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Hybrid Learning at Higher Education Institution: A Needs Analysis for Synergistic Scaffolds

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Hybrid learning is a common learning mode in the post Covid-19 era. In a hybrid learning context, some students attend a lecture in person, while others join virtually from home. University students face several challenges when they learn in this context. Providing adequate scaffolds can help these students learn more effectively in hybrid lessons. However, a literature review revealed that scaffolds were designed based on the existing studies or teachers' conceptualization of scaffolding. Need analysis for scaffolding, especially in a hybrid learning context, is under-researched. This action research aimed to investigate the challenges faced by postgraduate students and the types of scaffolds they needed during hybrid learning. This research involved 78 postgraduate students from a private higher education institution in Selangor, Malaysia. The participants completed an online questionnaire comprising six closed-ended and four open-ended questions. Descriptive data was used to present the data for the close-ended questions. The qualitative data was coded and categorized into themes. The quantitative results showed that the students only faced a few challenges regarding the course content, teaching methods, assessment, learning resources, and personal issues. However, the qualitative data revealed that the students did face various challenges during hybrid lessons. They needed both fixed and adaptive scaffolds to support their learning. Based on the results from the baseline study, the researchers designed synergistic scaffolds, which consist of fixed and adaptive scaffolds to support student learning. The practical implications of designing synergistic scaffolds to support hybrid learning are discussed.

Keywords: hybrid learning, tertiary education, synergistic scaffold, needs analysis

Introduction

Lockdowns in response to COVID-19 led to the worldwide closure of higher education institutions (HEIs) (Schleicher, 2020), impacting 220 million students at tertiary institutions (UNESCO, 2021). In Malaysia, HEIs were closed when the government imposed a Movement Control Order (MCO) on 18th March 2020. Two years after the pandemic outbreak, with more countries gradually reopening their borders to international students, many HEIs have been reopened for physical lessons. However, many international students have to continue online learning due to various factors such as partial lockdowns in their home countries, cumbersome pre-departure, and post-arrival procedures, risk of getting Covid in flight, costly quarantine fees, and familiarity with the mode of online learning (Bülow, 2021; Xi, 2022). As a result, hybrid learning has been widely adopted as a substitute for face-to-face learning.

In a hybrid learning context, students who join lectures physically on campus and present virtually share the same learning space (Ackerman, 2008). In other words, some students attend a lecture in person on campus, while others join virtually from home (Ackerman, 2008). Hybrid learning is necessary to ensure a smooth transition from fully online learning to physical lessons while waiting for some countries to reopen their borders (Bülow, 2021; Xi, 2021). According to Malaysia's Endemic Guidelines, starting from 1 April 2022, individuals must maintain social distance of at least one meter from others to reduce the risk of virus transmission (Majlis Keselamatan Negara, 2022). This limited the number of students who could be present in a class simultaneously. Hybrid learning could be a solution for a class with many students.

A range of work has investigated hybrid learning from academics and students' perspectives. Those studies focused on the design and development of hybrid learning models and teaching methods, students' experience and satisfaction with hybrid learning, as well as individual factors influencing successfulness of hybrid learning (Arispe & Blake, 2012; Li et al., 2023; Raes et al., 2019). Studies investigating students' challenges in hybrid learning found that they experienced personal challenges such as isolation, low motivation, and inadequate self-regulation skills (Garrison & Kanuka, 2022; Kenney, 2011). Arispe and Blake (2012) highlighted that non-native English speakers were overwhelmed by instructors' language and learning resources. Course content, teacher reinforcement, teaching approach, and technology adoption also impact student learning in this context (Kenney, 2011). Issues related to assessment, such as fairness in grading and task complexity, are also reported in hybrid learning (Fitriani, 2022). Despite the prevalence of hybrid learning, research on the challenges postgraduate students face in hybrid courses during the post-pandemic period is scarce (Anderson, 2022). This may be built on the assumption that postgraduate students have a higher ability to navigate and adapt to hybrid learning. If unaddressed, these challenges will affect postgraduate students' academic performance. Deriving from the existing literature (Arispe & Blake, 2012; Garrison & Kanuka, 2022; Kenney, 2011), the first objective of this study was to explore the challenges faced by postgraduate students during hybrid learning in terms of course content, instructional methods, assessment tasks, and individual factors.

It is crucial to provide scaffolding for students, including hybrid learners, who face challenges in learning (Hsiao et al., 2017; Korhonen et al., 2019). Most scaffolds are designed based on the existing literature or teachers' conceptualization of scaffoldings (Richardson et al., 2021). Teachers' conceptualization of scaffolding differs based on their discipline and teaching philosophy (Richardson et al., 2021). They design scaffolds without conducting a need analysis to identify the challenges faced by their students and the types of scaffolds that are helpful for them. As a result, these scaffolds may not be able to support the student effectively. Diagnosing students' learning needs is essential to designing effective scaffolds (van de Pol & Elbers, 2013). In higher education, the needs analysis of the types of scaffolds needed by postgraduate students in the hybrid learning context is under-researched. This gap leads to the second objective of this study, which was to investigate the postgraduate students' needs for scaffolding in a hybrid context.

Few scaffolding tools and agents can help students develop knowledge and skills in a complex, open learning environment (Tabak, 2004). It takes the concerted efforts of multiple types of scaffolds to support different aspects of learning to achieve a definite goal (Tabak, 2004; Ustunel & Tokel, 2018). Synergistic scaffolds (SS) are multiple forms of support that interact with each other concertedly to achieve a targeted goal (Tabak, 2004). Synergy can occur between fixed scaffolds (FS) and adaptive scaffolds (AS) over a sequence of learning

activities. FS is static support planned before the implementation of lessons (Saye & Brush, 2002). AS is dynamic and situational support provided to students based on their progressive development in learning (Saye & Brush, 2002). Research showed that SS effectively supports student learning in both physical and online contexts (Ustunel & Tokel, 2018). However, less attention has been paid to designing and implementing SS in a hybrid learning environment. The third objective of the current study focused on designing SS, including both FS and AS, to help first-semester postgraduate students learn in a hybrid learning context.

Three research questions were formulated to achieve the research mentioned above objectives:

- Research question 1: What are the challenges faced by postgraduate students in a hybrid learning context?
- Research question 2: What are postgraduate students' needs for synergistic scaffolds in a hybrid learning context?
- Research question 3: How can synergistic scaffolds be designed to support postgraduate students' learning in a hybrid learning context?

Literature Review

Research Framework

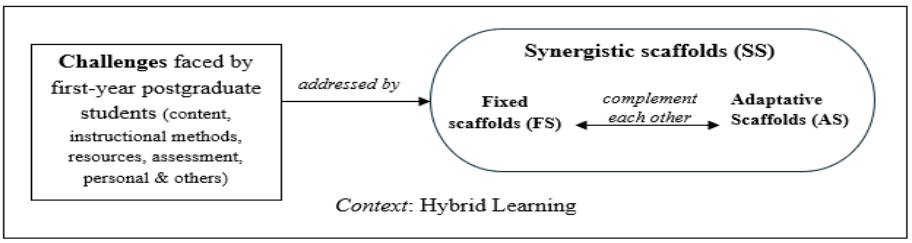


Figure 1: Conceptual framework of the study

This section will review the existing literature about the study's framing, as illustrated in Figure 1. The key dimensions include challenges in hybrid learning and synergistic scaffolds (SS), which consist of fixed scaffolds (FS) and adaptive scaffolds (AS). The acronyms in parentheses will be used in the article for brevity purposes.

Challenges in Hybrid Learning

Hybrid learning, which combines in-person and online instruction, poses significant challenges for HIE students. These challenges affect various aspects of the learning experience, including lesson content, teaching methods, learning resources, and assessment tasks. Understanding these difficulties from the students' perspective is crucial for improving the hybrid learning environment.

One of the primary challenges in hybrid learning is the inconsistency and fragmentation of lesson content. In a traditional classroom setting, content delivery is usually straightforward and cohesive. However, in a hybrid model, content may be delivered through various platforms and formats, leading to potential confusion and disconnection. The variability in teaching styles and technological proficiency can contribute to unpleasant learning experiences (Barbour et al., 2020). This fragmentation can make it difficult for students to integrate and synthesize information effectively. Furthermore, the quality and depth of online

content often do not match face-to-face instruction. Design and delivery of online content require significant pedagogical changes, which many educators may not be adequately prepared for, leading to gaps in learning outcomes (Rapanta et al., 2020; Dzuiban et al., 2018)

Another significant challenge is adapting to the diverse instructional methods used in hybrid learning. Engagement is a critical component of effective learning, and maintaining it in a hybrid environment can be difficult (Dzuiban et al., 2018). Bawa (2016) notes that the lack of face-to-face interaction makes it challenging for instructors to gauge student comprehension and adapt their teaching methods accordingly. This can lead to a one-size-fits-all approach that does not meet the diverse needs of students. According to Coman et al. (2020), the shift to online learning often relies on asynchronous teaching methods, which may only effectively engage some students. Bao (2020) points out that online lectures sometimes need more interactive elements that facilitate a more profound understanding. This can be particularly challenging for complex subjects that require detailed explanations and immediate feedback. The absence of immediate interaction and feedback in online sessions can decrease motivation and participation.

