Scaffolding Online Learning in a Higher Education Institution: A Need Analysis

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ABSTRACT

The COVID-19 pandemic has changed the learning landscape at higher education institutions worldwide. University students face many challenges, adapting to online learning instantly. It is necessary to provide adequate scaffolds to students when they learn online. However, a literature review revealed that scaffolds were designed based on the literature or teachers' conceptualisation of scaffolding. Need analysis for scaffolding is under-researched. This action research aimed to investigate the challenges faced by postgraduate students during online learning and the types of scaffolds they needed for online learning. This research involved 35 postgraduate students in a private higher education institution. The participants completed an online questionnaire. Data was coded and categorised into themes. The results showed that the students faced various challenges in terms of personal competency, language proficiency, assessment and learning resources. They needed support from fixed scaffolds and adaptive scaffolds. Based on the results from the baseline study, the researcher designed multiple forms of scaffolds to support online learning. This study highlights the need to design scaffolds based on student's learning needs to address the challenges they face in an online learning context. Limitations in terms of data collection method and instruments are discussed. Although the challenges explained by the students may only represent the period of campus closure, this research provides insights into students' perceptions of scaffolding in a unique period in higher education. The findings contribute to the design of scaffolding in the online learning context.

1. INTRODUCTION

In December 2019, a contagious coronavirus started to spread across nations worldwide. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a public health emergency of international concern (World Health Organisation, 2020). To prevent the spread of COVID-19, all countries took various measures such as enforcing social distancing and self-quarantine, implementing the "work from home" policy and closing non-essential sectors (World Bank, 2020). This pandemic has also resulted in the abrupt closure of tertiary education institutions globally, causing approximately eight million university students at risk of not returning to their institutions (UNESCO IESALC, 2020). The temporal closure has greatly impacted the universities in terms of teaching, research, and community service (Suhaida Halamy et al., 2021; UNESCO IESALC, 2020). Tertiary education providers worldwide, including Malaysia, had to transform their face-to-face lessons into online lessons (Suhaida Halamy et al., 2021; UNESCO IESALC, 2020). Teaching staff and university students faced many challenges as they had to quickly adapt to online learning (Almendingen et al., 2021). Besides technical and accessibility issues, university students also had to overcome some difficulties in learning. Research showed that students found it hard to achieve the learning objectives (Almendingen et al., 2021). Therefore, providing scaffolds to students when they learn online is crucial.

Wood and his collaborators introduced the term scaffolding to depict the interaction between a tutor and a child, which assists the child in solving problems which may be unachievable without help (Wood et al., 1976). Since its introduction, this metaphor has been widely used to depict temporary support provided by more capable individuals to help students move progressively towards independent learning (Maybin et al., 1992). This definition is always linked to the Zone of Proximal Development (ZPD) concept in Vygotsky's Theory of Social Constructivism (Puntambekar & Kolodner, 2005; Smit et al., 2013). Scaffolding is provided to learners within the ZPD to move them towards independence (Smit et al., 2013). Teachers can provide fixed or adaptive scaffolds to support student learning in an online setting. Fixed scaffolds are static support planned in advance of the implementation of lessons (Azevedo et al., 2005; Saye & Brush, 2002). Previous studies have shown that question prompts, comment boxes, and videos (Almendingen et al., 2021; Delen et al., 2014) are useful fixed scaffolds for facilitating student learning. Adaptive scaffolds are more dynamic and situational, where teachers conduct ongoing diagnoses of students' emerging performances and provide adequate support till they can take responsibility for their learning (Azevedo et al., 2005; Saye & Brush, 2002). For instance, teachers explain the meaning of terms, check students' answers and provide suggestions to improve student learning (Chen, 2021).

Most scaffolds are designed based on existing literature or teachers' conceptualisation of scaffoldings. Teachers' conceptualisation of scaffolding differed 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 during online learning and the types of scaffolds that are helpful for them. Diagnosing students' learning needs is essential to designing effective scaffolds (Van de Pol & Elbers, 2013). However, the need analysis for scaffolding is under-researched, and this action research filled this gap by investigating the challenges faced by the students during online learning and the types of scaffolds they needed for online learning. The findings from the need analysis provided the basis for designing scaffolds for supporting online learning.

