his own philosophy of life or worldview. With these educational objectives, the Philosophy Program launches the WISE PROJECT.

YEAR LEVEL	PROGRAM COMPETENCIES	PHILOSOPHICAL VALUES	PROGRAM FOCUS
1	Well-guided reasoning and inquiry	Art of Questioning	building and developing arguments
2	Independent Thinking and open-mindedness	Critical Thinking	writing publishable research papers
3	Synthesis and creation of ideas	Concept Formation	publishable research papers, public paper presentation
4	Enlightened practice of concepts and principles	Educational Praxis	practicum, thesis, comprehensive examinations in philosophy

This Project captures all the competencies students should develop as they are trained and mentored by competent professors and experts in the field. Every major course is geared towards the acquisition and fulfillment of knowledge, skills, and attitudes as each course contributes to the full realization of all target competencies from one level to the next for four years. The professors and experts shall focus on teaching and mentoring students in building and developing arguments, completing the thesis, writing, presenting, and publishing research papers, and fostering professional practicum development. The Program continuously promotes the values of questioning, critical thinking, and praxis. The Program serves as a pre-Law course, a preparatory course for graduate studies, Philosophy teaching, academic preparation for priestly ministry and religious life, training for research, and other professions that demand highly for critical thinking, creative thought, and innovative imagination. The UST Legazpi Philosophy Program begins and ends in the concept of ‘Truth in Action.’

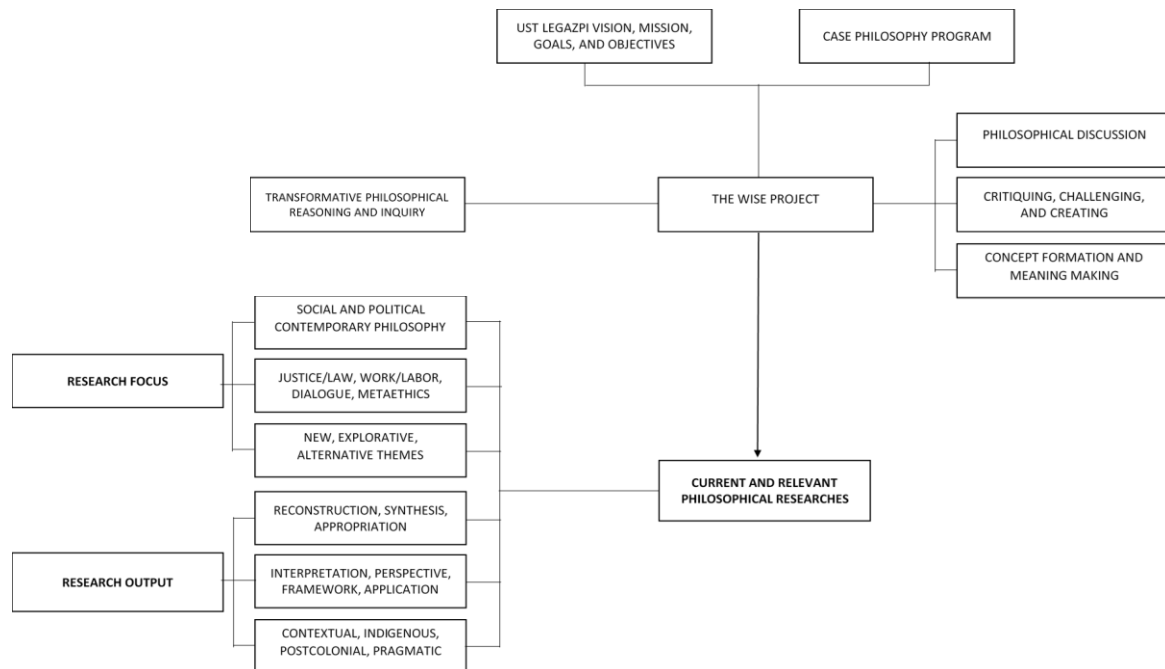


Figure 1. A Research Framework Model for UST Legazpi Philosophy Program

The WISE Project has to lead the entire UST Legazpi Philosophy Program to current and relevant philosophical researches. The take-off point of these researches has to be the foundation of doing philosophy itself: philosophical discussion, critiquing/challenging/creating role of philosophy, and concept formation and meaning making. This can be done by giving emphasis on research focus and research output that the Program has to articulate, ensure, and fulfill. For research focus, the Program has to highlight social and political contemporary philosophy as the locus of concepts and principles. The themes have to be on justice and law, work and labor, dialogue, and metaethics. Through these categories, we will be able to have more new, explorative, and/or alternative themes and perspectives. With these, the research output has to revolve on reconstruction, synthesis, and appropriation to guarantee educational praxis in philosophy. The Program has to continue harnessing and developing new and/or alternative interpretations, perspectives, framework, and application as its research output/outcome. The researches have to evolve on contextual, indigenous, postcolonial, and/or pragmatic areas or application in/of philosophy.

CONCLUSION

The research framework model, given its simplicity and brevity, captures the vision and mission of UST Legazpi Philosophy Program for its research component. Fundamentally, all philosophical researches have to demonstrate educational praxis, which is the end-point of philosophy teaching and learning; that is, ensuring the application of concepts and principles learned in the classroom that would actually contribute to the realization of a transformative philosophical teaching and learning. With the right focus and desired output for philosophical research, the UST Legazpi Program would remain committed in the understanding of UST Legazpi VMGO in four levels of philosophy education. All these would result to our ultimate end which is to live in a life of truth and love out of gratitude; that is, truth in action. In the end, full recognition of educational praxis, which is a reinforcement to a transformative education towards cultural transformation.

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Table 1. Undergraduate Philosophical Researches in UST Legazpi from 2000 To 2017

