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Design and Implementation of the E-module in Advanced Swimming

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ABSTRACT

The COVID-19 pandemic disrupted the educational system of the whole world. The institution's approach to the forced implementation of flexible learning is the development of printed and e-modules. This study aimed to develop, design, and evaluate the developed e-module in advanced Swimming as a learning material for Physical Education classes. Design research utilizing the ADDIE model was employed in this study. The e-module was developed based on the course specifications and the acceptability ratings of students and key informants. A purposive sampling method selected 80 students to participate in the examination to determine the least mastered topics. The e-modules were then developed considering these results. E-modules were then conducted for 267 students. These students, with the instructors and academic coordinators, further evaluated the acceptability of the e-modules. Interviews among students on their experiences of using the e-module and key informants from the academe were also conducted. Mean and standard deviation were employed to determine the level of acceptability of the developed e-module, and thematic analysis was utilized for the students' and experts' experiences. Results revealed that the developed e-module has excellently met the standards. The parts were adequate, sufficient, and appropriate as learning material for the intended users and were fitted to help the students learn easily. It also served its purpose of catering to the maritime students' needs during the pandemic. Further research should be conducted on the effectiveness of e-modules on the practical performance of students in advanced Swimming.

Keywords: E-module, Physical Education, Advanced Swimming, ADDIE, Maritime Education

Introduction

The use of technology in education has become imperative and inevitable, not a luxury, because of its positive effects on the teaching and learning process (Ja'ashan, 2015). Since technology has become an integral part of our lives, it has penetrated all areas of teaching and learning at the Higher Education level. Siemens, Gašević, and Dawson (2015) discussed that education technology has undergone three distinct generations of development, and now a fourth is emerging. Video in education is one element of those 'distributed interactions', and the role that video plays within education and how that role develops was explored in this study. Bransford, Brown, & Cocking (2000) discussed the use of video in the classroom and the importance of interactivity in helping students to learn by being able to re-visit and review the material. They emphasized the potential of technology to help in the learning process, but only if it is used properly. Day (2008) found that video usage can be a way to decrease the in-class time spent on information transfer and increase the in-class time available for more engaging learning activities that facilitate learners' active knowledge construction and how physical education can be learned during the pandemic.

Advanced Swimming, as a new general education subject of the Commission on Higher Education (CHED) for maritime based on CMO No. 20. s. 2018 needs learning resources such as books and modules to continue learning even during the pandemic. Although there are some developed modules like that of Navejas (2017) that integrate Pedagogical Content Knowledge (PCK) in her module on the said subject and that of Fernandez (2018) that utilize the module to address the anxiety of students in Physical education, there are few available resources that utilize videos and other audio-visual materials for the subject above because it is a suggested subject of CHED for maritime education. Thus, the researcher pursued the development of e-modules in the form of videos as a tool for the flipped classroom for the learners of the 21st century (CMO 20 s. 2021). Hence, this study aimed to develop e-modules that were compilations of videos for selected topics in *Physical Education 2 (Advanced Swimming)* in response to the demand of 21st-century students for technology-enabled learning material in a flipped classroom model. E-module can be defined as a digitalized module created interactively. It can also be regarded as a medium for independent learning because it has self-study guides. Unlike the usual modules, e-modules present videos and animations to enable users to learn actively. Using an e-module is one way of integrating ICT into the learning process. By developing the e-module, students are expected to learn the material easily, effectively, and efficiently (Fajaryati et al., 2017). Thus, an e-learning module could be a solution for young learners to study at home, for it provides digital teaching and learning materials through interactive videos to improve the students' interest (Trilestari, K. & Almunawaroh, N.F., 2020).