This study contributes to knowledge generation regarding the concept of scaffolding. In its original conceptualisation, scaffolding is provided by the tutor to learners in a face-to-face setting. This study expanded the notion of scaffolding to include fixed and adaptive scaffolds in online learning contexts. This study has practical implications as it provides insights into online learners' needs and the challenges they face in their learning. Diagnosing learners' needs and designing corresponding scaffolds should be at the heart of scaffolding (Smit et al., 2013). The research findings will further reveal how fixed and adaptive scaffolds can be designed and adapted to seamlessly support online learning based on learners' needs to close their learning gaps. In addition, this study proposed a scaffolding framework to support online learners. This framework can be contextualised to cater to diverse learners' needs at different school levels.

2. LITERATURE REVIEW

2.1 Online Learning Challenges

With the COVID-19 pandemic, it has become more apparent that students are susceptible to challenges brought by online learning during the COVID-19 pandemic. Adedoyin and Soykan (2020) identified seven challenges of online learning: technology, socio-economic factor, external interference, digital competence, assessment supervision, workload and compatibility. In terms of technology, students face the problem of poor internet connection and outdated technological devices (Adedoyin & Soykan, 2020; Almendingen et al., 2021; Bibi Noraini et al., 2020; Bringula et al., 2021; Ferri et al., 2020). Some devices are not compatible with new software or platforms, causing students to be unable to access learning resources or participate in class activities (Adedoyin & Soykan, 2020; Jaradat & Ajlouni, 2021). Students from low socio-economic status (SES) families may depend on school facilities such as internet connection and computer labs to follow online classes. Due to the closure of schools, these students take longer to migrate from physical lessons to online lessons (Adedoyin & Soykan, 2020). This issue has negative impacts on student learning as they are left behind in their studies. Parents of low SES families are normally less educated and cannot provide adequate assistance to their children during online learning (Duraku & Hoxha, 2020).

Students report that their attention was disrupted by external interference. This disturbance can be caused by family members, peers or pets (Adedoyin & Soykan, 2020; Almendingen et al., 2021; Bringula et al., 2021; Duraku & Hoxha, 2020; Jaradat & Ajlouni, 2021). The noise made by family members and free-roaming pets will cause students to lose their attention. Even tertiary students reported that they were less focused during online learning (Bibi Noraini Mohd Yusuf & Jihan Ahmad, 2020). Students are asked to run errands for their families and do household chores resulting in them procrastinating in completing their tasks and becoming less productive (Bringula et al., 2021).

Digital competence is essential during online learning. Teachers and students with low digital competency cannot easily access online learning resources, such as digital libraries (Adedoyin & Soykan, 2020). Students with technophobia are not inclined to use advanced technology in learning (Jaradat & Ajlouni, 2021). Less IT literate teachers cannot adopt appropriate online pedagogies to engage their students in learning (Ferri et al., 2020; Jaradat & Ajlouni, 2021). In terms of learning resources, the materials prepared by instructors lack clarity and cannot deliver the lesson content effectively (Jaradat & Ajlouni, 2021).

The online assessment also poses challenges to students. The design of assessment tasks, which include time allocation for online exams, clarity of instructions and feedback frequency, is inappropriate (Bringula et al., 2021; Jaradat & Ajlouni, 2021). Students are anxious that they

are not able to complete the online quiz or exam in time due to internet connection and unfamiliarity with the online assessment platform (Bringula et al., 2021).

The quick and sudden transformation from physical to online lessons significantly increased the workload of ICT departments, instructors and students. Students need to communicate with their instructors through emails, social media and messaging systems. Despite these various forms of online communication, students perceive a lack of social interaction with community members (Almendingen et al., 2021). They face problems keeping in touch and seeking advice from teachers and peers (Bringula et al., 2021).

Online learning cannot be effectively and efficiently applied in some disciplines, such as medicine and culinary, and this compatibility gap is yet to be fully closed (Adedoyin & Soykan, 2020). They further explain that even though remote, virtual laboratories and simulations are alternatives to physical classes, these methods are more appropriate to complement face-to-face training. Duraku and Hoxha (2020) further elaborated that online lessons broadcasted on television are short and not synchronised with the curriculum.