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
Isang Pananaw: Ang Katunayang Sosyal base sa Holistikong Loob	Reynancia, C.	2000	Filipino	Personal (Loob)		Perspective on Loob	Reconstruction	Filipino Philosophy, Contemporary	Filipino
A Paradigm on Man from William James Humanistic Pragmatism	Basco, A.	2000	English	Personal (Man)	William James (Contemporary)	Perspective on Man	Reconstruction	Philosophy of Human Person, Contemporary	Western
Intersubjective Transcendent Dialogue towards Common Understanding in Text Interpretation	Villareal, J	2001	English	Social (Dialogue)	Hans-Georg Gadamer (Contemporary)	Perspective on Intersubjective Transcendent Dialogue	Synthesis	Hermeneutics, Contemporary	Western
A Paradigm on Dialogue based on Buberian and Filipino Dialogical Frameworks	Almazan, E.P.	2001	English	Social (Dialogue)	Martin Buber (Contemporary)	Perspective on Dialogue	Synthesis	Existentialism, Contemporary	Western
A Metalinguistic Hermeneutical Value of Orag	Benasa, B.	2002	English	Ethical (Orag)		Interpretation on Metalinguistic Hermeneutical Value of Orag	Reconstruction	Hermeneutics Indigenous Philosophies, Contemporary	Filipino
An Assessment of Filipino Working Man based on Marx's Concept of Work	Ireso, R.J.	2003	English	Social (Work/Labor)	Karl Marx (Contemporary)	Application of Marx's Labor to Filipino Worker	Appropriation	Philosophy of the Human Person, Contemporary	Western
Appropriation of Husserlian Phenomenology to the Napaoëños Celebration of Semana Santa	Barcoma, L.J.	2003	English	Religious (Semana Santa)	Edmund Husserl (Contemporary)	Application of Husserl's Thoughts on Semana Santa in Napao, Sorsogon	Appropriation	Phenomenology, Contemporary	Western
Appropriation of Erich Fromm's Concept of Technological Social on Labor in the Philippine Setting	Galicia, A.	2003	English	Social (Labor)	Erich Fromm (Contemporary)	Application of Husserl's Thoughts to Filipino Labor	Appropriation	Philosophy of the Human Person, Contemporary	Western
The Supremacy of Law Over Conscience as the Ultimate Standard of Morality based on Martian Morality	Hilotin, R.	2003	English	Social (Law and Conscience)		Perspective on Supremacy of Law over Conscience	Reconstruction	Ethics, Contemporary	Western

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
The Integral Experiences of the Phenomenological Thought of Love in the Husserlian and Heideggerian Context	De Castro, P.	2003	English	Personal (Love)	Edmund Husserl Martin Heidegger (Contemporary)	Perspective on Love	Phenomenology	Phenomenology, Contemporary	Western
An Attempt to an Existential Meaning of AURORA	Guzman, G.	2003	English	Cultural (Aurora)		Interpretation on Existential Meaning of Aurora	Phenomenology	Existentialism Philosophy of Filipino Culture and Values, Contemporary	Filipino
An Assessment on Student's Demonstrations based on Paolo Freire's Concept of Education	Cabase Jr., E.	2003	English	Cultural (Students' Demonstrations)	Paolo Freire (Contemporary)	Application of Freire's ideas on Students' Demonstrations	Appropriation	Philosophy of Education, Contemporary	Western
The Concept of Jean-Paul Sartre of Action as Basis for Social Justice	Cereno, D.	2004	English	Social (Action)	Jean-Paul Sartre (Modern)	Perspective on Action	Reconstruction	Social and Political Philosophy, Modern	Western
A Perspective on Art based on Friedrich Wilhelm Joseph Von Schelling's Aesthetics	Palajos Jr., P.	2004	English	Aesthetic (Art)	Friedrich Wilhelm Joseph von Schelling (Modern)	Perspective on Art	Reconstruction	Philosophy of Art, Modern	Western
Jose Ma. Sison's Political Economic Development as Culmination of Karl Marx's Social Reform Theory	Barcellano, H.	2004	English	Social (Political Economic Development)	Jose Ma. Sison Karl Marx (Contemporary)	Perspective on Social Reform	Reconstruction	Marxism, Contemporary	Western
Natural Agreement: The New Concept of Civil Law as the Basis of Human Relation	Cabria, A.	2004	English	Social (Civil Law)		Perspective on Civil Law	Reconstruction	Social and Political Philosophy, Contemporary	Western
Human Consciousness as Man's Cause of Happiness and Suffering	Abogado, C.	2004	English	Personal (Human Consciousness)		Interpretation on the Cause of Happiness and Suffering	Reconstruction	Ethics, Contemporary	Western
A Concept of Ahimsa based on EDSA I and EDSA II	Vargas, R.A.	2004	English	Social (Ahimsa)		Application of Ahimsa to EDSA I and II	Appropriation	Indian Philosophy Philosophy of	Asian

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
								Filipino Culture and Values, Contemporary	
Nietzschean Concept of Political Power as Used in the Filipino Politics by the Politician	Lachica, M.	2004	English	Social (Power)	Friedrich Nietzsche (Contemporary)	Application of Nietzsche's Political Power to Filipino Politics	Appropriation	Social and Political Philosophy Philosophy of Filipino Culture and Values, Contemporary	Western
The Possibility of Reconciliation of the Eastern and Western Catholicism in the Light of Gabriel Marcel's Philosophy of Communion	Boholano, V.	2004	English	Social (Communion)	Gabriel Marcel (Contemporary)	Perspective on Catholicism	Synthesis	Philosophy of Religion, Contemporary	Western
The Fulfillment of the Prince of Niccolo Machiavelli through the Idea of Ubermensch of Friedrich Wilhelm Nietzsche	Duroy Jr., D.	2004	English	Social (Leadership: Prince and Ubernesch)	Niccolo Machiavelli Friedrich Wilhelm Nietzsche (Contemporary)	Interpretation of Political Leadership	Reconstruction	Social and Political Philosophy, Contemporary	Western
Basic Rational Criteria for a Political Conception of Justice based on Marxist Tradition	Sarmiento, E.R.	2004	English	Social (Justice)	Karl Marx (Contemporary)	Perspective on Basic Rational Criteria	Reconstruction	Social and Political Philosophy Marxism, Contemporary	Western
Horizontverschmelzung as a Political Conflict Resolution	Tayam, R.G.	2004	English	Social (Fusion of Horizons)	Hans-Georg Gadamer (Contemporary)	Interpretation of Horizontverschmelzung	Reconstruction	Hermeneutics Social and Political Philosophy, Contemporary	Western
Defining History based on the Idea of Force	Alegre, A.	2005	English	Social (History, Force)		Interpretation of History	Synthesis	Philosophy of History, Contemporary	Western
Paul Ricoeur's Political Philosophy: An Attempt to Legitimize Death Penalty	Yuson, M.A.	2005	English	Social (Death Penalty)	Paul Ricoeur (Contemporary)	Application of Ricoeur's Thoughts to Death Penalty Legitimacy	Appropriation	Social and Political Philosophy, Contemporary	Western
St. Thomas Aquinas'	Candolea, B.	2005	English	Social	Thomas Aquinas	Application of	Appropriation	Social and	Western