In a flipped classroom, students are introduced to the content at home and practice working through it at school. In this blended learning approach, face-to-face interaction is mixed with an independent study via technology. Students watch pre-recorded videos at home, then come to school to do the homework armed with questions and at least some background knowledge and perform the required activity. In the flipped classroom model, students practice under the teacher's guidance while accessing content independently (Teach Thought

Staff, 2016). Proponents of flipped classrooms assert that increased student-teacher interactions give teachers more opportunities to provide student feedback. Moreover, Karabulut-Ilgu et al. (2017) cited some benefits of flipped learning: Flexibility – students could re-watch the lecture videos. They could pause and rewind the videos, take notes, and perform activities while watching the lecture videos.

This study is anchored on the e-learning theory of Mayer & Moreno (2007) and Sweller (2005), as cited by David (2015), which consists of cognitive science principles that describe how electronic educational technology can be used and designed to promote effective learning. Another foundation of this study is based on Anchored Instruction (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990), which involves the use of an "anchor" material or media, often a video, to create a shared experience among learners and a beginning point for further learning on a topic.

Furthermore, constructivism is also evident in this study. This learning theory asserts that individuals form or construct much of what they learn and understand (Schunk, 2012). In constructive learning theory, learners do not transfer knowledge from the outside world into their memories but build personal meanings and interpretations based on experiences and interactions (Ertmer & Newby, 1993). The process involved and variables are presented in the following paradigm.

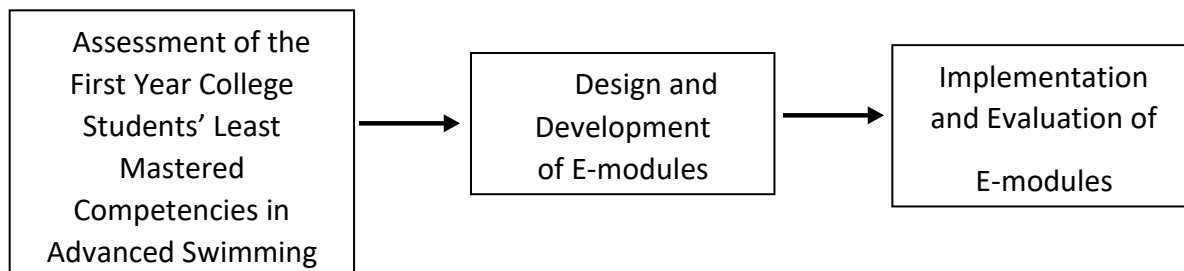


Figure 1. Paradigm of the study on the development and evaluation of the e-modules.

Statement of the Problem

Specifically, this study aimed to answer the following questions: (1) What are the least mastered competencies of first-year college students in Physical Education 2 (Advanced Swimming)? (2) What instructional materials can be developed to cater to the least mastered topics of first-year college students in Physical Education 2 (Advanced Swimming)? (3) What is the level of acceptability of the developed e-module as a tool for the flipped classroom in terms of (a) Learning Objectives, (b) Content, (c) Organization and Presentation, (d) Format and Design, (e) Learning Activities; and (f) Assessment as evaluated by the experts and students?; and (4) What are the experiences of the students in using the e-module?

Methodology

This study utilized design research using the Analysis-Design-Development-Implementation-Evaluation (ADDIE) Model of McGriff (2000) as its research design because it aimed to develop and evaluate an e-module as a tool for the flipped classroom. Of the two purposes of design research, this study utilized developmental studies that purport to develop research-based solutions for complex problems in educational practice. This type of research design is defined as the systematic analysis, design, and evaluation of educational interventions with the dual aim of generating research-based solutions for complex problems in educational practice and advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them (Plomp, 2013).

Development, implementation, and evaluation of e-modules and study participants

Initially, the principal investigator designed a questionnaire as an assessment tool to evaluate the student's learning using the hard copy modules. Such an assessment tool was administered to 80 first-year maritime students taking the Physical Education 2 (Advanced Swimming) course in the second semester of AY 2020-2021. From this assessment, the least mastered topics were then identified. With the identified least mastered topics, e-modules were then developed. A tryout of the e-modules was then conducted for 267 Bachelor of Science in Marine Transportation (BSMT) and Bachelor of Science in Marine Engineering (BSMarE) students taking Physical Education 2 during the study. These students further evaluated the e-modules for their acceptability.