2.2 Scaffolding Online Learning

In its original conceptualisation, scaffolding is used to explain 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). There were six tutor actions in the scaffolding process which included (1) cultivating interest in the task; (2) simplifying the task; (3) maintaining the directions to the task goals; (4) highlighting critical features of the tasks; (5) controlling frustration; and (6) modelling for imitation (Wood et al.,m 1976). Scaffolding is commonly linked to Sociocultural Theory by Vygotsky and the Zone of Proximal Development (ZPD) (Maybin et al., 1992; Puntambekar & Kolodner, 2005). ZPD is the gap between what a learner can do independently and what they can potentially do with the help of a more knowledgeable other (Puntambekar & Kolodner, 2005). The concept of ZPD was first explicitly linked to the idea of scaffolding by Cazden (1979) as she reviewed studies on mother-child interaction and related it to classroom talk. Her review provided scaffolds to help children answer teachers' questions and participate in discourses (Cazden, 1979).

In an online setting, both fixed and adaptive scaffolds can help students perform complex tasks and learn from problem-solving experiences (Richardson et al., 2021). Fixed scaffolds, including computer-assisted scaffolds, are widely used to facilitate online learning (Almendingen et al., 2021; Cho & Cho, 2016; Delen et al., 2014; Ekman, 2021; Korhonen et al., 2018). For instance, Korhonen et al. (2018) designed online tools to scaffold collaborative knowledge construction and exchange of ideas among university students. The researchers created a platform for students to communicate and exchange information with their peers to improve socialisation. Online meetings were scheduled for teachers to clarify students' doubts, whereas teachers could leave comments on the student circle's blog. Students found the comments helpful in improving the quality of their tasks. In a similar study to scaffold community knowledge, Ekman (2021) utilised a Facebook group for students to discuss how to monitor air pollution. The research findings improved the students' scientific arguments through a peer scaffold. For example, the students added information to their members' posts and supported their members in justifying their arguments about the high pollution index. The social presence of teachers and peers is crucial to developing a sense of connectedness for better mutual understanding (Cho & Cho, 2016; Kim & Lim, 2019).

Metacognitive scaffolds are commonly used to develop students' knowledge and reflective skills (An & Cao, 2014; Kim & Lim, 2019; Quintana et al., 2008). Quintana et al. (2008) argued that metacognitive scaffolds were needed to support online inquiry learning. Based on the positive results of their study, the researchers highlighted the design principles to support online metacognition, including providing visual representations to explain the task, integrating planning tools to monitor progress; and providing reflective prompts (Quintana et al., 2008). In a quasi-experiment study by Kim and Lim (2019), the researchers scaffolded ill-structured problem-solving among college students using supportive scaffolds and reflective scaffolds. Supportive scaffolds such as the explanations provided by the teachers, visual materials and links to online resources were provided to help students develop their domain knowledge. Metacognitive scaffolds, including exploratory questions, hints and expert models, were provided to help students reflect on the strategies used. This study indicated that the students could construct optimal solutions through continuous reflection using the scaffolds provided. Consistent with this study, An and Cao (2014) found that metacognitive scaffolds effectively support the students in designing problem-solving procedures.

Chen (2021) designed multiple forms of fixed scaffolds such as notes, captions, extended reading materials and model answers to support learning Chinese as a foreign language among international students. It was found that these fixed scaffolds could promote the students' online learning autonomy in terms of knowledge enhancement as they could search for the information needed. However, the students needed additional support from the teachers when they learned more complicated topics such as Chinese culture and history. In agreement with Chen's (2021) findings, teachers in the study conducted by Richardson et al. (2021) stressed that it is essential to support students with different types of scaffolds (e.g., cognitive scaffolds, metacognitive scaffolds, strategic scaffolds) in both fixed and adaptive forms. It is because fixed and adaptive scaffolds can complement each other (McNeill & Krajcik, 2009) in response to the diverse learning needs of students.

3. METHODOLOGY

3.1 Participants

This study was conducted on a group of first-semester postgraduate students at a private university in Selangor, Malaysia. The participants enrolled in a module that focused on imparting knowledge about teaching, learning and assessment. Data collection was through an online questionnaire, and 35 out of 76 students enrolled in this module completed it voluntarily. The response rate was 46%. This study adopted purposive sampling as the researcher clarified that if the students did not face any challenges during online learning, they could opt to withdraw from this study. The participants' demographic information is shown in Table 1.