Accessibility, quality, and appropriateness of learning resources are other concerns in hybrid learning. While digital resources for hybrid lessons offer flexibility, they also require reliable technology and internet access, which may only be available to some students (Dhawan, 2020). Besides, on-site learning resources must be more interactive when used without course instructors (Kebritchi et al., 2017). Deficiencies in self-explanatory elements, such as insufficient clarity, wordy description, and unorganized structure, often fail to support online learners in studying the materials independently (Lee et al., 2013). These resources need to be adapted or re-designed so that they can be effectively used by both physical and online learners (Kebritchi et al., 2017).

Assessment in a hybrid learning environment presents unique challenges. Traditional assessment methods, such as in-person exams and quizzes, may need to be more feasible and effective online. Gikandi et al. (2011) assert that formative assessments and frequent feedback are crucial for online learning success, but these require substantial time and effort from instructors. Furthermore, according to Adedoyin and Soykan (2020), the transition to online assessments has highlighted significant challenges in maintaining academic integrity, as the potential for cheating is higher in an online setting where monitoring is more complicated. Academic integrity necessitates the development of alternative assessment methods, such as open-book exams and project-based assessments, which can be more challenging to design and implement. According to Gikandi et al. (2011), these alternative methods require careful planning and additional resources to ensure fairness and effectiveness. Moreover, the abrupt shift to online assessments has left many students feeling unprepared and anxious about the fairness and accuracy of these new methods (Gillis & Krull, 2020). The lack of standardization in online assessments can lead to inconsistencies in grading and feedback, further complicating the learning experience (Fitriani, 2022).

Scaffolding Student Learning

Wood, Bruner, and Ross were the first to propose the notion of scaffolding in 1976. Scaffolding explains the interaction between a tutor and a child that assists the child in solving a problem and accomplishing a more complex task that may be unachievable without any assistance (Wood et al., 1976; Spector & Merrill, 2014). Scaffolding can be helpful to students in some ways, namely:

- scaffolding fosters the development of independence to perform the target skills in the long run, in addition to enhancing present performance,
- scaffolding is applied when students work on real, uncontrolled problems (Belland et al., 2014),
- scaffolding relates to the assessment of students' abilities at that particular moment, expanding on what the students already know (van de Pol & Elbers, 2013),
- scaffolding preserves the complexity of certain activities while simplifying others (Reiser, 2004), and
- scaffolding enables students to engage entirely in the activity. It helps them focus on the issue at hand, which will help them acquire the necessary knowledge and improve the task's productive difficulty (Belland et al., 2014).

Synergistic Scaffolds: Complementary Roles of Fixed and Soft Scaffolds

There are two types of scaffolds: fixed and adaptive scaffolds (Azevedo et al., 2005) or hard and soft scaffolds (Saye & Brush, 2002). Both can be used to help students perform complex problem-solving tasks. Fixed scaffolds are static support planned before the implementation of lessons (Azevedo et al., 2005; Saye & Brush, 2002). Within the curriculum, fixed scaffolds are materials that are purposefully included in lessons to facilitate learning, such as using prompts to support students' cognitive and metacognitive processes during knowledge construction (Dominguez & Svihla, 2023; Ge et al., 2010). Adaptive scaffolds are situational since they are dynamic and dependent on the learner's needs at that moment for a given task. These interactive, responsive scaffolds are used in the classroom and modified according to the learner's needs by a teacher. For instance, teachers conduct ongoing diagnoses of students' emerging performances and provide adequate support by providing more support or fading their support till students can take responsibility for their learning (Dominguez & Svihla, 2023; Forman et al., 2017; Saye & Brush, 2002; Smit et al., 2012; van de Pol et al., 2014).

Pre-planned fixed scaffolds lack the elements of contingency and responsiveness compared to adaptive scaffolds (Saye & Brush, 2019). Adaptive scaffolds can reinforce support provided through fixed scaffolds or augment fixed scaffolds by providing essential scaffolding not embedded in fixed scaffolds (Tabak, 2004; Ustunel & Tokel, 2018). Synergistic scaffolds are multiple forms of support that interact with each other to achieve a targeted goal (Tabak, 2004). Research shows that both fixed and adaptive learning are necessary to support physical and online learning (Tabak, 2004; Lee, 2019; Ustunel & Tokel, 2018). Examples of fixed scaffolds are computer-generated prompts, templates, charts, and discussion boards (Belland, 2017; Kannaki et al., 2011; Kim. 2017; Ustunel & Tokel, 2018; von Fintel & Eybers, 2000;). Adaptive scaffolds include asking reflective prompts, providing feedback, summarising ideas, creating social spaces, modeling, defining terms, and elaborating ideas (An & Cao, 2013; Hsiao et al., 2017; Rose & Meyer, 2002; Santoso, 2010).

There are few studies on scaffolding hybrid learning. For example, Hsiao et al. (2017) investigated the impacts of providing fixed and adaptive scaffolds to support student-centered learning in business modules. The hard scaffolds were provided in four forms: conceptual, procedural, strategic, and metacognitive scaffolds. The study showed that the scaffolds help the students construct knowledge. Conceptual and metacognitive scaffolds were more helpful for student learning than the procedural and strategic scaffolds. The conceptual scaffolds explained the conceptual framework of real-world scenarios, while the metacognitive scaffolds guided them to reflect on their learning. Similarly, An and Cao (2013) found that

metacognitive scaffolds supported the students in problem-solving by helping them set goals and deadlines, engage in research, organize their ideas, challenge misunderstandings, avoid procrastination, monitor and evaluate their progress, and revise ineffective strategies.

In a study by von Fintel and Eybers (2000), different types of social interaction tools, such as discussion boards, blogs, and journals, were used to scaffold argumentative skills in a hybrid academic literacy module. The study found that the discussion board was the most effective scaffolding tool, allowing students to interact with the lecturers and their peers. The lecturers guided students through phases of identifying argumentative topics, formulating problem statements, and proposing evidence for claims. Creating social spaces for students to share ideas with their teachers and peers is crucial for scaffolding knowledge construction to meet individual learning needs (Rose & Meyer, 2002; Santoso, 2010). Scaffolds designed to sequence content, learning tools, and tasks systematically can develop students' argumentative skills (von Fintel & Eybers, 2000).

Methodology

Research Design: Action Research

This study adopted an action research design. Action research is a systematic procedure conducted by practitioners to address an actual educational issue they face. Action research aims to improve classroom practice through a spiral of self-reflection whereby teachers evaluate different solutions to their problems and gain knowledge from testing multiple ideas (Creswell, 2008). Action research involves four steps: (1) identifying an area of focus, (2) collecting data, (3) analyzing and interpreting data, and (4) developing an action plan (Mills, 2000). These steps do not follow a linear pattern but a "spiral" back-and-forth pattern to evaluate, revise, and repeat the plan.
In this study, the first author was the lecturer who taught a postgraduate core module named Learning and Assessment. The second author was the module tutor, who assisted the lecturer in assessing one of the students' assignments and co-teaching one lesson. This module was offered in the second block of the semester, from Week 8 to Week 15. Before enrolling in this module, the students had taken another core module that focused on the philosophical foundation of the curriculum from Week 1 to Week 7. The Learning and Assessment module focuses on developing students' knowledge and skills in teaching and assessment. Among the topics covered are applications of learning theories in teaching, teaching approaches, lesson planning, assessment planning, and contemporary issues in assessment. This module was conducted in a hybrid setting at the time of this study. Due to varied travel restrictions in different countries (or provinces in the same country), the students were given the flexibility to join the lessons on-site or online. Each hybrid lesson took four hours as this was a 4-credit module.

We conducted this research in this postgraduate module to improve our students' learning experiences in a hybrid learning context. In line with the design of action research, firstly, we identified the areas of focus, which were the challenges our postgraduate students faced during hybrid learning and the potential synergistic scaffolds that could be designed to facilitate their learning from the existing literature. Secondly, we conducted a baseline study to understand these issues. Thirdly, we analyzed and interpreted the results from the baseline study. Finally, we designed SS to support their learning. This study was the first iteration of the action research. The research design is summarised in Figure 2.