Four maritime students were selected using a purposive sampling method to serve as key informants about their experiences using the e-module. Each specialization has two representatives to ensure the heterogeneity and adequacy of experience information. Moreover, six key informants who have been teaching for decades in the field of educational technology and information technology, physical education instructors handling the Advanced Swimming course, curriculum development and instructional materials development, and teacher implementers of the e-module were likewise interviewed for the acceptability of the e-module.

Table 1. The Participants and the Research Tasks

Participants	Tasks
Research principal investigator	Initial designing of the e-module in the Advanced Swimming course based on the result of the assessment given to First-year maritime students where the least mastered topics were identified
Respondents:	
First-year maritime students (n = 80)	Assessment of the least mastered topics using the examination made by the principal investigator
BS Marine Transportation and BS Marine Engineering	Tryout out the e-module
	Interview on their experiences during the implementation of the e-module

students (n = 267)	Evaluation of the acceptability of the revised e-module
	Submitted video on their practical performance
Key informants:	
Physical Education instructor implementers (n = 2)	Implement the designed e-module
Course chair and academic committee members (n = 4)	Interview for experiences during the implementation
	Observation and evaluation during the tryout of the e-module
	Evaluation of the acceptability of the revised e-module
Maritime students (n = 4)	Interview for experiences on using the e-module

Research Instruments

The questionnaire developed by the principal investigator, which was used as an assessment tool for Physical Education 2 (Advanced Swimming), was the initial research instrument of this study. This researcher-made assessment tool was an 80-item multiple-choice test administered to first-year college students. The main goal of this assessment was to determine the least mastered topics, which were the basis for developing acceptable e-modules to improve students' performance.

The principal investigator developed another questionnaire in a 5-point Likert scale to assess the acceptability of the e-modules. Key informants from the academe validated these instruments, and a reliability test was conducted where Cronbach's alpha equals 0.89. Kuder-Richardson 20 or KR 20 was used to analyze the internal consistency of the assessment tool, while Cronbach's alpha was used for the students' and experts' evaluation questionnaires. The interview schedule guided the researcher to solicit the students' experiences utilizing the e-modules after the tryout.

Data Gathering Procedure

The process of gathering pertinent data in this study was based on the ADDIE model. Figure 2 below shows each phase in the procedure.

The data-gathering procedure is shown in the Tabulation below.

Analysis	● Administered the researcher-made test to assess the least mastered topics of first-year college students in Physical Education 2 (Advanced Swimming).
Design	● Designed an outline of the e-module based on the least mastered topics and the course syllabus. The format of the e-module was also determined in this stage.
Development	● Developed the e-module for the least mastered topics based on the format and outline in the designing stage using Camtasia 2018. Initial validation of the e-module by the experts, like content checking, was done in this stage.
Implementation	● Tried out the e-module to first-year maritime students in a flipped classroom model.
Evaluation	● Students and experts evaluated the acceptability of the developed e-module. ● Interviewed with randomly selected students about their experiences in using the e-module.

Figure 2. The research procedure on the conduct of the study.

Data Analysis

Moreover, descriptive statistics were employed to analyze and interpret quantitative data: frequency count, percentage, mean, and standard deviation. Practical analysis was used to analyze qualitative data.