Table 1: Participants' Demographic Information

Demographic Information	Frequency (Percentage)
Gender	
Male	10 (28.6%)
Female	25 (71.4%)
Status	
Local	7 (20.0%)
International	28 (80.07%)

3.2 Research Design

This study adopted a practical action research design. Practical action research is a systematic procedure conducted by practitioners to address an actual educational issue they face 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). Practical action research involves four steps, namely (1) identifying an area of focus, (2) collecting data, (3) analysing and interpreting data as well as (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 author (addressed as "I" in this paragraph) was the practitioner who taught this postgraduate module. I conducted this research in my practice to improve my students' learning experiences. Firstly, I identified the areas of focus: the challenges my postgraduate students faced during online learning and the potential scaffolds that could be designed to facilitate their learning. Secondly, I conducted a baseline study to understand these issues. Thirdly, I analysed and interpreted the results from the baseline study. Finally, I designed different types of scaffolds to support their learning. This study was the first iteration of the action research.

3.3 Data Collection and Analysis

The qualitative data for the baseline study was collected using an online questionnaire. This questionnaire was developed based on the literature review about scaffolding online learning. The link to the questionnaire was shared on the official Learning Management System (LMS) of the University. The students were given one week to complete the questionnaire which consist of two sections. Section 1 collected the participant's demographic information. Section 2 consisted of two open-ended questions which focused on the challenges faced by the participants during online learning and the types of scaffolds needed to support their learning.

This study adopted a thematic analysis. Firstly, the participant's responses to the questions were coded. Secondly, the codes were categorised into themes based on the challenges faced by the students and the types of desired scaffolds. The data was first coded independently by two researchers. The author was one of the coders. The second coder is an academic at a US-based university with no direct involvement with this study other than being a coder and peer debriefer. The codes were then compared against each other to identify areas of agreement and disagreement. Any disagreements in coding were discussed until a consensus was achieved.

4. RESEARCH FINDINGS

The research results are reported from two aspects: 1) challenges faced during online learning; and 2) scaffolds for online learning.

4.1 Challenges Faced during Online Learning

This study found that the participants faced several challenges when they learned online during the COVID-19 pandemic. Only the challenges which can be addressed using scaffolds are reported. Therefore, technical issues such as poor connectivity, inaccessibility to online resources and time constraints are not reported. The challenges are discussed from the following four aspects: (1) students' competency, (2) language proficiency, (3) assessment tasks, and (4) learning resources, as summarised in Figure 1.
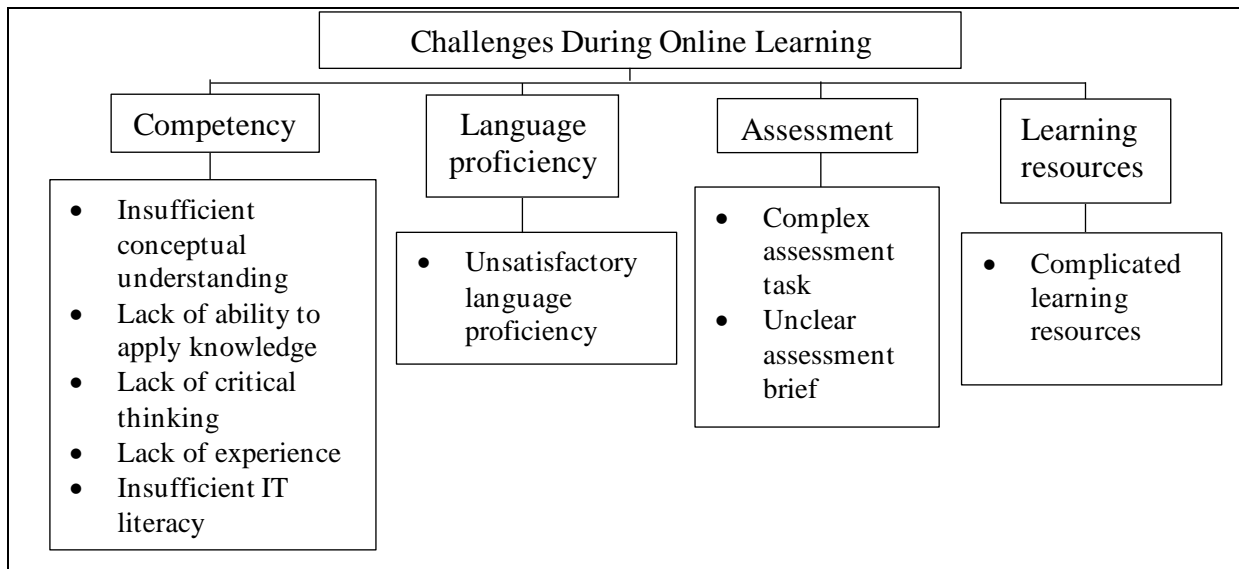
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                Challenges During Online Learning