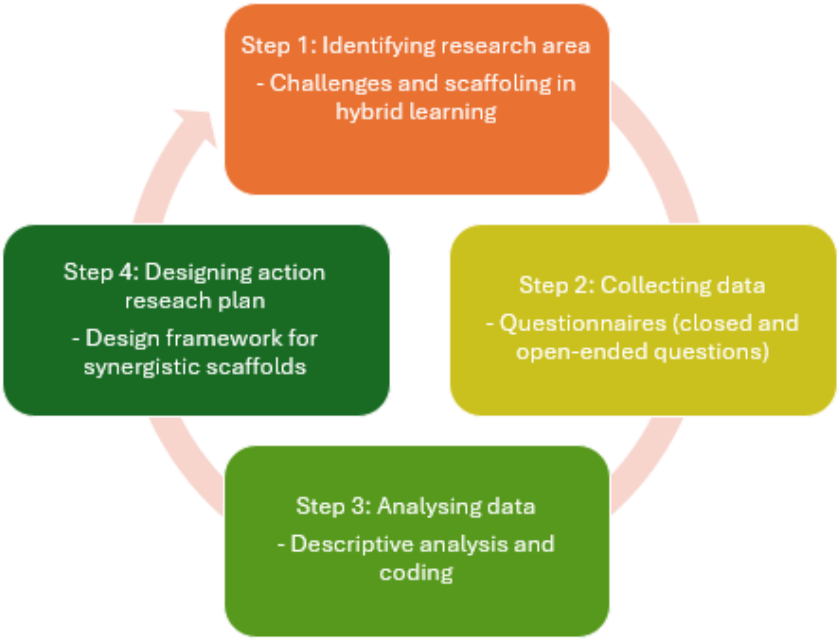


Figure 2: Action research design in the study

Participants

The participants of this study were first-year postgraduate students enrolled in the Master of Teaching and Learning (MTL) program at a private higher education institution in Malaysia. At the time of the research, they enrolled in the core module taught by the authors. Forty-eight out of a total of 78 students completed the survey. The response rate was 62%. About 88% of the participants were female and international students (90%). The participant profiles are shown in Table 1. Since they were still stranded in their home country when this survey was conducted, 42 students joined online lessons in this hybrid learning context.

Table 1. Participants' profiles

Demographic Information	Frequency (Percentage)
Gender	
Male	6 (12.5%)
Female	42 (87.5%)
Status	
Local	5 (10.4%)
International	43 (89.6%)
Learning mode	
Physical lessons on campus	6 (12.5%)
Virtual lessons	42 (87.5%)

The data was collected from an online questionnaire using a Google form. The survey questionnaire was developed based on a review of previous literature on hybrid learning (Dzuiban et al., 2018; Fitriani, 2022; Garrison & Kanuka, 2022; Gikandi et al., 2011; Kenney, 2011). The survey instrument consisted of four parts. Part A collected the participants' demographic profiles, such as gender, age, and nationality. Two questions collected information about how students joined hybrid lessons (i.e., physical and virtual). If they joined the lessons virtually, they were required to provide a reason to join virtual lessons.

Part B consisted of four close-ended questions and three open-ended questions. The questions focused on the challenges faced by the participants in terms of lesson content (Kenney, 2011), instructional methods (Garrison & Kanuka, 2022), learning resources (Kebritchi et al., 2017; Lee at al., 2013), assessment task (Gikandi et al., 2011; Fitriani, 2022) and personal challenges (Garrison & Kanuka, 2022). All close-ended questions consisted of a few items, as summarised in Table 2. For all these close-ended questions, the participants indicated their response using a scale of 1 to 5, from 1 being "strongly disagree" to 5 being "strongly agree that it is a challenge." The two open-ended questions asked the participants to explain if the instructional strategies and learning resources used in the hybrid lessons were appropriate to support their learning (Dzuiban et al., 2018; Garrison & Kanuka, 2022). The last open-ended question allowed the participants to explain the other challenges not listed in the sessions mentioned above. Part C consisted of one open-ended question, which required the participants to explain the scaffolds they needed.

Table 2. A summary of the questionnaire

Part	Category	Type of questions (Number of items)
Part A	Demographic information	Closed-ended
Part B	Challenges in a Hybrid Learning Context	
	Part B (I) Lesson Content	Closed-ended (5 items)
	Part B (II) Instructional Methods	Closed-ended (9 items) Open-ended (1 item)
	Part B (III) Learning Resources	Closed-ended (4 items) Open-ended (1 item)
	Part B (IV) Assessment Task	Closed-ended (8 items)
	Patt B (V) Personal	Closed-ended (4 items)
	Part B (VI) Other challenges	Open-ended
Part C	Scaffolds needed	Open-ended

A panel of two experts familiar with instructional design for hybrid learning was invited to review the initial questionnaire. The panel provided multiple comments and suggestions related to the wording of some survey items, the organization and length of the questionnaire, and the relevance of the questions. Based on the experts' suggestions, the online questionnaire was revised.

The link to the Google form was shared with the participants during a hybrid tutorial lesson at the beginning of the second block of the semester. Since the students had taken another core module in the first block, they were familiar with class content, assessment tasks, and the term "scaffolds." Based on their prior learning experiences, the students could complete this questionnaire. The participants were given 20 minutes to complete the questionnaire.

Data analysis

IBM® SPSS, version 25.0, was used for data analyses. Descriptive statistics were used to describe the participants' demographics and challenges.

The responses to the open-ended questions were coded and categorized into themes based on the challenges related to teaching methods, learning resources, and types of scaffolds needed. Two coders coded the data. First, the coders chose one response and coded the data separately. Then, the codes were reviewed and revised based on the consensus of the two coders. Once agreement was reached on the coding schemes, all responses were coded. Next, the coders discussed their coding results until a consensus was reached. Across the entire process,

approximately 10% of changes were made to the codes. The codes were then collapsed into themes to answer the two research questions. A coding system sample is shown in Table 3.

Table 3. Coding samples

Samples of students' responses	Codes	Categories	Themes
"I find classroom discussions and tools such as Peardeck and Classpoint are helpful in allowing me to contribute to the class discussion." (S7, VL)	Peardeck and Classpoint	Technology integration	Instructional methods
"*I feel that the information technology methods used by the teachers in the classes are all very good. For example, MyTiMes, Google Classrooms, Peardeck, etc., increase the engagement of our online students.*" (S26, VL)	MyTIMeS, Google Classroom, Peardeck		
"*The lecturer provided a set of questions for us to think about and answer as well as linking them together, which was very helpful in facilitating my active learning.*" (S33, VL)	Question and answers	Discussion	
"The teaching method supports my learning. The teachers timely discuss the questions in class, and the students can express their own opinions." (S44, PL)	Discuss questions		

Research Findings

The research findings report the challenges the participating MTL students faced and the type of scaffolds they needed when they learned in a hybrid setting.

Challenges in a Hybrid Learning Context

The challenges faced are reported from five aspects: content, teaching methods, assessment tasks, personal issues, and others. The mean for all items did not exceed 3.0, showing that the MTL students generally did not face many challenges when they followed hybrid lessons.

Table 4 shows the challenges that the students faced related to lesson content. The mean for Item CL1 was the highest (i.e., 2.90). The result indicated that the students held a neutral point of view on the quantity of lecture content. The students disagreed that the module content is irrelevant to their future careers (Item CL4, mean = 1.98). They also agreed that the learning outcomes of the lessons were communicated to them (Item CL5, mean = 1.92). The depth of the subject matter knowledge (Item CL2, mean = 2.63) and the language difficulty (Item CL3, mean = 2.54) did not pose many challenges to them.

Table 4. Challenges related to lesson content

Code	Description	Mean + SD
CL1	There is too much content to be learned.	2.90 + 1.08
CL2	The subject matter knowledge is too deep.	2.63 + 0.94
CL3	The language used in the learning resources is too technical and difficult to be understood.	2.54 + 0.90
CL4	The content is irrelevant to my current/future career.	1.98 + 0.97
CL5	The learning outcomes of the lesson are not clearly explained.	1.92 + 0.71

Table 5 shows the challenges related to the teaching methods used by the lecturer during the hybrid lessons. The statistics show that the teaching methods used by the lecturer were appropriate for hybrid learning, as evidenced by the mean score, ranging from 1.17 to 2.27.