Results and Discussion

The study revealed first-year college students' eight least mastered competencies in *Physical Education 2 (Advanced Swimming)*, as shown in Table 1. The least mastered topics of first-year college students for the first four chapters of Advanced Swimming were the following: In lesson 1, the two least mastered topics were "The Breathing Techniques in Freestyle Stroke," showing only 44 or 57.14% of the students answered the items in this topic correctly and "The Shoulder Roll in Backstroke" where 56 or 72.73% of the students answered the items correctly. For the second chapter, the number one least learned lesson is "The Body Positioning in Breaststroke," showing 29 or 37.66% of the respondents answered the items correctly. In contrast, this chapter's second least learned topic is "Different Kinds of Diving," where 36 or 46.75% of the respondents answered the items correctly. For chapter 3, "Timing and Coordination in Butterfly Stroke" and "Phases of Arm Pull and Leg Kick" were the two least mastered topics in this chapter, where 24 or 31.17% for the former and 43 or 55.84% for the latter, of the students, answered the questions in these topics accurately. Lastly, in chapter 4, the bottom two least mastered topics were "Officials for Swimming" and "FINA Rules," showing 10 or 12.99%, and 16 or 20.78% of the students correctly answered the items in these two topics. The ones with ranks 1 and 2 were considered the least mastered topics per chapter.

Due to the low performance of the students in the least mastered topics, as disclosed in Table 1, the researcher developed an e-module in the form of a video with corresponding

activity sheets per module as a tool for the flipped classroom model. This supports the findings in the study of Fajaryati et al. (2017) that by developing the e-module, students are expected to learn the material easily, effectively, and efficiently. In addition, Day (2008) found that video usage can be a way to decrease the in-class time spent on information transfer and increase the in-class time available for more engaging learning activities that facilitate learners' active knowledge construction.

Furthermore, the developed e-module in Physical Education 2 (Advanced Swimming) has the following parts: title, learning objectives, overview, discussion, references, activity sheet, and answer key, as shown in Figure 3. Moreover, it has two distinct features in the e-modules, namely the checkpoint and key to correction, that help students reflect on their progress.

The e-modules were in video format that could be played by the students using their smartphones, laptops, or tablets. These range from 30 – 40 minutes, depending on the lesson tackled. Students could listen, watch the videos, and then answer the questions after discussing a subtopic to check their understanding. They could pause and play the video whenever they wanted, making it flexible.

Table 2. Least mastered topics in Physical Education 2 – Advanced Swimming (n=80)

Topic	<i>f</i> (correct responses)	% (correct responses)	Rank
Lesson 1			
The Breathing Techniques in Freestyle Stroke	44	57.14%	1
The Shoulder Roll in Backstroke	56	72.73%	2
The Phases of Arm Pull in Backstroke	58	75.32%	3
Lesson 2			
Different Kinds of Diving	36	46.75%	2
The Phases of Arm Pull in Breaststroke	38	49.35%	3
The Body Positioning in Breaststroke	29	37.66%	1
Lesson 3			
Timing and Coordination in Butterfly Stroke	24	31.17%	1
Phases of Arm Pull and Leg Kick	43	55.84%	2
The Body Positioning	45	58.44%	3
Breathing Techniques	55	71.43%	5
Water Entry	46	59.74%	4
Lesson 4			
Entry and Turns	69	89.61%	6
Individual Medley	40	51.95%	4
Officials for Swimming	10	12.99%	1
Medley Relays	50	64.94%	5
FINA Rules	16	20.78%	2
Commencement of the Event	18	23.38%	3

This format is per the statement of Acuram (2015) that the format and style of a module may differ depending on its purpose and the institution where it is developed. The

components of each module should be title, overview, objectives, discussion of content, self-check test, evaluation activities, and references. It also follows the list of components of a typical module enumerated by Aguirre & de Cadiz (2013), which includes the title, overview, objectives, learning activities, and post-test.

Different e-modules were tried out in different sections to maximize the validity of the student's evaluation of the acceptability of the e-module. For the BSMT, e-module 1.1 or "The Breathing Techniques in Freestyle Stroke" and e-module 1.2 or "Shoulder Roll in Breaststroke" were utilized, e-module 2.2 or "Different Kinds of Diving" and e-module 3.1 or "Timing and Coordination in Butterfly Stroke" was utilized for BSMarE.

These e-modules were given to the students a day during the flexible learning modalities during the pandemic for them to watch the videos at home. During the actual class, they were encouraged to ask questions to clarify their understanding of the videos, and the teacher acted as a facilitator. After an online short discussion, worksheets were forwarded to assess whether they learned the concepts from the watched e-modules.