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
Political Philosophy in an Attempt to Reorganize the Organization of Fraternities in Aquinas University of Legazpi				(Organization of Fraternities)	(Medieval)	Aquinas' Idea to Fraternities organization		Political Philosophy, Medieval	
Uniting the Three Branches of the Philippine Government through Han Fei Zi's Philosophy on Legalism	Grivalde, R.	2005	English	Social (Legalism)	Han Fei Zi (Ancient)	Application of Han Fei Zi's Legalism to the three branches of government	Appropriation	Chinese Philosophy, Ancient Eastern	Eastern
John Rawls' Political Liberalism: A Possible Solution to Huntington's Clash of Civilizations	Bombon, A.D.	2005	English	Social (Justice)	John Rawls Samuel Huntington (Contemporary)	Application of Rawls' Ideas to Huntington's clash of civilizations	Appropriation	Social and Political Philosophy, Contemporary	Western
A Reconstruction of the Metaphysical Dualistic Idea of Rene Descartes in the Contemporary Period	Florin, A.	2008	English	Epistemological (Metaphysical Dualism)	Rene Descartes (Modern)	Interpretation of Cartesian Metaphysical Dualism	Reconstruction	Cartesian Philosophy, Modern	Western
Humanist Principles as Guidelines for a Commensurable Doctrine on Religion	Fujimoto, G.	2008	English	Social (Religion)		Framework on Humanist Principles	Synthesis	Philosophy of Religion, Contemporary	Western
A Moral Standard from Kant's and Mill's Ethical Theories	Cabredo, A.	2008	English	Ethical (Metaethics)	Immanuel Kant John Stuart Mill (Contemporary)	Moral Framework	Synthesis	Ethics, Contemporary	Western
Frameworks of Hegel and Gadamer towards a View on Metaethics	Relente, L.A.	2008	English	Ethical (Metaethics)	GWF Hegel Hans-Georg Gadamer (Contemporary)	Moral Framework	Synthesis	Ethics, Contemporary	Western
Reevaluating the Bikolano Idea of Oragon through Nietzschean Ubermensch	Belbes, Y.	2008	English	Cultural (Oragon and Ubermensch)	Friedrich Nietzsche (Contemporary)	Interpretation on A Re-evaluation of Orag	Reconstruction	Indigenous Philosophies, Contemporary	Western
Phenomenology of Love as Hobbes' Ethical Egoism	Cervantes, A.	2009	English	Ethical (Love)	Thomas Hobbes (Modern)	Interpretation of Love	Reconstruction	Philosophy of the Human Person, Modern	Western

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
An Alternative Epistemology based on Reconstruction of Kant's Theory of Knowledge using James' Theory of Truth	Siapno, C.	2009	English	Epistemological (Knowledge and Truth)	Immanuel Kant William James (Contemporary)	Epistemological Framework	Synthesis	Epistemology, Contemporary	Western
Utang na Loob bilang Pantayong Pananaw sa Katunayang Sosyal	Robrigado, J.F.	2009	Filipino	Cultural (Utang na Loob)		Perspective on Utang na Loob	Reconstruction	Philosophy of Filipino Culture and Values, Contemporary	Filipino
Tendency and Self-Reference of Philosophical Theories (An Introduction to a Future Systematic Bikolano Philosophy)	Huelva III, J.	2009	English	Cultural (Bikolano Philosophy)		Framework for a future systematic Bikolano philosophy	Synthesis	Philosophy of Filipino Culture and Values, Contemporary	Western
Identity as Equilibrium of Freedom and Law Based on Aquinas' and Kant's Notion of Law and Sartre's and Marcel's Notion of Freedom	Husain, T.A.	2009	English	Personal (Identity)	Thomas Aquinas Immanuel Kant (Modern)	Framework on Identity	Synthesis	Ethics, Contemporary	Western
Strategic Mechanisms as Bases for Restructuring Social Justice from Rawls' Political Conception of Justice and Walzer's Complex Equality	Fernandez, J.L.	2009	English	Social (Justice)	John Rawls Michael Walzer (Contemporary)	Framework on Strategic Mechanisms	Synthesis	Social and Political Philosophy, Contemporary	Western
Semana Santa as Dialectical Hermeneutics	Adornado, J.E.	2009	English	Cultural (Semana Santa)	Hans-Georg Gadamer (Contemporary)	Interpretation of Semana Santa	Reconstruction	Hermeneutics Philosophy of Filipino Culture and Values, Contemporary	Western
Thomism and Richard Rorty's Philosophy towards Neo-Pragmatism	Magalona, J.	2010	English	Social (Neo-Pragmatism)	Richard Rorty Thomas Aquinas (Contemporary)	Perspective on Neo-Pragmatism	Synthesis	Pragmatism, Contemporary	Western
Society in the Light of Freedom and Will:	Arcilla, Jr., R.	2010	English	Social (Self-Discipline)		Interpretation of Human Society	Reconstruction	Social and Political	Western

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
Implications on the Role of Self-Discipline towards Emancipation								Philosophy, Contemporary	
A View on Neo-Marxism Based on the Political Thoughts of Habermas and Nozick	Fuentes, R.R.	2010	English	Social (Justice)	Jurgen Habermas Robert Nozick (Contemporary)	Framework on Neo-Marxism	Synthesis	Marxism, Contemporary	Western
Rawls' Political Liberalism and Nozick's Anarchy, State, and Utopia	Barrameda, J.	2011	English	Social (Justice)	John Rawls Robert Nozick (Contemporary)	Framework on Justice based on Rawls' and Nozick's Justice	Synthesis	Social and Political Philosophy, Contemporary	Western
Isang Pananaw: Ang Konsepto ng Libog bilang Estetika sa Katunayang Sosyal	Vargas, J.E.	2011	Filipino	Cultural (Libog)		Interpretation of Libog as aesthetics	Reconstruction	Philosophy of Filipino Culture and Values, Contemporary	Filipino
Impossibility of Interreligious Dialogue	Lumberio, P.M.	2011	English	Religious (Dialogue)		Interpretation of Interreligious Dialogue	Reconstruction	Philosophy of Religion, Contemporary	Western
The Possibility of the Impossibility of Reaching Social Consensus	Banares, P.C.	2012	English	Social (Social Consensus)		Interpretation of Social Consensus	Reconstruction	Social and Political Philosophy, Contemporary	Western
Kahulugan ng Tao Patungo sa mga Hayop sa Tomistikong Pananaw	Magdaong	2013	Filipino	Personal (Identity)	Thomas Aquinas (Medieval)	Interpretation of Human Value relative to animals	Reconstruction	Thomism, Contemporary	Western
A Synthesis on the Philippine Tertiary Education Practice based on Whitehead's 'Aims of Education'	Fresnido, R.	2013	English	Social (Practice)	Alfred North Whitehead (Contemporary)	Application of Whitehead's ideas to PH tertiary education	Appropriation	Philosophy of Education, Contemporary	Western
A Phenomenology of Smoking	Bertillo, G.	2013	English	Personal (Smoking)		Perspective on Smoking	Phenomenology	Phenomenology, Contemporary	Western
Plato's and Machiavelli's Concepts of Justice towards an Ideal Social: Netopia	Bamba, A.	2013	English	Social (Justice)	Plato Niccolo Machiavelli (Modern)	Framework on Ideal Society	Synthesis	Social and Political Philosophy, Ancient/Modern	Western
The Analects of Confucius and the Prince of Niccolo Machiavelli towards a	Barja, M.	2013	English	Social (Political Leadership)	Confucius Niccolo Machiavelli (Modern)	Framework on Leadership	Synthesis	Social and Political Philosophy, Ancient/Modern	Eastern/Western