    Competency         Language          Assessment         Learning
                       proficiency                          resources

  • Insufficient                        • Complex
    conceptual        • Unsatisfactory    assessment      • Complicated
    understanding       language          task              learning
  • Lack of ability     proficiency     • Unclear           resources
    to apply                             assessment
    knowledge                            brief
  • Lack of critical
    thinking
  • Lack of experience
  • Insufficient IT
    literacy
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Figure 1 Challenges in Online Learning Context

4.1.1 Students' Competency

Students' competency was related to their ability to apply knowledge and skills to perform a task successfully. It can be discussed from the aspects of conceptual understanding, knowledge and skills.

4.1.1.1 Insufficient conceptual understanding

The participants mentioned that they have a limited conceptual understanding of the subject matter related to teaching and learning. For example, two participants said,

"I have difficulty in understanding the main ideas of the article (learning resource). I cannot grasp all the concepts." (S3)

"There are too many academic terms and facts. Sometimes I cannot understand without examples." (S28)

One participant, S13, further related this challenge to his degree, which was not in the field of education:

"The main challenge I faced was to understand the psychological aspect in the effort of creating a cohesive education. I come from an engineering background, so the psychological aspect is not a familiar topic. It is difficult to develop a deep understanding of this topic."

4.1.1.2 Lack of ability to apply knowledge

Two participants mentioned that they had difficulty applying their knowledge in their studies or careers. For example, S8 said,

"*Even though I can understand the content of the lesson, I am not able to apply the concepts to the assignments.*" S18 echoed her peer's comment and explained *I think sometimes it's hard to connect the educational theories with my current job."* (S18)

4.1.1.3 Lack of critical thinking

A participant expressed the view that she cannot think critically,

> *"I found the assignments challenging, maybe I lack critical thinking. I don't know how to analyse a problem and critique an article."* (S8)

4.1.1.4 Lack of experience

Lack of experience was another challenge mentioned by the participants. They agreed that having no experience in teaching was a disadvantage as they could not visualise a classroom scenario and utilise their experience to complete the tasks given. S24 responded,

> "*I am not a teacher and have no teaching experience, I do not have a deep understanding of some theoretical knowledge...I cannot relate it with what happens in a classroom."* (S24)

S31 expressed the same view,

> *"I just graduated from university. I don't have any experience, so it is hard for me to finish some tasks."*

4.1.1.5 Insufficient digital literacy

IT literacy is an essential skill during online learning. I used various online platforms to engage my students in learning. It was found that a few students are not familiar with the online learning tools. This affected their engagement during the lessons. For example, two participants explained,

> *"I am not familiar with Padlet. I took some time to figure out how it works."* (S4)

> *"I am unfamiliar with Times (Learning Management System). Sometimes I could not find the learning resources."* (S9)

4.1.2 Language Proficiency

Language proficiency is one of the most typical challenges among international students. S1 and S3 explained that English is not their first language,

> *"I think the challenges are the language, but I try my best to increase my English skill."* (S1)

> *"It is hard for me to understand the meaning of some professional terms. I am not an English native speaker."* (S3)

4.1.3 Assessment Task

Since the students were in the first semester of their studies, they found the assessment tasks challenging due to two factors: (a) complexity of the task and (b) simplistic assessment brief.

4.1.3.1 Complex assessment task

The students were required to complete three graded assessment tasks in this module. These assessment tasks included reflective writing, an assessment plan and a lesson plan. Ungraded formative assessments such as article reviews and quizzes were also implemented to assess students' understanding of the lesson content. However, three participants expressed the view that those tasks were a bit challenging for them. For example, S5 mentioned,

"*I faced difficulty in understanding what is expected in the assignment, particularly how to develop an assessment plan, what and how to cite as well as how to present the work.*"

S9 and S16 shared the same opinions. They responded,

"*The structure for the assignment is slightly challenging. I need some time to make sense and put into order the materials*". (S9) and "*There is too much information to cover in the assignments. I am confused and not sure if the work I have done is really what is expected from me.*" (S16)

4.1.3.2 Superficial description of assessment task

For the students, the descriptions for the assessment tasks were broad and general. For example, a student mentioned,

"*I knew that I was required to reflect on my learning experience. However, I didn't know what I should write. Which aspect I should focus on?*" (S19)

4.1.4 Learning Resources

As first-semester students, the participants thought the learning resources' content was overwhelming. S29 explained,

"*There is too much information on the PPT. I can`t identify the key points. I spent a lot of time reading and understanding the content.*"

S23 echoed,

"*There is too much new information learned. The PPT contained a lot of information. I had no time to internalise the knowledge during the classes.*"

4.2 Students' Needs for Scaffolds during Online Learning

The students' responses indicated that they needed guidance to enhance their understanding. Thus, scaffolds are needed when learning online. A fixed scaffold will benefit the students.