The students strongly disagree that the lecturer did not share real-life teaching experiences to complement the module content (TM9, mean = 1.17). They disagreed with the items related to the lecturer's incompetency in handling on-site and online students (i.e., Item TM1, Item TM3, TM4, and TM8). The mean for these items ranged between 1.94 to 2.00). The mean for Item TM2 and TM6 was the same (i.e., 2.19). This indicated that the technological tools were suitable for hybrid learning, and there were enough opportunities for small-group discussions. The mean for Item TM05 was the highest (mean = 2.27), showing that some students might find it challenging to interact with peers who joined the lessons using different modes.

Table 5. Challenges related to instructional methods

Code	Description	Mean ± SD
TM5	Communicating with peers who attend the classes in different modes is difficult.	2.27 + 1.14
TM2	The technological tools used are not appropriate for hybrid learning.	2.19 + 2.12
TM6	There are fewer opportunities for group discussions/ interactions.	2.19 + 0.94
TM8	The lecturer has difficulty monitoring the online chat and misses some messages.	2.00 + 1.05
TM1	I do not get enough attention as the lecturer is busy attending both on-campus and online students.	2.00 + 1.03
TM4	The methods cannot cater to the needs of both on-campus and online students.	1.96 + 0.92
TM3	There is not enough time for the lecturer to answer all questions from the on-campus and online students.	1.94 + 0.89
TM7	The teaching methods used are mostly lecture-based.	1.92 + 0.71
TM9	There is a lack of sharing real-life teaching experience.	1.17 + 1.02

The responses to the open-ended questions supported the findings from the questionnaire. Only two respondents perceived the teaching methods inappropriate to support hybrid learning. However, they did not provide any reason for their responses.

The students with opposite thoughts explained that the lecturers responded promptly and provided examples to clear their doubts. These statements support the findings of Item TM3. For example, S1 said, "*I can ask the teacher questions through chat, email, and other ways, and the teacher will give answers in time*." S24 elaborated, "*The teacher explained it more understandably and also gave examples and showed pictures in class."*

In line with the findings from TM6, the students thought they had ample opportunities to interact with the lecturers.

> "*The lecturer provided a set of questions for us to think about and answer as well as linking them together, which was very helpful in facilitating my active learning*." (S33, VL)

> "*The teaching method supports my learning. The teacher timely discusses the questions in class, and the students can express their own opinions*." (S44, PL)

In agreement with Item TM2, some students thought technology integration helped them adapt to hybrid learning. They explained,

> "*I find classroom discussions and tools such as Peardeck and Classpoint are helpful in allowing me to contribute to the class*." (S7, VL)

> "*I feel that the information technology methods used by the teachers in the classes are all very good. For example, MyTiMes, Google Classrooms, Peardeck, etc., increase the engagement of our online students.*" (S26, VL)

One response from the "Other Challenges" section agreed with TM3, indicating that time constraints are a challenge in hybrid learning, especially for those who joined the lessons virtually. S32 (VL) also mentioned, "*I could not ask the lecturer my questions in time*." Consistent with the findings for Item TM6, one student shared, "*At home, I cannot ask my friends in time because of inconvenient communication mode*." (S27, VL)

Table 6 presents the challenges related to the learning resources. The students strongly disagreed with the items about limited resource type (LR1, mean = 1.20), delayed uploading of materials (LR2, mean = 1.10), and misalignment between the content and the learning outcomes (LR5, mean = 1.09). They also disagreed that the language of the learning resources was incomprehensible (LR3, mean = 1.84) and excessive number of resources (LR4, mean = 1.50).

Table 6. Challenges related to learning resources

Code	Description	Mean ± SD
LR3	The language of the learning resources is difficult to understand.	1.84 + 0.89
LR4	There are too many learning resources provided for a week.	1.60 + 1.01
LR1	There is no variation in the learning resources.	1.20 + 0.73
LR2	The learning resources are not uploaded on time.	1.10 + 0.43
LR5	The content of the learning resources is not aligned with the module learning outcomes.	1.09 + 0.56

The qualitative data supported the findings for Item LR3, showing that the students faced few challenges in understanding or utilizing the learning resources. For instance, the students explained,

> "*The PowerPoint slides can help me to understand the content of the lessons and main points.*" (S32, VL)

> "*When I do not understand the content, I can repeatedly watch the learning resources to solve my doubts*." (S38, VL)

Concerning Item LR4, one student shared that she found it challenging to finish watching all the videos posted on the platform. She said,

> "*I think there are too many videos (in the previous module). I did not have time to watch all the videos before the class*." (S9, VL)

However, one student expressed her disappointment over the content, commenting that, "*The courseware is not rich in content.*" (S30, VL)

Table 7 shows the challenges related to the assessment task faced by the students. The mean for seven items was close to 2.0. The students did not face many challenges with the alignment of the assessment task with the module learning outcome (AT4, mean = 2.19) and module content (AT6, mean = 1.92); rubrics (Item AT8, mean = 2.17); question clarity (AT2, mean = 2.10); and assessment details (AT1, mean = 1.92). The lecturer clarified their doubts (AT7, mean = 1.94) and provided timely feedback to help them improve the quality of their assessments (ATt5, mean = 2.02). Even though the students had to complete three assignments within eight weeks, they disagreed that it was too demanding (AT3, mean = 2.58).

Table 7. Challenges Related to Assessment Tasks

Code	Description	Mean ± SD

AT3	The assessment tasks are too demanding to be completed within a short period of time.	2.58 + 0.96
AT4	The assessment tasks are not aligned with the learning outcomes.	2.19 + 0.84
AT8	The rubrics are confusing.	2.17 + 0.83
AT2	The questions in the assessment tasks are ambiguous.	2.10 + 0.78
AT5	The feedback given to the draft does not help improve the assessment.	2.02 + 0.79
AT7	My doubts about assessment tasks are not addressed on time.	1.94 + 0.73
AT6	The assessment tasks are irrelevant to the module content.	1.92 + 0.85
AT1	The assessment brief is unclear.	1.92 + 0.77

Table 8. Personal Challenges During Hybrid Learning

Code	Description	Mean ± SD
PC1	It is challenging to pay attention for 4 hours in the hybrid context.	2.96 + 1.35
PC3	I am not familiar with the technological tools used.	2.63 + 0.94
PC2	I experience a sense of detachment or isolation as I am not able to communicate with on-site and online peers.	2.25 + 1.21
PC4	I do not have the confidence to ask questions.	2.19 + 0.96

The students' competencies and attitudes toward learning posed challenges to them. As shown in Table 8, the students disagreed with items related to low IT competency (PC3, mean = 2.63), detachment from the lessons (PC2, mean = 2.25), and lack of confidence (PC4, mean = 2.19). However, the mean for Item PC1 (2.96) showed that they neither agreed nor disagreed that it was challenging to concentrate in the hybrid class for 4 hours.

The students faced challenges beyond the four aspects discussed above. These challenges can be categorized into interruptions, motivation, language issues, and peer relationships.

Interferences with family members were one of the challenges faced by the students who joined the hybrid lessons online. The students said, "*When I attend classes from home, my classes are sometimes interrupted by my family as they expect me to be available to them*." (S7, PL) and "*Interference at home from my family members*." (S22, VL)

> Isolation also impacted the student's motivation as one of them said, "*I also struggle with low motivation when attending classes online as it feels isolating*." (S7, PL)

The students also came across challenges caused by their language proficiency. One of them shared, "*My English is not very good. Sometimes it is difficult to understand some homework*" (S24, VL)

Two students expressed that they could not develop good relationships with their peers due to the constraint of hybrid learning. They explained, "*We have poor peer relationships as we do not see each other.*" (S31, VL) and "*There is less participation in the discussion from classmates. So, we cannot get to know each other.*" (S35, VL)

Types of Scaffolds Needed

The research findings from the close-ended questions suggest that the students did not face many challenges that could hamper their hybrid learning. However, the students' responses to the open-ended questions indicated that they needed both FS and AS in hybrid lessons.

Fixed scaffolds

Fixed scaffolds are pre-designed static supports. Three students mentioned detailed explanations of the assignments and samples among the fixed scaffolds. For example, S1 (VL) said, "…*I would like to have more detailed assignment requirements or homework examples*."

S2 (VL) shared that she needed visual aids. However, she did not specify the examples of visual aids she needed.

Adaptive scaffolds

The students needed adaptive scaffolds, which are just-in-time support given by the lecturer when teaching and learning opportunities emerge. The adaptive scaffolds mentioned by the students include providing explanations, examples, and lesson summaries, as well as creating opportunities for reflection.