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
Model of Political Leadership									
Hyper-Reality in Reality Shows towards Pragmatism of Simulation	Munoz, R.	2013	English	Social (Hyperreality)	Jean Baudrillard (Contemporary)	Perspective on Hyperreality	Reconstruction	Postmodernism, Contemporary	Western
A Critique of Money Based on Karl Marx's 'Capital, Volume 1'	Barcebal, G.I.	2013	English	Social (Money)	Karl Marx (Contemporary)	Framework on Money	Reconstruction	Marxism, Contemporary	Western
The Rationalistic Egoistic Man of Ayn Rand in the Political Liberalism of John Rawls	Babasoro, A.	2014	English	Personal (Man)	Ayn Rand John Rawls (Contemporary)	Interpretation of Ayn Rand's Man thru Rawls' ideas	Reconstruction	Philosophy of the Human Person, Contemporary	Western
Deconstructing the Filipino Conception of Family	Arispe, J.	2015	English	Social (Family)	Jacques Derrida (Contemporary)	Interpretation of Family	Deconstruction	Philosophy of Filipino Culture and Values, Contemporary	Western
A Postmodernist Reading of Seduction Using Jean Baudrillard's Simulacra towards a Conception of (New) Ethics	Sabao, D.C.	2015	English	Ethical (Seduction)	Jean Baudrillard (Contemporary)	Ethical Framework on Seduction	Synthesis	Postmodernism, Contemporary	Western
Appropriating the Confucian Jen to Contemporary Philippine Political Context	Beringuela, R.	2015	English	Social (Jen)	Confucius (Ancient)	Application of Jen to Philippine Politics	Appropriation	Chinese Philosophy Philosophy of Filipino Culture and Values, Contemporary	Asian
Approaching Global Poverty through Rawls' Principles of Justice	Badillo, L.	2016	English	Social (Global Poverty)	John Rawls (Contemporary)	Application of Rawls' Justice to Global Poverty	Appropriation	Social and Political Philosophy, Contemporary	Western
The Pornography of Violence	Peralta, J.V.	2016	English	Social (Violence)	Albert Camus (Contemporary)	Framework on Violence	Synthesis	Ethics, Contemporary	Western
The Deconstruction of the Phallus	Rellon, A.P.	2016	English	Social (Phallus)	Jacques Derrida (Contemporary)	Framework on Feminism	Synthesis	Social and Political Philosophy, Contemporary	Western
The Salvific Power of	Llacer, J.	2017	English	Social	Martin Heidegger	Interpretation of	Reconstruction	Philosophy of	Western

RESEARCH TITLE	RESEARCHER	YEAR	LANGUAGE	NATURE OF CONCEPT	PHILOSOPHERS	RESEARCH OUTPUT	RESEARCH APPROACH	AREA OF PHILOSOPHY, RELEVANCE	FRAME
Technology based on Heidegger's 'A Question Concerning Technology' and 'Memorial Address'				(Technology)	(Contemporary)	Technology		Science and Technology, Contemporary	
A Post-Human Perspective based on Technocentrism	dela Cruz, W.	2017	English	Social (Technocentrism)		Framework on Posthumanism	Synthesis	Philosophy of Human Person, Contemporary	Western
A Critique of Normative Ethics Towards a Metaethic of Supererogation	Clerigo, J.	2017	English	Ethical (Supererogation)		Framework on Supererogation	Synthesis	Ethics, Contemporary	Western

Teaching Chinese as a Foreign Language: A Cross-Cultural Study of Animal Signs in Chinese and Thai

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ABSTRACT

Numerous animal-related words exist in both Chinese and Thai. Numerous animals have fixed visual characteristics that have been assigned human-related meanings. The semantic distinctions between “鼠Shǔ (hǎnū) Rat”; “牛niú (wāw) Ox”; “虎hǔ (sēūx) Tiger”; “兔tù (krātāy) Rabbit”; “龙lóng (māngkr) Dragon”; “蛇shé (ngū) Snake”; “马mǎ (mā) Horse”; “羊yáng (kæa) Sheep”; “猴hóu (ling) Monkey”; “鸡jī (kì) Chicken”; “狗gǒu (sūnākh) Dog”; “猪zhū (hǎmū) Pig” were determined by comparing the picture qualities of Chinese zodiac animals using idioms in Chinese and Thai. Based on the findings of previous research, this study employs a comparison of Chinese zodiac idioms to demonstrate that the two countries are physically and culturally similar. Consequently, both the content and language of the idioms are extremely similar. Moreover, because the two countries have distinct national and cultural characteristics, the idioms contain a variety of phrases. The researcher believes comparing the Chinese and Thai zodiacs will aid in understanding the cultural structures of both nations. However, cultural differences between Chinese and Thai provide these twelve animals with diverse cultural connotations, which may make teaching the twelve zodiac animals more difficult. As a result, when teaching Chinese Zodiac culture, teachers should continuously enhance their teaching strategies and develop relevant and effective lesson plans. It is hoped that by the end of this study, people will have a better idea of how this study affects culture.

KEYWORDS: Zodiac; Cross-Cultural; Teaching Chinese as a Foreign Language

INTRODUCTION

When people describe the natural characteristics of animals, they usually imbue them with unique connotations, so that certain animals acquire fixed characteristics of the image and become the image symbols of specific individuals. There are numerous animal-related idioms in both Chinese and Thai. However, due to the difference in historical and cultural background, geographical environments, and living patterns between China and Thailand, different cultures' perceptions of these animals vary. They have a significant link with others. Li, Z. (2008) A nation's language symbolizes its culture and spiritual environment. As a fundamental component of language, colloquialism reflects not only a culture and way of life but also its emotions and cognitive processes. We can also learn about a country's culture, traditions, and way of life through its idioms. Wen-Hong, W. U.(2005). Understanding the differences between cultures is crucial for effective linguistic communication. Culture plays a significant role in shaping how people communicate, interpret messages, and respond to various forms of expression. Analyzing the Chinese and Thai idioms that make up a significant portion of the important zodiac animal idioms, this research aims to clarify how the cultures of China and Thailand are both similar and different. Additionally, the paper could analyze how the Chinese zodiac animal system and associated idioms are used to teach Chinese language learners.