4.2.1 Adaptive Scaffolds

The students needed adaptive scaffolds, which are just-in-time support given by the lecturer when teaching and learning opportunities emerged. The adaptive scaffolds mentioned by the students include providing examples, feedback and guiding questions, as well as creating social spaces for peer interactions.

4.2.1.1 Providing examples

A few participants explained that concrete examples could help them better understand the lesson's content and abstract concepts. For instance, S33 said,

"*For some abstract concepts or difficult academic terms, it is better if the lecturer can give us some examples. Examples are good for understanding.*"

S18 and S31 also mentioned that real-life examples from classrooms could help the students without teaching experience. They explained,

"*Hope the lecturer can give more examples from classrooms when she teaches the theoretical knowledge.*" (S18)

"The lecturer can give more real-life examples related to how to teach a topic. Classroom scenarios from her experiences would be helpful. It is hard for me to visualise what happens in a classroom. I do not have any teaching experience" (S31)

4.2.1.2 Providing feedback

The participants perceived that the lecturer needed to provide feedback on their assignments and class work. For instance, S7 explained,

"*Whenever I email her to ask any question or seek for feedback for my work, she replies instantly. This is so admirable. I think feedback is important for me to improve my performance.*"

S11 expressed the same opinion:

"*The lecturer can check our work and give some comments so that we know if we are on the right track for assessment.*"

4.2.1.3 Providing guiding/prompting questions

A participant explained that guiding questions would be helpful for assignment completion. S17 said,

"*Assistance with a few questions regarding the assignments can help us complete the tasks. We can ensure that we are on the right track.*"

S37 wrote,

"*The lecture can prompt us...This will stimulate our thinking so that we can think deeper.*"

4.2.1.4 Creating more opportunities for peer interactions

One participant suggested that the lecturer should create more opportunities for peer interaction. This would allow them to communicate with their peers and learn from them. S22 wrote,

"*The lecturer could plan some group activities such as peer interaction. Our more experienced peers can support our learning too.*"

4.2.2 Fixed Scaffolds

Fixed scaffolds are predesigned resources that can facilitate student learning. The students expressed that they needed support from fixed scaffolds such as pre-recorded video, templates and work samples.

4.2.2.1 Provide various forms of learning resources

Ten participants mentioned that pre-recorded lessons, assignment guidelines, and templates could support their learning. For example, S17 and S21 explained,

"*The lecturer had pre-recorded the guidelines for the assignments. I think this is helpful as I can watch the recording repeatedly.*" (S17)

"*The lecturer can also pre-record some lessons, especially the notes which are not discussed during the lesson hour so that we can better understand the content.*" (S21)

The participants mentioned that work samples could serve as a reference for them to complete their assignments,

> *"Samples of assignments may be helpful."* (S22)

> *"It is good if we can refer to some sample assignments. It can help me gain a better idea on how to complete an assignment and how the end-product will look like."* (S34)

4.2.2.2 Improving the clarify of content

Three students expressed the view that the content of the learning resources, including the language, could be simplified to improve the clarity of the content. For example, S6 and S16 said,

> *"Provide simplified slides to enhance our understanding."* (S16)

> *"Improve the clarity of the content such as explaining the concepts using simpler language. Examples, figures and tables can be used to summarise the key ideas."* (S6)

4.3 Scaffolding Design Framework

Based on the needs analysis results, I designed multiple forms of fixed and adaptive scaffolds to facilitate online learning, as summarised in Table 2.

Table 2 Summary of Scaffolding Design

Types	Purpose	Scaffolding Strategies
Fixed scaffolds	Mastery of content knowledge	Lecture notes
		Learning Management System (e.g., Forum)
		Pre-recorded videos
	Supporting completion of the assessment	Pre-recorded videos on the ways to complete the assignments step-by-step
		Question prompts on assessment brief
		Template
Adaptive scaffolds	Mastery of knowledge	Providing feedback
		Modelling
		Providing detailed explanations
		Paraphrasing
		Prompting
		Providing examples
		Creating spaces for peer interactions

The fixed scaffolds were designed for two purposes: to help the students (a) master the content knowledge; and (b) complete the three assessment tasks (e.g., writing a reflection, designing an assessment plan, and planning a group lesson). The description for each scaffold is presented in Table 3.