Three students mentioned that they needed more explanations from the lecturer regarding the class content and assessment tasks. For instance, S4 said, "*Provide explanations to help me understand the theories and complete the study*." (S4)
S31 and S48 hoped the lecturer would provide more real-world examples when explaining the theories. S31 (VL) said, "*The lecturer can support theories with real-world examples*."

S38 (VL) preferred the lecturer to give a summary at the end of the lesson, "*I would like to have a lesson summary after each lesson to recap everything we have discussed in that lesson*."

S2 (VL) thought that reflection was necessary. She said, "*The lecturer can give us time for a short reflection after every class. She can give us some prompting questions*…"

Designing Synergistic Scaffolds for Hybrid Learning

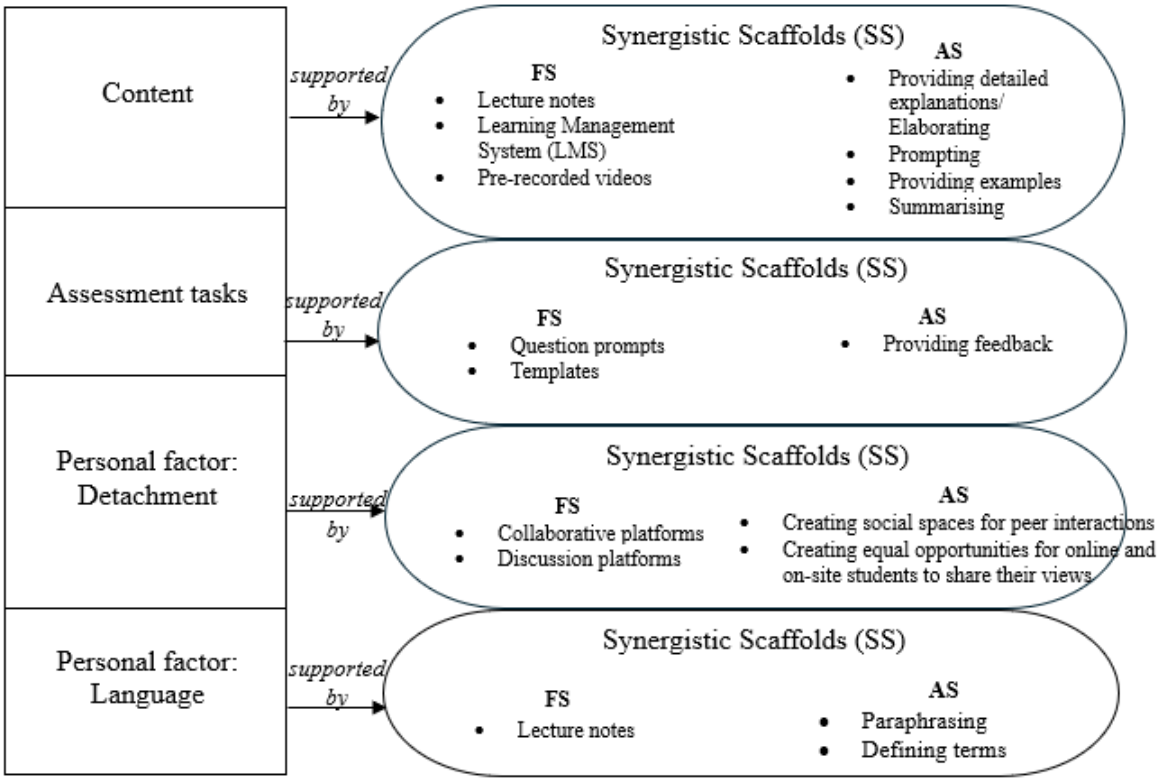


Figure 3. Synergistic scaffolds framework

Based on the findings from the needs analysis, we designed multiple forms of FS and AS to facilitate hybrid learning. The SS was designed to address the students' challenges regarding lesson content, completion of three assessment tasks (i.e., reflection, assessment plan, and case study), and personal factors, including detachment and language, as illustrated in Figure 3. The synergistic scaffolds were designed based on the existing literature on scaffolding hybrid learning and online learning, as most of the students were virtual learners. We designed fixed scaffolds such as prompts, templates, charts, and discussion boards (Belland, 2017; Gerard & Linn, 2016; Kim. 2017; Ustunel & Tokel, 2018; von Fintel & Eybers, 2000) to address the challenges faced by the students. Some of the adaptive scaffolds we designed include asking reflective prompts, providing feedback, summarising ideas, creating social spaces, modeling, defining terms, and elaborating (An & Cao, 2013; Hsiao et al., 2017; Rose & Meyer, 2002; Santoso, 2010).

The descriptions for FS and AS are presented in Table 9 and Table 10, respectively.

Table 9. Fixed scaffolds for supporting hybrid learning

Challenges addressed	Fixed scaffolds	Description
Content	Lecture notes (Kannaki et al., 2011)	The lecture notes contain detailed explanations, examples, figures, and tables for each topic (e.g., learning theories, different teaching methods, etc.) to deepen students' knowledge.
Content	Forum in Learning Management System (LMS) (von Fintel & Eybers, 2000)	The forum allows students to provide opinions and respond to the comments posted by their peers. Non-verbal interactions among students encourage them to construct knowledge through interactions.
Content	Pre-recorded videos/ Videos from the internet (Ustunel & Tokel, 2018)	The pre-recorded videos complement the lecture notes. It contains some examples to elaborate on the ideas/concepts presented in the lecture notes.
Assessment tasks	Question prompts (Belland, 2017; Gerard & Linn, 2016; Kim. 2017; Ustunel & Tokel, 2018)	Question prompts aim to stimulate student thinking and keep them focused on the key requirement of the assessment task.
Assessment tasks	Template (Kannaki et al., 2011)	A template consists of all the essential components of an assessment plan.
Personal: Detachment	Collaborative platforms (Google Slides, Wiki)	Platforms that create social spaces for students to work together with their peers
Personal: Detachment	Discussion platforms (i.e., Padlet, Classpoint, Forum on LMS)	Platforms that create social spaces for students to share their ideas
Personal: Language	Lecture notes (Kannaki et al., 2011)	The lecture notes contained definitions for jargon and were written in clear, precise, yet simple language.

Regarding adaptive scaffolds, some question prompts and sentence starters were drafted based on the existing literature, as shown in Table 10. Lecturers could adopt or adapt these AS to address the challenges faced by the students in terms of lesson content, completion of

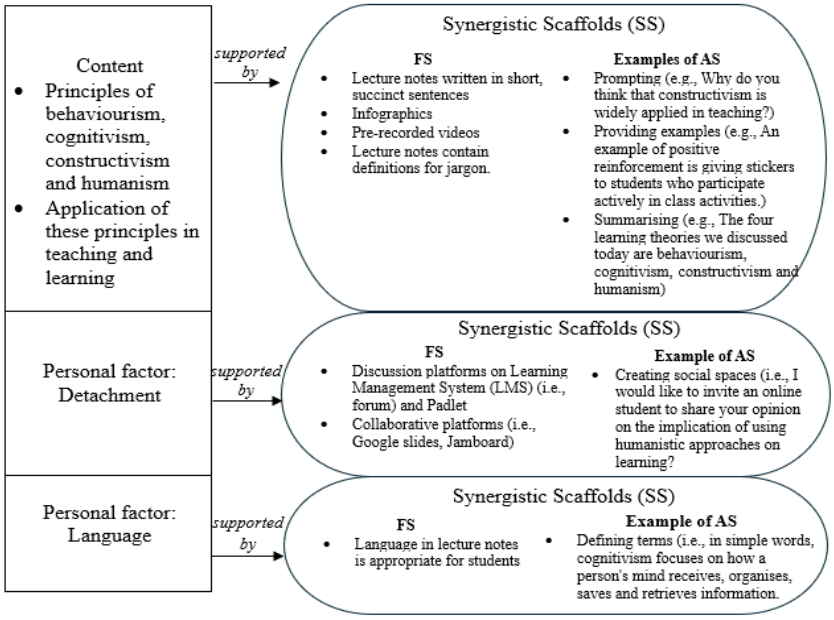
assessment tasks, and personal factors (e.g., language proficiency and detachment) during lecture hours.