LITERATURE REVIEW

The study of the symbolic significance of animals in Chinese language pedagogy primarily entails a comparative analysis between the Chinese language and foreign languages. The comparative analysis of the meanings associated with the twelve zodiac animals in the Chinese language in relation to other languages represents a pivotal and distinctive facet that teachers must underscore and meticulously incorporate into their instructional design. This emphasis typically garners more attention within the framework of Chinese cultural studies, encompassing an analysis and comparison of the nuanced variations inherent in the symbolism of the twelve zodiac animals within Chinese culture and the cultural contexts of other languages. This approach particularly accentuates the introduction of the symbolic meanings of the twelve zodiac animals to international students.

Several researchers have undertaken studies on the significance of symbolic animals in both Chinese and Thai languages, as follows: Ma (2011) and Liu (2014) explored the origins of the twelve zodiac animals and compared the cultural meanings and implicit meanings of idioms in Chinese and Thai. Li (2014) Zhu (2015) delved into the structural content and symbolic meanings of idioms in Chinese and Thai, discussed the relationship between the twelve zodiac animals and Chinese language education, analyzing the advantages and disadvantages of teaching design between Chinese and Thai educators. Xu (2021) elucidated the cultural differences of the twelve zodiac animals in the Chinese-Thai context and analyzed the cultural misinterpretations of the zodiac animals, along with classroom activity design.

From the aforementioned documents and related research works, numerous researchers have conducted comparative studies and explored idioms and images that reflect cultural meanings. The insights derived from these studies are employed as guidance for further exploration and as a basis for designing culturally aligned teaching activities in the future.

RESEARCH INSTRUMENT

The process of data selection concerning animal-related idiomatic expressions in Chinese and Thai languages was delimited as follows:

Content Delimitation (Scope of Content):

The idiomatic expressions involving animals in Chinese and Thai languages were examined through the analysis of two specific reference materials:

1. "现代汉语词典" (Modern Chinese Dictionary): This modern Chinese language dictionary, which has undergone multiple official revisions since its first publication in 1978, was consulted to investigate idiomatic expressions associated with all twelve types of animals, as specified.
2. "พจนานุกรมฉบับราชบัณฑิตยสถาน ฉบับ พ.ศ.2554" (Royal Institute Dictionary, 2011): This specific edition of the Royal Institute Dictionary was consulted to examine idiomatic expressions involving animals, encompassing all twelve types, along with their respective lexical and contextual meanings.

The Chinese corpus utilized in this study is drawn mostly from the “Chinese Dictionary”, while the Thai corpus is drawn primarily from the “Royal Thai Dictionary” and “Thai Sayings”. Specifics are as follows: “鼠 Shǔ (hǎnū) Rat”; “牛 niú (wəw) Ox”; “虎 hǔ (sēux) Tiger”; “兔 tù (kratāy) Rabbit”; “龙 lóng (māngkr) Dragon”; “蛇 shé (ngū) Snake”; “马 mǎ (mā) Horse”; “羊 yáng (kæa) Sheep”; “猴 hóu (ling) Monkey”; “鸡 jī (kì) Chicken”; “狗 gǒu (sūnākh) Dog”; “猪 zhū (hǎmū) Pig”.

Table 1: Chinese and Thai zodiac animal idioms

	鼠 rat	牛 ox	虎 tiger	兔 rabbit	龙 dragon	蛇 snake	马 horse	羊 sheep	猴 monkey	鸡 chicken	狗 dog	猪 pig	Total
Chinese	141	196	389	68	391	105	535	106	22	184	175	14	2326
	6.06%	8.43%	16.72%	2.92%	16.81%	4.51%	23.00%	4.56%	0.95%	7.91%	7.52%	0.60%	100%
Thai	7	28	36	12	1	23	8	5	10	29	37	23	219
	3.20%	12.79%	16.44%	5.48%	0.46%	10.50%	3.65%	2.28%	4.57%	13.24%	16.89%	10.50%	100%

Source: “Chinese Dictionary” and “Royal Thai Dictionary”

Based on the analysis of 2326 Chinese zodiac animal idioms and 219 Thai zodiac animal idioms, it is clear that Chinese and Thai have a significant number of different idioms and have many similarities. However, it includes a number of idioms that are impacted by geography and culture.

A comparison of the cultural connotations of the Chinese and Thai zodiac signs

1. “鼠 Shǔ (hǎnū) Rat”: Since the rat is the first sign of the Chinese zodiac, it is termed “子鼠(Zi shǔ)”. It is a negative and pejorative emblem of cowardice, avarice, cunning, and wretchedness. In China, "rat" has been a symbol of humility, inferiority, cunning, and deceit since antiquity. “贼眉鼠眼(Zéiméishǔyǎn)” refers to short-sightedness and lack of foresight in Chinese. “鼠目寸光(Shǔmùcùnguāng)” have been used to describe miserable and intolerable people. The little people are referred to as “鼠辈(Shǔbèi)”; items that are stolen from unknown sources are referred to as “老鼠货(Lǎoshǔ huò)”; the small talents used to carve insects are referred to as “鼠技(Shǔ jì)”; and corrupt officials are referred to as “硕鼠(Shuò shǔ)”; and traitors are referred to as “社鼠(Shè shǔ)”, etc.

In Thailand, “Rats(hǎnū)” have a negative reputation. People who surreptitiously injure others are referred to as “Rats(hǎnū)” in Thai, and their crafty character is compared to that of a mouse, which is a metaphor for “家贼(Jiāzéi)”. Notably, the rat is also revered in Thailand as the god of wealth, the messenger of the Great Black Sky, who is responsible for the protection of the family and the prosperity of the harvest. Therefore, in certain regions, the rat rice cake is reserved for the first month, and the manner in which the rat consumes the rice cake is used to determine whether or not one will have good fortune. According to Thai legend, the mouse is the hero who aided the great power.

2. “牛 niú (wəw) Ox”: “Ox” is the second sign of the Chinese zodiac and is described as “丑牛(Chǒu niú)”. In China, the "cow" symbolizes the gods. In ancient Chinese traditions, Shennong 《神农》 and Chiyong 《战神》, the god of war, are both cow-headed and human. 《列异传》: “老子西游，关令尹喜望见其有紫气浮关，而老子果乘青牛而过（When Laozi went

west, Yin Xiwang observed a purple air floating pass, and Laoziguo encountered a green bull) ". It is clear that "ox" is associated with "spirit" or "immortal." "Cow" signifies large and numerous, as in "牛劲(niújìn)," "牛饮(niúyǐn)," "牛喉(niú hóu)," "牛毛(niúmáo)," "牛刀小试(niúdāoxiǎoshì)," "牛鼎烹鸡(niú dǐng pēng jī)," etc. In idioms such as "牛马(niúmǎ)" and "做牛做马(zuò niú zuò mǎ)," "cow" also refers to poverty and humility. Moreover, the ox symbolizes humility and diligence. "老黄牛(Lǎo huángniú)" is a metaphor for a person who is industrious, regardless of compensation, and works tirelessly without grumbling. Due to their stubbornness, bulls are often referred to as bulls. For instance, the seventeenth chapter of "《红楼梦》A Dream of Red Mansions" states, "众人见宝玉牛心,都怕他讨了没趣(Everyone sees Baoyu's ox heart, and they fear he will be dull)." In China, the "cow" was renowned for its tenacity and strength. People often use the phrase "老黄牛(Lǎo huángniú)" to refer to qualities like persistence and hard work.