Table 3 Description of Fixed Scaffolds

Form of Fixed Scaffold	Description
Lecture notes	The lecture notes contain detailed explanations, examples, figures and tables for each topic (e.g., learning theories, different types of teaching methods etc.) to deepen students' knowledge.
Forum in Learning Management System (LMS)	The forum allows students to provide opinions and responds to the comments posted by their peers. Non-verbal interactions among students encourage them to construct knowledge through interactions.
Pre-recorded videos	The pre-recorded videos complement the lecture notes. It contains some examples to elaborate on the ideas/concepts presented in the handouts. The pre-recorded videos also provide step-by-step instructions to guide students in developing an assessment plan.
Question prompts in the assessment brief	Question prompts aim to stimulate student thinking and keep them focused on the key requirement of the assessment task.
Template	A template is used to help students develop the assessment plan. Students can create documents quickly within the scope of the assessment task.

Table 4 Summary of Adaptive Scaffolds

Scaffolding strategies	Description	Example
Providing feedback	Provide opinion, review, evaluation and suggestions for improving student work	Can you support your explanation with evidence from the classroom?
Modelling	Set an example for imitation	This is how you can develop a rubric for your student project. First, you should identify the performance criteria based on the learning objectives.
Providing detailed explanations/ Elaborating	Answer a question, provide more detailed information or clarification, and say something that adds to the information present in the discussion	To add to what we have discussed about the concept of object permeance at the sensorimotor stage, children will learn how to search for an object when they cannot see it.
Paraphrasing	Rephrase a statement using better-known words in response to students' language problem	In other words, "what else do you need to know so that you can design an effective lesson?"
Prompting	Ask for the next step, an example, of the understanding of a problem or content knowledge	You mentioned that the student-centred teaching approach has more advantages compared to the teacher-centred teaching approach. Why do you say so?
Providing examples	Propose a concrete example to deliberate an idea/ concept	Teachers need to consider their students' prior knowledge before they design a lesson. For example, It is inappropriate to teach energy conversion if students do not know the different types of energy.
Creating social spaces for peer interactions	Create group discussions for students to make their thinking visible and construct knowledge through interactions and active negotiation	Can you share with us how your group is going to design a differentiated lesson based on the scenario given?

In terms of adaptive scaffolds, some question prompts and sentence starters were drafted to reflect the common scaffolding strategies that could be used to address the challenges faced by the students (refer to Table 4).

5. DISCUSSION

This study investigated the challenges faced by postgraduate students during online learning and the scaffolds they desired in this learning context. In the next stage of this action research, the designed scaffolds will be implemented and evaluated to capture their effects on supporting online learning. Online learning requires students to have high self-management and self-regulated skills. Students reported that they poorly managed their time and were not able to complete all tasks on time (Jaradat & Ajlouni, 2021). In contrast, none of the participants in this study mentioned the issue of self-regulation. Based on the researcher's experience with the selected group of students, the students showed that they strived for their best to complete all the tasks on time.

Students need to equip themselves with IT literacy in the context of online learning. Similar to the previous studies (Adedoyin & Soykan, 2020), some participants were not IT literate. They faced some difficulties in navigating how to use an online application. A plausible reason is that countries such as China have strict restrictions on the use of online platforms, including Google, Twitter and Facebook (Li, 2018). The international students from these countries need to spend some time familiarising themselves with these popular platforms. To complicate the problem, these students need to use Virtual Private Network (VPN) to assess the university's learning management system, making the learning resources less accessible to them.

The quality of online learning materials impacts student learning (Jaradat & Ajlouni, 2021). Consistent with a previous study by Jaradat and Ajlouni (2021), the participants thought that lengthy notes, notes with jargon and general guidelines for assessment were not helpful for their learning. They also indicated that a previous study found that students were less motivated to follow online lessons as they felt isolated when they learned alone. The participants in this study also explained that they wished to interact more frequently with their peers. However, in opposition to the motivation factor, the participants perceived that they could develop their knowledge through peer interactions (Cho & Cho, 2016; Kim & Lim, 2019). The challenges in terms of concentration and external inferences (Adedoyin & Soykan, 2020; Bringula et al., 2021; Jaradat & Ajlouni, 2021) were not found in this action research. The participants in this study paid more attention to the challenges related to learning and self-competency than the external factors.