It was also found that the acceptability of the eight developed e-modules as evaluated by the experts and the students in general and in terms of learning objectives, content, organization, presentation, format, design, learning activities, and assessment was rated "Highly Acceptable". Table 3 shows the overall acceptability of the eight developed e-modules.

As to the overall acceptability of the e-module, it has an overall rating of "highly acceptable" ($M = 4.75$, $SD = 0.06$). This shows that the e-module has excellently met the standards, and no revision is needed. In particular, the students rated the assessment part the highest, with a mean of 4.87 and an SD of 0.27. Also, for the experts, the learning objectives obtained the highest rating ($M = 4.80$, $SD = 0.45$). Regarding the average mean, the highest rating was attributed to the learning objectives ($M = 4.83$, $SD = 0.04$). Still, the lowest rating was accounted for from format and design ($M = 4.66$, $SD = 0.15$), yet both were highly acceptable. In general, the overall rating of the students in terms of overall acceptability was "highly acceptable" ($M = 4.83$, $SD = 0.03$), and a similar overall rating of "highly acceptable" was found by the experts ($M = 4.68$, $SD = 0.09$).

Based on the result, the respondents agreed that the e-module is highly acceptable in learning objectives, content, organization and presentation, format and design, learning activities, assessment, and overall rating. This implies that the developed e-module is worthy and can serve as instructional material in a flipped classroom model to help students learn independently.

This result is under the study of Robles (2009), who cited that the development of the learning package was reliable, as revealed by the high percentage obtained in the strongly agreed category of the instrument. The developed Computer Assisted Learning Package (CALP) was valid as to its objective, contents, manner of presentation, and usefulness and, therefore, could be used as instructional material for enrichment and remediation.

Table 3. Overall Acceptability of the Eight Developed E-modules

	Students		Experts		SD	Mean	Description
	M	SD	M	SD			
Learning Objectives	4.85	0.23	4.80	0.45	0.04	4.83	Highly Acceptable
Content	4.83	0.23	4.72	0.52	0.08	4.77	Highly Acceptable
Organization and Presentation	4.83	0.23	4.60	0.79	0.16	4.71	Highly Acceptable
Format and Design	4.77	0.30	4.56	0.77	0.15	4.66	Highly Acceptable
Learning Activities	4.82	0.24	4.72	0.63	0.07	4.77	Highly Acceptable
Assessment	4.87	0.27	4.68	0.72	0.13	4.78	Highly Acceptable
Overall Rating	4.83	0.03	4.68	0.09	0.06	4.75	Highly Acceptable

Note: Description is based on the following scale. 4.51-5.0 (Highly Acceptable), 3.51-4.50 (Acceptable), 2.51-3.50 (Moderately Acceptable), 1.51-2.50 (Fairly Acceptable), 1.0-1.50 (Not Acceptable).

In addition, the student's experiences in using the e-module were the following: the e-module was unique, innovative, and easy to understand, making it interesting and exciting; it had immediate feedback because of the presence of practice exercises to check their progress; and it is an effective and flexible instructional material that helps students learned the lessons seamlessly.

The presence of the checkpoint section and an explanation after that part made the e-module student-friendly, as the key informant told the researcher. The conversational tone of the e-module conveyed the social presence of the teacher, which guided the students well in learning the lesson.

In addition, the researcher conducted triangulation in support of the study findings on whether students can apply the knowledge learned. Students were required to execute the activities on the video submitted before receiving the final credit of their grades.

These results conform to the quantitative analysis because the students have rated the learning activities and assessment part of the e-module as highly acceptable and suited to the level of the students. Moreover, these statements support the findings of Cox (2017) that students prefer technology because they believe it makes learning more interesting and fun. Subjects that students deem challenging or boring can become more interesting with virtual lessons, through a video, or when using a tablet.