But in Thailand, "ox (waw)" is a symbol of sloth, chatter, and procrastination. This may have something to do with the fact that cows rarely work in the fields; eat and sleep; sleep and eat; and have perpetually drooling mouth corners. "(วัวหยาบคอก)" signifies that something has occurred and is then considered. It should be emphasized that although "cow" has a bad connotation in Thailand, there are still several beliefs and practices associated with cattle in Thailand such as "รักวัวให้ผูก รักลูกให้ตี"(If you love a child, you should wear a tie.); "วัวแก่กินหญ้าอ่อน"(an aged ox feeds on grass); "อยู่บ้านท่านอย่านั่งดูดาบ ปั่นวัวปั่นควายให้ลูกท่านเล่น"(Stay at home and make noise. For your youngster, make an ox and a buffalo).

3. “虎hǔ (sēūx) Tiger”: “Tiger” ranks third in the Chinese zodiac, so it is called “寅虎(Yín hǔ).” In the minds of the two peoples, the tiger is a symbol of mighty power, ferocity, daring, and danger. In Chinese, “虎贲(Hǔbēn)” refers to brave warriors, “虎臣(Hǔ chén)” refers to brave ministers, and “虎将(Hǔjiàng)” refers to fierce generals. “虎头虎脑(Hǔtóuhǔnǎo)”, “虎背熊腰(Hǔbèixióngyāo)”, and “虎虎有生气(Hǔ hǔ yǒu shēngqì)” describe a person who is strong and energetic; “虎视眈眈(Hǔshìdāndān)” describes someone coveting something; and other words “龙潭虎穴(óngtánhǔxué)”“老虎屁股摸不得(lǎohǔ pigu mō bùde)”“前门拒虎, 后门进狼(qiánmén jù hǔ, hòumén jìn láng)”mean that the tiger is ferocious and terrifying. In Chinese, "tigress“母老虎”" is also used to describe a fierce wife, and "autumn tiger“秋老虎”" is used to refer to the sweltering heat after the beginning of autumn.

Tiger-related Thai idioms and idiomatic expressions For instance, "the tiger knows"“เสือรู้” alludes to a clever or intelligent individual. Also, in Thai, "the old tiger“เสือเก่า” " is used to describe someone with a lot of experience and "tiger sleeps and eats “เสือนอนกิน”" is used to describe someone who gets things for free.

4. “兔tù (kratāy) Rabbit”: “Rabbit” is the fourth sign of the Chinese zodiac and is known as the “卯兔(Mǎo tù)”. Rabbits are emblems of intelligence, agility, and cuteness, and the people of the two countries have a great deal of affection for them. Ancient Chinese poetry contains the phrase “静如处子, 动若脱兔(Jìng rú chǔzǐ, dòng ruò tuōtù).” There are, of course, pejorative phrases in Chinese, such as “狡兔三窟(Jiǎotùsānkū)” which implies that the rabbit is "cunning."

When it comes to rabbits, the people of the two countries frequently think of the moon and Chang'e, but the Thais also believe that the moon's shadows are jade rabbits preparing rice cakes. The Thai word for “兔(ear)” refers to those who are sharp-eared, inquisitive, and obnoxious in their pursuit of information and intellect. In addition, in Thai, rabbit signifies cowardly, yet in Chinese, “胆小如鼠(Dǎn xiǎo rú shǔ)” is used to describe a cowardly individual.

5. “龙lóng (mạṅgr) Dragon”: “Dragon” is the fifth sign of the Chinese zodiac and is known as

“辰龙Chenlong.” As an illusionary creature, the dragon can ascend to the heavens, enter the ocean, and summon wind and precipitation. In China, the dragon is highly esteemed and holds a prominent position. In ancient times, it signified the emperor and represented nobles, such as “龙颜(Lóng yán)”“龙袍(lóng páo)”“龙子(lóng zǐ)”“龙孙(lóng sūn)”. In addition, “龙凤呈祥(lóngfèng chéng xiáng)” represents good fortune; “龙争虎斗(lóngzhēnghǔdòu)”, “龙腾虎跃(lóngténgǔyuè)”, and “生龙活虎(shēnglónghuóhǔ)” indicate a warm and spirited environment.

Some Thai scholars consider the dragon to be one of the greatest works of art, sacred animals, and spiritual entities produced by the Chinese. Even though there are dragons in India and the West, the Chinese sacred dragon is the most beautiful and detailed.”

In Thailand, “Dragon(mangkrai)” is blended with so many folk beliefs and venerated as the god of sea, water, and wind, among other things. The symbol of the Thai dragon is essentially unchanged from Chinese myths, legends, Buddhist religious texts, etc.

6. “蛇shé (ngū) Snake”: “Snake” is the sixth sign of the Chinese zodiac and is named “巳蛇(Sì shé).” Both cultures believe that snakes are nasty, hateful, and obstinate. Chinese words using the word “snake” nearly always convey that snakes are repulsive, such as “蛇蝎心肠(Shéxiē xīncháng)”, “杯弓蛇影(Bēigōngshéyǐng)”, “美女蛇(Měinǚ shé)” “蛇鼠一窝(Shé shǔ yī wō)” “强龙斗不过地头蛇(Qiáng lóng dòu bùguò dìtóushé)” etc.

There are also other Thai words that imply that snakes are frightening, wicked, and stubborn, such as “จิ้งจอก (งูเห่า) (农夫和眼镜蛇)”, which is used to characterize people who are stubborn and quick to retain grudges.

On the one hand, “snake” is unpleasant and frightening, while on the other hand, it is respected. The Chinese consider snakes to be “小龙(Xiǎolóng)” and believe that they are connected to dragons. Additionally, they believe that large snakes can turn into dragons and ascend to heaven. In addition, Thailand venerates snakes as water deities and gods. There are folktales in China about people marrying snakes, such as The Legend of the White Snake, and legends in Thailand such as “งูเลื้อยเข้าบ้าน (蛇入家)” (snake entering the house).” The snake is a sign of wealth and the patron saint of the family in Thailand. Thais continue to carry snakeskin in their wallets as a means of amassing wealth. In China, the serpent continues to represent greed. For instance, the expression “人心不足蛇吞象the human heart is too little and the snake eats the elephant” is used to illustrate someone's avarice.