Table 10. Adaptive scaffolds for supporting hybrid learning

Challenges addressed	Adaptive scaffolds	Description	Examples
Content	Providing detailed explanations/ Elaborating (Kannaki et al., 2011)	Answer a question, provide more detailed information or clarification, and say something that adds to the information present in the discussion	The concept of object permanence at the sensorimotor stage means that children will learn how to search for an object when they cannot see it.
Content	Prompting (An & Cao, 2013; Kannaki et al., 2011)	Ask for the next step, which is an example of understanding a problem or content knowledge.	Why do you think flipped learning is more suitable to be implemented at the tertiary level than the secondary level?
Content	Providing examples (Kannaki et al., 2011)	Give a concrete example to deliberate an idea/ concept	Teachers must consider their students' prior knowledge before designing a lesson. For example, it is inappropriate to teach water cycles if students do not know the different states of water.
Content	Summarising/ concluding (Kannaki et al., 2011)	Summarise key content knowledge/ make a conclusion	The following are the highlights of this lesson: 1. The four major learning theories are behaviorism, cognitivism, constructivism, and humanism. 2. Learning theories allow teachers to understand how students learn and develop more comprehensive learning and assessment strategies for students.
Assessment tasks	Providing feedback (Kannaki et al., 2011)	Provide opinions, reviews, evaluations, and suggestions for improving student work.	You need to provide a concrete example to support your argument.
Personal: A sense of detachment	Creating social spaces for peer interactions (Kannaki et al., 2011; Rose & Meyer, 2002; Santoso, 2010)	Create group discussions for students to make their thinking visible and construct knowledge through interactions and active negotiation.	Can you tell us how your group is going to design a differentiated lesson based on the given scenario?
Personal: A sense of detachment	Creating equal opportunities for online and on-site students to share their views	Requires responses from online and on-site students	I invite one on-site student and one student to join us virtually to express your views on this issue.
Personal: Language	Paraphrasing (Gerard &	Rephrase a statement using	In other words, "What else do

	Linn, 2016)	better-known words in response to students' language problems.	you need to know so that you can design an effective lesson?"
Personal: Language	Defining terms (Gerard & Linn, 2016)	Explain the meaning of a term	Rote learning is the process of memorizing information based on repetition.

The need analysis was completed during the first lesson. Based on the initial design of the synergistic scaffolds, we created an action plan that would be implemented starting from the second lesson. The action plan lasted 6 weeks and covered various topics related to teaching and assessing learners. Figure 4 shows a sample of the action plan for a topic related to applying learning theories in teaching and learning.

Challenges	Synergistic Scaffolds
Content Week 2 Application of learning theories in the classrooms • Behaviorism • Cognitivism • Constructivism • Humanism	
Assessment tasks	

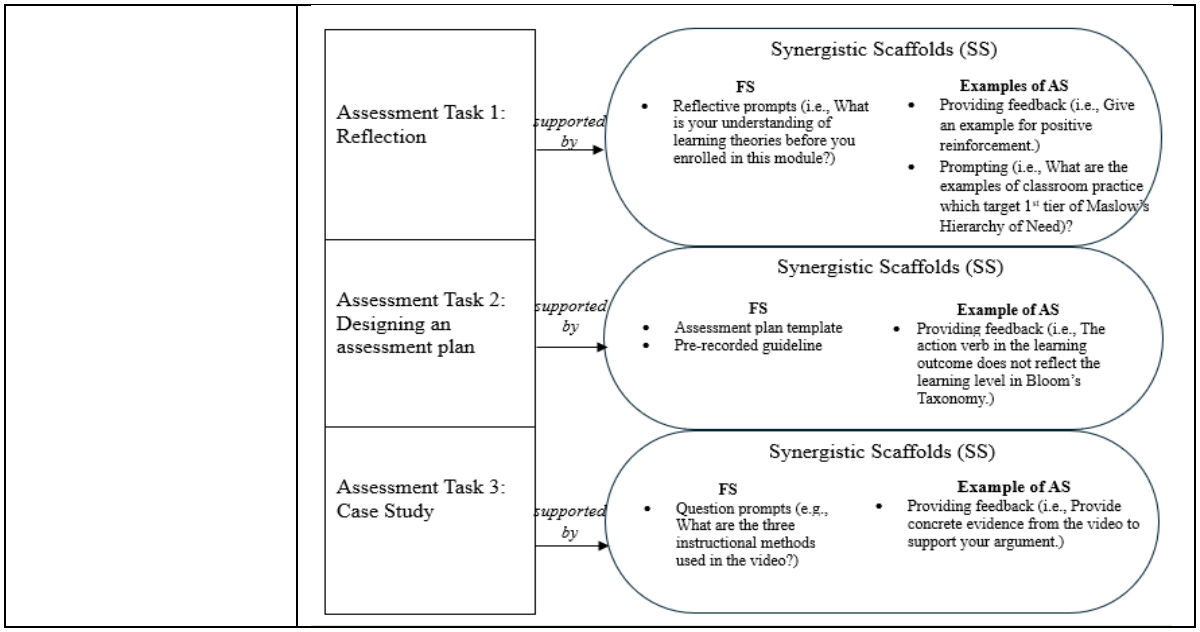


Figure 4. Sample of action plan for synergistic scaffolds

Discussion

As highlighted in the systematic review by Raes et al. (2019), "most of the existing literature is exploratory and qualitative and has focused mostly on the description of students' experiences, the organizational implementation, and the technological design. Empirical studies have only begun to emerge, and more research is needed…." (p. 2). This study was empirical research that could provide insights into the challenges faced by postgraduate students during hybrid learning and the scaffolds they desired in this learning context. Even though the questionnaire results showed that the students faced minor challenges related to the content, instructional methods, assessment tasks, learning resources, and personal issues, the qualitative data provided insights into the changes they faced. Regarding lesson content, the students mostly agreed that the content was relevant to their teaching profession and aligned with the module objectives. However, they showed some concerns about the depth of the content and the number of topics covered. Since most of the students were not native English speakers, the language of the content also posed some challenges to them.

Well-designed hybrid lessons allow students to access learning resources easily and flexibly (Li et al., 2023). In this study, the students faced very few challenges regarding the learning resources. Various learning resources such as lecture notes, assignment guides, and research articles were uploaded on the LMS a few days before the lessons so the students could come prepared for class. Factors such as course objectives and resources influence the effectiveness of hybrid lessons (Liu, 2021). The students in this study agreed that the learning resources supported attaining the module learning objectives.

Various instructional strategies, such as collaborative learning, technology integration, and direct instruction, were adopted during hybrid learning to cater to the needs of both on-site and online students. In contrast with the research by Raes et al. (2019), which showed that the students faced pedagogical challenges when they learned in hybrid mode, the students in this study thought that the methods used by the lecturers created sufficient opportunities for the students from different learning spaces to interact. They agreed that the lecturer could manage

two groups of students well and allowed them to share their thoughts equally. This finding disagreed with Li et al.'s (2023) study, which indicated that hybrid learning lowered the levels of interaction among the students and made it more difficult for the lecturers to manage the classroom. A plausible reason for this difference was that the lecturer and the tutor (i.e., the first and the second author) had conducted hybrid lessons for a few semesters. Thus, we developed the skills to design the hybrid lessons appropriately based on the students' learning needs.

The academics in Li et al.'s (2023) study provided positive feedback for their students' assessment participation. Similarly, this research indicated that the students could understand the assessment brief, descriptors in the rubrics, and assessment requirements. Academics need to conduct fair assessments and prepare assessment materials to cope with the situations in hybrid learning (Li et al., 2023). They may also need to modify the assessment tasks, including using formative assessments to monitor students' progress in the course (Singh et al., 2021).

Effective online learning necessitates interactive and multimedia-rich content, which can be time-consuming and resource-intensive to develop (Gikandi et al., (2011). Consequently, students may have to rely on subpar materials that do not effectively support their learning. The responses provided by the students to the learning resources were positive. This indicated that the students in this study did not face many challenges regarding the accessibility, quality, and quantity of the learning resources. A plausible reason was that the lecturer had taught this module for three years since Covid-19. Over the years, the learning resources have been continuously adapted based on virtual students' learning needs. For example, the resources were prepared in visual and audio forms, and there was less non-academically related jargon in the resources, as suggested in the literature (Carstens, 2016; Smit et al., 2012).

Among all the challenges, the students rated the personal challenges the highest. This was due to the nature of the lesson, which lasted 4 hours per lecture. This core module was also offered in the first semester when the students were newly enrolled in the programs. They might still need more time to adapt to a postgraduate program. Besides, similar to research by Garrison and Kanuka (2022), the absence of instructors causes a sense of isolation for students who join hybrid lessons online. Compared to face-to-face learning, hybrid learning provides fewer real-time interactions between lecture students and student-students, hindering the spark of meaningful conversations and the development of close relationships between all parties involved (Cho & Berge, 2017; Singh et al., 2021).