This study revealed some new findings which are not reported in the previous studies. For instance, lack of teaching experience, critical thinking skills, and inability to apply knowledge also hampered their learning process. This module requires the students to understand pedagogies and assessments in order to relate their knowledge to real-world classrooms. The participants who joined this module without prior teaching experience found it challenging to make real-life connections. Students used to conventional teaching are prone to demonstrate knowledge and content rather than higher-order thinking skills (Farha Alia Moktar, 2016). Besides that, students who did not own a bachelor's degree related to education found it hard to develop a sound conceptual understanding of the topics.

In agreement with a previous study by McNeill and Krajcik (2009), the research findings indicated that students needed both fixed and adaptive scaffolds to address their challenges.

Predesigned fixed scaffolds lack the element of responsiveness and contingency compared to adaptive scaffolds (Saye & Brush, 2002). The participants mentioned that they needed detailed explanations from the teachers and visual materials (Chen, 2021; Kim & Lim, 2019). Model answers and work samples can reduce students' cognitive load and help them construct solutions for a problem (Chen, 2021; Kirschner et al., 2006). The participants perceived that guiding questions and feedback would be helpful in supporting their learning. Guiding questions and question prompts can explicitly guide students to achieve a shared understanding of the goal of a task (Gerard & Linn, 2016; Puntambekar & Kolodner, 2005). Encouraging student participation in discussion allows students to merge the ideas of different individuals, which leads to the development of coherent understanding (Gerard & Linn, 2016; Puntambekar & Kolodner, 2005; Suhaida Halamy et al., 2021).

6. CONCLUSION

Keeping up in the digital age is essential for online learning, especially during the COVID-19 pandemic outbreak. Teachers need to make rapid changes in the curriculum, and the delivery methods to address the challenges learners face in these complex online classroom conditions (Farha Alia, 2016). This study provided insight into the challenges faced by postgraduate students and the scaffolds they needed. Both fixed and adaptative scaffolds are necessary to facilitate student learning as they work synergistically to complement and interact with each other in a concerted way to facilitate a targeted goal (McNeill & Krajcik, 2009). Understanding students' learning needs is essential to ensure that the scaffolds designed are adequate to support student learning (Puntambekar & Kolodner, 2005). The findings from the needs analysis helped the researcher design different forms of fixed and adaptive scaffolds to support online learning. Although the challenges explained by the students may only represent the period of campus closure during COVID-19, this research shed light on students' perceptions of scaffolding in a unique period in higher education. The findings may be helpful in designing scaffolding in similar learning contexts. In the next course of action, the researcher would implement the designed scaffolds and evaluate their impacts on supporting students' online learning.

This study has several limitations. First, the qualitative data was collected through a questionnaire. Most of the responses were brief without any elaboration. An in-depth explanation needs to be collected using interviews to understand better 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 video recordings for data triangulation. The second limitation is related to the instrument. The instrument only consisted of two open-ended questions focused on the student's challenges and the types of scaffolds they needed. The data analysis found that the students did not explain their challenges from different aspects. Some students discussed the challenges of the content, whereas a few explained the challenges in completing the assessment tasks. In the future, the instruments could be redesigned to understand the challenges faced in different aspects such as lesson content, delivery methods and assessment. Thirdly, this action research was conducted during the COVID-19 pandemic when all the students joined the lessons virtually. Now, most universities have started to conduct hybrid learning. Hybrid learning combines face-to-face and online learning simultaneously (Ackerman, 2008). Students may face different challenges in a hybrid learning context. This research can be extended to hybrid lessons to better support students in this learning context. In addition, future studies may focus on developing an adaptive scaffolding pedagogy for different immerse learning settings such as blended learning and online learning to facilitate student learning better.

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APPENDIX

Appendix 1 Interview Questions

Section A: Participant Information

Tick (√) your answer.

1.

Gender   ☐ Male
             ☐ Female
             ☐ Prefer not to say

Status   ☐ Local student
            ☐ International student

Section B: Perception of Online Learning

1. What are the challenges you face during online learning?

2. What kind of scaffold can the lecturer provide to address the challenges you face?

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