Furthermore, these findings agree with the study by Nardo & Hufana (2014) that the

students' exposure to appropriate activities heightened their understanding. It also substantiates the recommendation of Woolfitt (2015) that videos should incorporate active elements (such as quizzes) or be combined with other learning activities. Like any medium, a video's content and message must be constructed well to support learning.

Conclusions

Some students still struggle in the subject Physical Education 2 (Advanced Swimming) during the pandemic, as evidenced by their least mastered topics since it's a practical performance course. The e-module, which not only consists of the basic parts such as learning objectives and discussion but also contains distinct features, namely, checkpoint and key to correction, helped students reflect on their learning progress through self-assessment.

The e-module has excellently met the standards, and no major revision is needed, as reflected in the evaluation by the experts and the students. The learning objectives, content, organization and presentation, format and design, learning activities, and assessment were acceptable to the intended users.

Thus, the developed e-module is fitted to help the students easily learn the concepts of Physical Education and Advanced Swimming. The e-module served its purpose to cater to the needs of the 21st-century learners of a technology-enhanced instructional material that is flexible, innovative, interesting, and acceptable, which would facilitate their construction of knowledge through videos and coming to class prepared in a flipped classroom model.

Implications

The findings of this study have led to certain implications for both theory and practice. For theory, the results of this study affirmed that by developing the e-module, students are expected to learn the material easily, effectively, and efficiently (Fajaryati et al., 2017). Furthermore, the findings also attested what Day (2008) found out that: video usage can be a way to decrease the in-class time spent on information transfer and increase the in-class time available for more engaging learning activities that facilitate learners' active knowledge construction. It also affirms the findings of Cox (2017) that students prefer technology because they believe it makes learning more interesting and fun.

For practice, the results of this study revealed that the developed e-module composed of videos and activity sheets was highly acceptable for the students and the experts, as indicated by the quantitative analysis. The students also validated their experiences using the e-module as they agreed that the instructional material is interesting, exciting, easy to understand, flexible, innovative, and consequently an effective aid in learning. This result was aligned with the stand of Bishop & Verleger (2013) that the flipped classroom approach allows students to learn at their own pace, as they can stop, backtrack, and review while watching videos. Motivation increases when students know they must apply or discuss the out-of-class content during face-to-face class.

Since we are now in the digital age, teachers and other educators must consider this idea regarding instructional material development. This is supported by Day (2008), who states that in "light of contemporary learning theory, the traditional one-to-many lecture still prevalent in most classrooms is arguably not the most educationally effective" (p. 19). This statement is largely attributed to the lack of learner engagement in often passive lecture settings. Hence, technology-enhanced instructional materials like the e-module in videos paired with an innovative flipped classroom strategy are one of the new trends today.

When deploying video and considering its educational effect, it can be helpful to keep the constructivist perspective in focus to ensure that the student is assisted in actively constructing the relevant knowledge.

Recommendations

Hence, it is recommended that teachers are encouraged to create, develop, and utilize technology-based instructional tools and strategies to provide interesting and meaningful experiences to the learners.

Students, being the main beneficiaries of the study, may not confine their learnings within the four walls of the classroom; instead, they may explore other means of learning the subject, like in the flipped classroom model where lectures can be done at home in the form of videos.

School administrators may develop projects, such as instructional materials development. They can tap the institution's curriculum planners and designers to plan training and seminars, especially in integrating technology into teaching through innovative instructional materials to cater to the needs of 21st-century learners.

Textbook writers may consider using e-modules in the form of videos as supplementary materials aside from the textbooks they publish to better facilitate learning in this technology-suffused education system.

More in-depth research on the e-module developed in this study to ascertain the effectiveness of this instructional material composed of videos is encouraged.

Furthermore, a blended learning modality is encouraged for courses with required laboratory and performance so students can apply the theories learned in online/modular instruction.

Further research should be conducted on the effectiveness of e-modules on the practical performance of students in Advanced swimming.

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