Personal issues related to technology accessibility and student's inadequate information technology (IT) competencies are widely reported (Dhawan, 2020; Smith et al., 2019). However, these two challenges did not emerge from the data. The postgraduate students in this study had learned how to navigate the LMS and used some online apps in the first module they enrolled in. They should have developed the basic IT competency in using the common online platforms. In addition, teachers who have taught in many settings could easily devise solutions to overcome the hindrance in their teaching practice (Raes et al., 2019). Since we have taught this module for a few semesters, we understood the kind of assistance the students might need in terms of the use of technology. Whenever we used new apps such as Classpoint and Google Jamboard, we demonstrated how to access the learning apps, post a response, and insert an online photo. These practices facilitated their use of IT.

Attention should be paid to scaffolding student learning when teaching staff design pedagogical methods for their students (Korhenan et al., 2019). Pre-designed materials on

LMS also play pivotal roles in scaffolding students (von Fintel & Eybers, 2020). Thus, based on the needs analysis, we designed SS, which consisted of FS and AS, to support the postgraduate students' learning. For instance, to scaffold content knowledge construction, we designed FS, such as lecture notes and pre-recorded videos, to explain the key concepts the students needed to learn in this module (Kannaki et al., 2011; Ustunel & Tokel, 2018). AS provided by the lecture, for example, providing concrete examples, prompting, and explaining on the spot, are expected to reinforce the content delivered through FS (An & Cao, 2013; Kannaki et al., 2011). Korhenan et al. (2019) argued that the most productive scaffolds for online learning are teachers' comments throughout the lessons and feedback on student assessments. FS and AS are equally important in supporting student learning, and thus, it is crucial to seek a balance between the roles of these two types of scaffolds to maximize the potential of SS (Ustunel & Tokel, 2018). In the next stage of this research, we will implement the SS and evaluate their effectiveness in scaffolding hybrid learning.

Conclusion

Although the challenges explained by the students may only represent their engagement in hybrid learning during the post-COVID-19 era, when the traveling restrictions were not entirely removed, this research shed light on students' perceptions of scaffolding in a unique period in higher education. This research shed light on the challenges postgraduate students face and their perceptions of scaffolding in the hybrid learning context. Hybrid learning presents numerous challenges for HIE students regarding lesson content, instructional methods, learning resources, and assessment tasks. Addressing these challenges requires a concerted effort from educators and institutions to standardize content delivery, provide equitable access to technology, create engaging and high-quality digital resources, and develop effective assessment strategies. Understanding those challenges and the need for scaffolding is essential to ensure that the scaffolds designed adequately support them. Fixed scaffolds alone are far from a perfect instructional means to support student learning, and thus, adaptive scaffolds are needed to complement the fixed scaffolds (Tabak, 2004). Without concerted efforts to scaffold student learning, the potential benefits of hybrid learning may be overshadowed by its difficulties.

This study has practical implications for practice and research in the field of scaffolding hybrid learning. This study allowed students to share the challenges they faced in hybrid learning and the types of scaffolds that could help them learn effectively. By considering students' voices for scaffolds, the research findings can help lecturers design fixed and adaptive scaffolds to support hybrid learning more effectively. Students can be counted as collaborators as they provide inputs for designing the scaffolds instead of passive learners who are being scaffolded. Besides, this study expanded the research context to include hybrid learning, which has become a popular learning mode in the post Covid-19 era. Therefore, understanding how to scaffold on-site and online students simultaneously is crucial to ensure that both student groups are adequately supported. The excerpt of the action plan provides teaching staff with a more concrete and contextualized example to design synergistic scaffolds. They can design synergistic scaffolds that address the student's learning gaps.

This study, being of an exploratory nature to understand student learning in a hybrid learning context, raises several opportunities for future research. However, this study has several limitations. First, all data was collected through a questionnaire. Most of the responses to the open-ended questions were brief, without any elaboration. For example, a student mentioned that visual aids could support student learning. However, since this student did not specify the

type of visual aids needed, it would be challenging for lecturers to identify the type of visual aids that would be helpful for students. Besides, only some of the students' responses supported the closed-ended questions. For instance, the quantitative data showed that the students strongly agreed that the assessment brief was clear. However, some students mentioned needing more detailed explanations of the assessment tasks with open-ended questions. Thus, interviews are needed to understand better their struggles and how each type of scaffold can support student learning. For future studies, the researcher can collect the data using a few methods such as questionnaires, interviews, and classroom observation for data triangulation.

The second limitation was related to the questionnaire. Only the sections related to the teaching methods and assessment tasks contained an open-ended question. In-depth information on the challenges regarding the lesson content, as well as personal and other challenges, was not obtained. In future studies, students can be asked to provide real-life examples of the challenges to support their arguments. This study informed the lecturers about the challenges faced by the students and the types of scaffolds needed. Future studies may focus on designing scaffolds to address those challenges in a hybrid learning setting. This can be followed by an evaluation of the effectiveness of scaffolds to support student learning. The researchers would propose guidelines for future research and practice in hybrid learning based on the results.

References

Ackerman, A. S. (2008). Hybrid learning in higher education: Engagement strategies. Media Review, *14*, 145-158.

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: The challenges and opportunities. *Interactive Learning Environments*. https://doi.org/10.1080/10494820.2020.1813180

An, Y., & Cao, Li. (2015). Examining the effects of metacognitive scaffolding on students' design problem solving and metacognitive skills in an online environment. *MERLOT Journal of Online Learning and Teaching*, *10*(4), 552-568.

Anderson. R. A., (2022). *Hybrid learning: A qualitative case study of a school reopening during the Covid-19 pandemic*. (Publication No. 29320465) [Doctoral dissertation, Concordia University]. ProQuest Dissertations and Theses Global.

Arispe, K. & Blake, R. J. (2012). Individual factors and successful learning in a hybrid course. *System*, *40*, 449-465.

Azevedo, R., Cromley, J. G., Winters, F. I., Moos, D. C., & Greene, J. A. (2005). Adaptive human scaffolding facilitates adolescents' self-regulated learning with hypermedia. *Instructional Science*, *33*(5), 381–412. https://doi.org/10.1007/s11251-005-1273-8

Barbour, M. K., Siko, J. P., Gross, E., & Waddell, K. (2020). Understanding teachers' efficacy towards virtual schooling: A collaborative autoethnography. *Journal of Technology and Teacher Education*, *28*(2), 373-397.

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, *2*(2), 113–115. https://doi.org/10.1002/hbe2.191

Bawa, P. (2016). Retention in online courses: Exploring issues and solutions—A literature review. *SAGE Open*, *6*(1). https://doi.org/10.1177/2158244015621777

Belland, B. R. (2017). Instructional scaffolding in STEM education: Strategies and efficacy evidence. Springer International Publishing. https://doi.org/10.1007/978-3-319-02565-0

Belland, B. R., Walker, A., Kim, N. & Lefler, M. (2014). A preliminary meta-analysis on the influence of scaffolding characteristics and assessment quality on cognitive outcomes in STEM education. Presented at *the 2014 Annual Meeting of the Cognitive Science Society*, Québec City, Canada.

Bülow, M. W. (2021). *Designing Synchronous Hybrid Learning Spaces: Challenges and Opportunities*. In E. Gil, Y. Mor, Y. Dimitriadis and C. Köppe (Eds). Hybrid Learning Spaces. Springer.

Carstens, A. (2016). Designing linguistically flexible scaffolding for subject-specific academic literacy interventions." *Per Linguam*, *32*(3), 3. https://doi.org/10.5785/32-3-690.

Cho, M. H., & Berge, Z. L. (2017). Overcoming barriers to adult participation in online learning environments. *TechTrends*, *61*(6), 535-543.

Coman, C., Tîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. *Sustainability*, *12*(24), 10367. https://doi.org/10.3390/su122410367

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. Journal of Educational Technology Systems, *49*(1), 5–22.

Dominguez, S. and Svihla, V. (2023). A review of teacher implemented scaffolding in K-12', *Social Sciences & Humanities Open*, *8*(1), p. 100613. https://doi.org/10.1016/j.ssaho.2023.100613.

Dziuban, C., Moskal, P. D., Thompson, J., Kramer, L. A., & DeCantis, G. (2018). Student satisfaction with online learning predicts student success. *Internet and Higher Education*, *25*, 51-57.

Fitriani (2022). Adapting language tests to hybrid learning: EFL teachers' challenges and their practices. *Journal of Language Teaching and Learning, Linguistics and Literature*, *10*(2), 1768-1777. https://doi.org/10.24256/ideas.v10i2.3320

Forman, E. A., Ramirez-DelToro, V., Brown, L., & Passmore, C. (2017). Discursive strategies that foster an epistemic community for argument in a biology classroom. *Learning and Instruction, 48,* 32–39. https://doi.org/10.1016/j.learninstruc.2016.08.005

Garrison, D. R., & Kanuka, H. (2020). Blended Learning: Uncovering its transformative potential in higher education. *Internet and Higher Education*, *3*(2-3), 95–105.