7. “马mǎ (mā) Horse”: “Horse” is the seventh sign of the Chinese zodiac, which is known as the “午马(noon horse)”. It represents versatility, strength, speed, and agility. There is a “快马加鞭(quick horse to whip)” in Chinese, and a “ม้าเร็ว (快马)” in Thai (fast horse). Additionally, “horse” refers to individuals in both nations. In Chinese, for example, there are “千里马(Qianli Ma),” “驽马(Zhu Ma),” and “驸马(Consort Ma),” among others. “ม้าเฝ้า (马奴)” signifies servants and the like in Thai. The Chinese word for a human face is “马脸horse face,” and the Thai word for face is “หน้า (面)” (face).

The difference is that “horse” also represents ladies in China. Several poems in the book of songs 《诗经》 refer to “horses,” which typically refer to or are associated with ladies. In the Tang dynasty's Yougan 《有感》, which was written by Bai Juyi: The horse in “Don't raise a skinny pony, don't teach a prostitute” refers to a prostitute. Such as “犬马(dog and horse),” “马前卒(pawn),” and “犬马之龄(dog and horse age),” etc., these terms refer to human enslavement. In Thai, “horse” refers to the mount of the gods,

which is revered and admired by the populace. When ancient aristocrats worshipped the gods or fulfilled their vows, they frequently presented live horses, or trojans, to temples and shrines. Later, they progressively evolved into horse paintings.

8. “羊yáng (kæa) Sheep”: “Sheep” is one of the six ancient Chinese animals. The eighth sign of the Chinese zodiac is named “未羊(Wèi yáng).” The archaic term “sheep” means “祥(Xiáng).” It represents subservience, meekness, purity, attractiveness, and good fortune. Sheep are frequently the victims of vicious animals, so the word has also evolved to represent frailty and compassion. In Chinese, the phrases “一虎十羊、势无全羊(one tiger and ten sheep, no whole sheep)” and “羊落虎口(the sheep fall into the tiger's jaws)” are used to depict the vulnerability of sheep, but the phrase “三羊开泰(Three sheep bring happiness)” is used to describe good fortune.

In spite of the fact that Thais rarely consume mutton and do not consider sheep to be livestock, “sheep grazing” is a symbol of honesty, frailty, and compassion in Thai culture. The term “แพะรับบาป (替罪羊)” in Thai refers to the slaughtering of sheep to atone for human transgressions. Later, it becomes a metaphor for an individual who has been accepted by others.

9. “猴hóu (ling) Monkey”: “Monkey” ranks ninth in the Chinese zodiac and is referred to as “申猴(Shen monkey).” People in both nations believe that monkeys are agile, intelligent, and good imitators. Since “猴(monkey)” in Chinese is synonymous with “侯(marquis)” in feudal society, monkeys are considered fortunate. However, the Chinese idioms associated with “猴(monkey)” sometimes have pejorative connotations, such as “猴急(monkey is in a rush),” “朝三暮四(day and night),” “心猿意马(thinking of a horse),” “沐猴而冠(bathe in monkeys and crows),” “山中无老虎,猴子称大王(there is no tiger in the mountains, and monkeys are named King),” etc.

Thais consider “the monkey” to be a cunning and imitative animal. Similar to Chinese, typical Thai idioms are almost disparaging, with the exception of “ฉลาดเป็นลิง (聪明像猴子) (clever as a monkey)”. Moreover, they are nearly pejorative, such as “ลิงหลอกเจ้า (monkey deceives the leader)” means that an adult is unknowingly swindled by a liar. “ลิงได้แก้ว (monkey gets a cup)” means that he does not know a thing is of high value to himself and finally ignorantly abandons it. “ลิงล้างก้น (monkey washes buttocks) means something done casually, but not neatly” etc. In addition, “monkey” can be used as an expletive to express swift action and work, as in “มือไวเป็นลิง (手快像猴子) (hands as fast as monkeys)”.

10. “鸡jī (kì) Chicken”: “Chicken” refers to the tenth animal in the Chinese zodiac, the chicken. As the bird of the morning, the chicken dispels darkness, subdues evil, and repays goodness. These and other themes are popular in both countries, as is the historic tradition of “斗鸡(cock fighting).”

According to Chinese philosophy, “chicken” possesses “五德(five virtues).” “《韩诗外传》(Han Shi Wai Zhuan)” wrote: “She is literary who wears the crown on her husband's head. Those who battle with their feet are considered martial. Whoever dares to battle against the enemy is courageous. If you are nourished, you will be charitable. If you do not lose track of time at night, you will be loyal.” Due to the identical pronunciation of “chicken” and “ji” in ancient Chinese, both words have the same meaning: prosperity. But “chicken” are also stigmatized as being weak and insignificant. For example, “杀鸡儆猴(kill the chicken to warn the monkey),” “鸡肋(chicken ribs),” and “落汤鸡(dump the soup chicken)” etc.

In ancient Thailand, “chicken” as “ไก่(kì)” was considered a mystical bird capable of driving away the night. Due to the fact that its crow signals the end of the spring night for both men and women, the chicken

frequently appears as a taboo bird in waka. In addition to “ไก่ซ่อน (chicken)” in Thailand, it is simple to be misled by experience without firsthand knowledge. The phrase “ไก่เห็นตีนงู งูเห็นนมไก่ (鸡看见脚蛇, 蛇看见奶鸡) (The foot snake, the snake sees the milk chicken)” is a chicken-related idiom that suggests they both know each other's secrets.

11. “狗gǒu (sunaḥ) Dog”: “狗” means “Dog”, which is the eleventh sign of the Chinese zodiac. In all nations, dogs possess the qualities of loyalty, dependability, and gratitude, as well as the ancestry of slaves who intimidate others. Although there are Chinese idioms demonstrating the loyalty of dogs, such as “不嫌母丑,狗不嫌家贫(don't dislike the ugly mother; the dog doesn't dislike the poor family)” and “狗恋主人(the dog loves its master)”, there are more scolding words composed of the word “dog”, such as “恶狗(vicious dog)”, “疯狗(mad dog)”, “野狗(wild dog)”, “癞皮(mangy dog)”, “落水(drowning dog)”, “丧家犬(bereaved dog)”, “走狗(running dog)”, “哈巴狗(pug)”, and “狗腿子(dog leg)”.

In the opinion of Thais, “dog(sunaḥ)” also represents fidelity and dependability. The Thai language contains “สุนัขรับใช้ (忠犬) (Loyal Dog)”, a heartwarming narrative about the loyalty of a dog to its owner. Although “หมาลอบกัด (狗咬) (dog bite)”, “หมาจิ้งจอก (流浪狗) (stray dog)”, “หมาหวงสิ่ง (狗不想给东西) (dog doesn't want to give things)” and other negative idioms also exist, there are more derogatory expressions, such as “agility” and “bravery.” In addition, Thailand refers to obedient servants as “dogs.”