Gikandi, J. W., Morrow, D., & Davis, N. E. (2011). Online formative assessment in higher education: A review of the literature. *Computers & Education*, *57*(4), 2333-2351. https://doi.org/10.1016/j.compedu.2011.06.004

Gillis, A., & Krull, L. M. (2020). COVID-19 remote learning transition in spring 2020: Class structures, student perceptions, and inequality in college courses. *Teaching Sociology*, *48*(4), 283-299. https://doi.org/10.1177/0092055X20954263

Ge, X., Planas, L. G., & Er, N. (2010). A cognitive support system to scaffold students' problem-based learning in a web-based learning environment. *Interdisciplinary journal of problem-based learning*, *4*(1), 30-56. https://doi.org/10.7771/1541-5015.1093

Gerard, L. F., & Linn, M. C. (2016). Using automated scores of student essays to support teacher guidance in classroom inquiry. *Journal of Science Teacher Education*, *27*(1), 111-129. https://doi.org/10.1007/s10972-016-9455-6

Glaser, B. G. (1965). The constant comparative method of qualitative analysis
Hsiao, E-Li., Mikolaj, P., & Shih, Y-T., (2017). A design case of scaffolding hybrid/online student-centered learning with multimedia. *Journal of Educators Online*, *14*(1).

Holton, D., & Clarke, D. (2006). Scaffolding and metacognition. *International Journal of Mathematical Education in Science and Technology*, *37*(2), 127-143.

Johnson, A., & Adams, J. (2021). Higher education in the era of the fourth industrial revolution: A systematic review. *Higher Education Research & Development*, *40*(2), 327–343.

Kannaki, S. N., Kamala, P. M., Fauziah, K. P. D., & Tee, M. Y. (2011). Scaffolding for problem-based learning success: An action research project. In Chang Tik, C (Ed.) *Proceedings of the 3rd International Conference on Teaching and Learning (ICTL 2011).* INTI International University, Malaysia. p.1-7.

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology Systems*, *46*(1), 4-29. https://doi.org/10.1177/0047239516661713

Kenney, J. (2012). Adopting a blended learning approach: challenges encountered and lessons learned in an action research study. *Journal of Asynchronous Learning Networks*, *15*(1), 45–57.

Kim, N. J. (2017). Enhancing students' higher-order thinking skills through computer-based scaffolding in problem-based learning. (Doctoral dissertation). Retrieved from https://digitalcommons.usu.edu/etd/5488

Korhonen, A, M., Ruhalahti, S., & Veermans, M. (2019). The online learning process and scaffolding in student teachers' personal learning environments, *Education and Information Technologies*, *24*, 755-779.

Lee, Y., Choi, J., & Kim, T. (2013). Discriminating factors between completers of and dropouts from online learning courses. *British Journal of Educational Technology*, *44*(2), 328–337. https://doi.org/10.1111/j.1467-8535.2012.01306.x

Li, K. C., Wong, B. T. M., Kwan, R., Chan, H.T., Wu, M.M.F., Cheung, S.K.S (2023). Evaluation of hybrid learning and teaching practices: The Perspective of academics. *Sustainability*, *15*, 6780. https://doi.org/10.3390/su15086780

Liu, Q. (2021). Research on the effectiveness of hybrid teaching of General Mechanical Equipment Maintenance Course. *Journal of Service Science and Management*, *14*, 627–635.

Majlis Keselamatan Negara. (2022). #Reopening safety guidelines: Indoor workplaces. https://asset.mkn.gov.my/web/wp-content/uploads/sites/3/2019/08/MKN-Guidelines_Indoor-Work-Spaces_220120_vF.pdf

Raes, A., Detienne, L., Windey, I., & Depaepe, F., (2019). A systematic literature review on synchronous hybrid learning: Gaps identified. *Learning Environments Research, 23*, 269–290

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the COVID-19 crisis: Refocusing teacher presence and learning activity. *Postdigital Science and Education*, *2*(3), 923–945. https://doi.org/10.1007/s42438-020-00155-y

Richardson, J. C., Caskurlu, S., Castellanos-Reyes, D., Duan, S., Duha, M. S. U., Fiock, H., & Long, Y. (2021). Instructors' conceptualization and implementation of scaffolding in online higher education courses. *Journal of Computing in Higher Education*, *34*, 242–279. https://doi.org/10.1007/s12528-021-09300-3

Rose, D. H., & Meyer, A. (2002). Teaching every student in the digital age: Universal design for learning. ASCD.

Santoso, A., (2008). The art of scaffolding in EFL writing class in a hybrid environment: A Practical experience. *International Journal of the Computer, the Internet and Management*, 16(SP3), Article number: eLearningAP. 8.1-8.12.

Saye, J. W., & Brush, T. (2002). Scaffolding critical reasoning about history and social issues in multimedia-supported learning environments. *Educational Technology Research and Development*, *50*(3), 77–96. https://doi.org/10.1007/BF02505026

Schleicher, A. (2020). *The impact of COVID-19 on education - Insights from Education at a Glance 2020*: OECD.

Smit, J., van Eerde, H. A. A., & Bakker, A. (2012). A conceptualization of whole-class scaffolding. *British Educational Research Journal, 39,* 817–834.

Smith, N., Smith, M., & Wang, X. (2019). Learning with technology: Perceptions and practices from student voices. Technology, *Pedagogy and Education*, *28*(1), 53–69.

Spector, J. M., & Merrill, M. D. (2014). *Handbook of research on educational communications and technology* In. J. Elen & M. J. Bishop (Eds.). Springer Science. https://doi.org/10.1007/978-1-4614-3185-50

Singh, J., Steele, K., & Singh, L. (2021). Combining the best of online and face-to-face learning: Hybrid and blended learning approach for COVID-19, post-vaccine, & post-pandemic world. *Journal of Educational Technology Systems*, *50*(2), 140-171.

Tabak, I. (2004). Synergy: A complement to emerging patterns of distributed scaffolding. *The Journal of the Learning Sciences*, *13*(3), 305–335. https://doi.org/10.1207/s15327809jls1303_3

UNESCO. (2021). COVID-19: Reopening and reimagining universities, Survey on Higher Education through the UNESCO National Commissions. https://unesdoc.unesco.org/ark:/48223/pf0000378174

van de Pol, J., & Elbers, E. (2013). Scaffolding student learning: A micro-analysis of teacher-student interaction. Learning, *Culture and Social Interaction*, *2*(1), 32-41. https://doi.org/10.1016/j.lcsi.2012.12.001

von Fintel, C., & Eybers. O. O (2020). Leaps into cyberspace: A case study for scaffolding argumentation in a hybridized academic literacy module. https://repository.up.ac.za/handle/2263/81699

Ustunel, H. H., & Tokel, S. T. (2018). Distributed scaffolding: Synergy in technology-enhanced learning environments. *Technology, Knowledge and Learning*, *23*(1), 129-160. https://doi.org/10.1007/s10758-017-9299-y

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem-solving. *Journal of Child Psychiatry and Psychology*, *17*, 89-100.

Xi. R. (2022). Hybrid learning for post COVID-19 – why it matters. https://www.ubss.edu.au/media/3708/hybrid-learning-for-post-pandemic.pdf

THE EFFECTIVENESS OF PROBLEM-BASED LEARNING ON STUDENTS' CREATIVE THINKING: A META-ANALYSIS STUDY

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ABSTRACT

Problem-based learning (PBL) is well esteemed by scholars as one of the most effective methods for nurturing creative thinking. However, due to the limitations of the sample, the discipline, and so on, single fragmented studies are incapable of summarizing the overall effectiveness and application of PBL, resulting in researchers being unable to maximize the effectiveness of PBL for creative thinking. Responding to the above issues, this paper focuses on a meta-analysis to dissect the effect size of PBL on students' creative thinking, as meta-analysis is capable of synthesizing cross-experimental effects and analyzing variables comprehensively. The purpose of this paper is to verify whether PBL significantly improves students' creative thinking compared to conventional methods and what moderating variables account for the differences in effect sizes across studies.15 studies were included in this meta-analysis, based on strict inclusion criteria and after a meticulous risk of publication bias analysis. After the overall effect size analysis, due to the heterogeneity of the source literature, a random effects model was chosen for this analysis. The finding of this study is that the overall effect size of the 15 studies is 1.240, $p<0.05$, which is a high-level effect size, indicating that