12. “猪zhū (hīmū) Pig”: “Pig” is the last sign of the zodiac, hence it is called “亥猪(Hai pig)”. Pigs represent obesity, gluttony, ignorance, and dirt. The Chinese term “猪圈(pigsty)” and the Thai character “เล้าหมู” both refer to an unclean chamber. People in both nations use pigs to reprimand others. The Chinese mostly utilize the cultural semantics of “stupid, fat,” but the Thai “หมูอ้วน肥猪(fat pig)” primarily scolds fat, gluttonous.”

In addition to the preceding imagery, pigs in China also represent good fortune. For instance, the “fat pig arch” signifies a prosperous New Year and a bountiful crop at the Spring Festival. “Zhu Ti Jin Bang” is homophonic with “imperial examinations devour pig's feet.” “春节的“肥猪拱门”寓意新年吉庆、丰收。考科举吃猪蹄，谐音“朱题金榜”。 Such as: “ZhouyiNvhou Gua 《周易·女后卦》” “有攸往,见凶,羸豕孚蹢躅” his father's words, “you go there, observe ferocious, lei, fu, and squat.” “羸豕”Lei hog” translates to “Lou pig” and refers to a sow in estrus, which is a metaphor for a woman with intense sexual desire. Ugly, vulgar. The term “pig head dog face” is used to describe a person's unattractive appearance.

Thai also consider “pig,” although they do not dislike it. Instead, they believe it to be robust. There are numerous expressions in Thai, including “หมูในอว (猪在锅) (pig in the pot)”, “กินอย่างหมู อยู่อย่างหมา (吃像猪住像狗) (feed like a pig and live like a dog)”, and others. Keep in mind that cultural perceptions and symbolic meanings can vary widely across different societies, and the interpretation of these expressions might also depend on the context in which they are used. In some cultures, pigs might symbolize positive qualities like abundance and prosperity, while in others, they might be associated with negative traits.

Overall, analysis seems to have unveiled a rich tapestry of idiomatic expressions in both Chinese and Thai cultures. The differences and similarities between these idioms provide insights into the uniqueness and interconnectedness of these two societies. Further exploration could delve into specific examples of idioms and their origins, as well as the cultural contexts that led to their creation.

Teaching Chinese as a foreign language

In recent years, numerous academics have explored and investigated the zodiac culture and its associated cultural teachings. On the basis of prior study, such as: Lu (2006), Liu (2012), Zhang (2013), etc., This paper studies and analyzes the culture of the Chinese zodiac based on the teaching design and methods of earlier Chinese zodiac animal terms. The relationship between connotation and the teaching of Chinese as a foreign language is researched further, along with the teaching methods and instructional design that are compatible with the cultural connotation of the zodiac.

3.1 The cultural significance of the Chinese zodiac and the cultural instruction of Chinese as a second language

Zhao (2008) Culture is mirrored in language. To really master a language, cultural instruction in the language is important. As a well-known Chinese zodiac, its rich cultural meanings are strongly tied to people's lives, and it provides overseas students with a vivid window through which to explore and comprehend Chinese culture. The cultural teaching of the zodiac and the cultural teaching of Chinese as a foreign language are interrelated and mutually reinforcing in the cultural teaching of Chinese as a foreign language.

The cultural significance of the zodiac not only assists Chinese students in learning Chinese culture but also increases their enthusiasm for cultural study. During our examination of the "dog" in the Chinese zodiac, we discovered that, in addition to the positive connotation of "loyalty" the dog also has the negative connotations of "pug", "door dog" and "running dog." In addition, we can learn more about China's long-standing cultural connotations, such as why Chinese culture often uses "Chillima" to describe visionary and capable people; "Suomu" to describe greedy and exploitative rulers; and "flattery" to describe flattering people; learn and master the cultural connotation of the zodiac; and If they use it right in their daily lives, they can not only learn more about other cultures but also better communicate with people from other cultures.

3.2 Teaching Design of the Zodiac

This instructional strategy uses the Chinese zodiac as its teaching subject and is intended for foreign students who have attained an intermediate or advanced level of Chinese and who can read some TV, news, and other daily media. The primary instructional content sources are Gu (2008) and Mao Zong's translation (2017).

Each class hour in this instructional plan is 45 minutes in length. In the first class, we primarily understand the animal image characteristics of the 12 zodiac signs; the appearance and order of the 12 zodiac animals as well as their zodiac signs; in the second class, we explain the rat, ox, and tiger; rabbit, dragon, and snake. draw and cartoons, as well as engage in some enjoyable classroom activities such as zodiac guessing competitions. Prepare the necessary teaching aids, including images, videos, PowerPoint courseware, etc., prior to instruction.

This instructional strategy begins with images of the zodiac, assists students in understanding the traits, names, and sequence of each animal, and explores in depth the cultural significance of the zodiac. This Zodiac culture education course can increase students' enthusiasm for learning Chinese culture, foster students' self-learning abilities to acquire and comprehend Chinese traditional culture, and enhance students' language communication skills and cross-cultural communication abilities.

3.2.1 Teaching objectives

(1) Comprehend the physical qualities of the animals of the Chinese zodiac and master the names of the animals.

- (2) understand the relevant knowledge of the Chinese zodiac, as well as the appearance and order of the animals of the Chinese zodiac.
- (3) understand the cultural meaning of the Chinese zodiac and experience the rich Chinese traditional Zodiac culture.

3.2.2 Teaching content

- (1) The animal image characteristics of the Chinese zodiac, including the real image, cartoon image, paper-cut image, etc.
- (2) The appearance and sequence of the twelve zodiac animals, and their zodiac signs.
- (3) The numerous cultural connotations of the Chinese zodiac and its application in communication.

DISCUSSION AND CONCLUSION

A comparison between Chinese and Thai cultures through the lens of the zodiac. The passage discusses how the idioms related to the Chinese zodiac demonstrate the geographical proximity and extensive cultural interactions between the two countries. The commonalities in idiom content and expression are attributed to these interactions. Additionally, the passage suggests that the unique national and cultural characteristics of both countries lead to a wide range of idiomatic expressions. Furthermore, the passage emphasizes the potential of comparing the Chinese and Thai zodiacs to gain insights into the cultural structure of the two nations. However, it acknowledges that differences between the two cultures can lead to varied cultural connotations for the twelve zodiac animals, posing challenges when teaching the Chinese zodiac. Effective teaching methods and adaptable lesson plans are deemed essential for conveying the cultural significance of the Chinese zodiac accurately.

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