

A Mixed Method Case Study on Tertiary Educators' and Students' Practices of Hybrid Teaching

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Abstract: Higher Learning Institutions (HLIS) are geared towards implementing hybrid teaching to enhance educational access in achieving quality education. However, despite its widespread adoption, there remains a significant lack of comprehensive feedback regarding its application in teaching and learning. As a result, this study aims to investigate current hybrid practices among Malaysian undergraduate students and lecturers. The study employed an embedded case study design, which integrates qualitative and quantitative methods and more than one unit of analysis. Specifically, lecturers' perceptions of their hybrid teaching practices at their universities were investigated using interviews. On the other hand, students' perceptions of their participation in hybrid learning were observed using a questionnaire. Eighty-six undergraduate students and six lecturers from Malaysian universities participated in this study. The qualitative and quantitative data were analysed using thematic analysis and Partial Least Squares Structural Equation Modelling. The qualitative findings revealed that lecturers showed pedagogical content knowledge practices in hybrid teaching by enhancing students' skill engagement via learning materials. Additionally, they found that hybrid teaching practices are possible with minimal use of technology if the effort is made to engage students. The quantitative findings uncovered that skill engagement significantly mediated the relationship between participation and performance engagement. This study suggests that preparing engaging and attentive learning materials for teaching content is essential to engaging students in hybrid teaching and learning while securing their skill engagement. Hence, lecturers in universities should focus on this experience to provide supportive material, such as guided activities with specific feedback and responses, while putting effort into engaging students in hybrid teaching and learning.

Keywords: Educational Access, Hybrid Teaching and Learning, Pedagogical Content Knowledge, Skill Engagement, Technological Knowledge

1. Introduction

Advancements in technology have significantly enhanced teaching and learning processes, offering innovative solutions to educational challenges (Shashank Joshi, 2023; Yakut Özek & Sincer, 2024). The COVID-19 pandemic catalysed this shift, compelling educators and learners to embrace online platforms for instruction. This transition highlighted the transformative potential of digital tools in Education. However, online learning also introduced challenges such as student disengagement and the loss of real-time, face-to-face interaction, and these issues have prompted educators to adopt more proactive approaches (Kamaludin & Sundarasan, 2023). Furthermore, Saleem et al. (2024) underscore the critical role of technological readiness in ensuring effective implementation with a reference to classroom observation on engagement, which enables successful learning outcomes (Teoh & Singh, 2019). As a result, the modification and adaptation of online teaching strategies have become a growing trend (Ulla & Perales, 2022).

In response to the demand for flexible and inclusive learning environments, hybrid teaching and learning have emerged as a practical solution. This approach accommodates a preference for in-person interaction while addressing logistical and contextual constraints (Ulla & Perales, 2022). Nevertheless, due to its relatively recent adoption in higher Education, the hybrid model still lacks comprehensive conceptual frameworks and standardised guidelines for implementation.

In Malaysia, the shift towards hybrid Education is gradually gaining momentum, which is supported by evolving practices and stakeholder feedback. The Malaysian Ministry of Higher Education has recently highlighted the importance of adopting hybrid and flexible teaching strategies to enhance educational delivery (Jeevita, 2024; Joyce, 2023). Despite these initiatives, many institutions rely on asynchronous methods that alternate between remote and in-person modes. Consequently, most existing research focuses on hybrid learning rather than the simultaneous integration of face-to-face and online instruction, the core of hybrid learning.

Moreover, concerns have been raised regarding hybrid learning's potential impact on student engagement, which tends to vary depending on the learning environment (Vo & Ho, 2024). Thus, gaining a deeper understanding of how hybrid models are currently implemented in higher Education is essential. This study explores the current practices and perceptions of hybrid teaching and learning among university students and lecturers in Malaysia.

2. Literature Review

In hybrid Education, educators play a vital role in supporting students within a learning community. A learning community comprises a cohort of educators, students, parents, and other stakeholders who collaborate toward a shared educational goal. According to Gibson and Blandford (2005) and Bohari et al. (2025), such a community is defined by a common characteristic and a collective aim, working cohesively within a developmental framework that includes leadership, mental growth, and personal mastery, as outlined by Senge (1990). This collaborative engagement occurs across various platforms that are both physical and virtual, transcending geographical or modality boundaries.

Whether interactions take place face-to-face or in remote settings, communication and collaboration remain essential in achieving shared learning outcomes. These interactions are guided by the leadership of educators and shaped by individual cognitive engagement. The learning community functions within a specific cultural and contextual environment, aligning with Vygotsky's sociocultural theory (Vygotsky, 1978), emphasizing the importance of social interaction and cultural tools in constructing knowledge. In this sense, the learning community fosters a sense of belonging and purpose, central to individual development and collective educational success.

2.1 Hybrid Teaching and Learning

Hybrid learning environments involve face-to-face meetings and significant online learning activities, which substitute traditional in-person classroom sessions (Ahlgren et al., 2020). Educators presented the definition with varying intentions when discussing the shift from conventional to online

modes. Some educators (Guo et al., 2019; Zhang, 2019) defined learning modes that combine conventional and flipped classroom modes as a hybrid, while others (Cahyono & Asikin, 2019; Fish, 2022) described them as interchangeable between face-to-face and online learning. Recent hybrid teaching emphasizes more flexibility (Jiang et al., 2023). According to the definition, the mixed learning environment is significant for subjects like English, which require communication skills, a cultural perspective on learning, language development, and mathematics (Cahyono & Asikin, 2019; Zhang, 2023). As a whole, hybrid learning environments involve a blend of face-to-face meetings and significant online learning activities, which substitute traditional in-person classroom sessions. Today's hybrid classrooms operate for various specific and necessary purposes, providing more opportunities for future growth. The definition may change according to current needs.

When considering flexibility in teaching, a clear guideline is required. The quality may need more guidance. Since hybrid teaching occurs when all students are learning synchronously in different places, it creates a lively environment. This practice burdens teachers since they are in an environment that requires guidance. Furthermore, the hybrid teaching model is unstable, with results fluctuating due to studies indicating its ineffectiveness in teaching certain subjects, such as a specific subject in managerial economics (Metzgar, 2014). More studies are interested in investigating factors contributing to hybrid teaching. Among the successful aspects of hybrid teaching were teachers' efforts in carrying out pedagogical instruction, including the planning and integration of tools in teaching; teachers' attitudes towards conducting hybrid teaching; institutional supports; and technology used (Ahlgren et al., 2020; Yakut Özek & Sincer, 2024). Nevertheless, hybrid teaching after the COVID-19 pandemic may need a review since more concerns were emphasised in students' engagement (Bergdahl, 2022; Van der Rijst et al., 2023). Engagement has been a more complicated issue since it is modified from classroom engagement to revised forms of teaching based on behavioural, emotional, and cognitive aspects, impacting learning outcomes (Fredricks et al., 2004). In practice, engagement always refers to an individual's active involvement in a learning activity (Christenson et al., 2012) as reflected in teachers' efforts.

2.2 Integration of Zone of Proximal Development (ZPD) and Sense-of-Community Theory

Teachers prepare or use creativity to ensure scaffolding that supports students' meaningful learning and creates a cultural context for hybrid teaching and learning. This effort ensures cognitive development within their Zone of Proximal Development (ZPD) (Vygotsky, 1978), filling the gap between what they can do independently and achieve with guidance. Nevertheless, some students may be left behind in ZPD; they require more attention in hybrid classrooms.

When individuals actively demonstrate their thoughts throughout a learning process, they are involved in encoding and decoding information. In this thinking process, positive emotions such as enthusiasm and resilience will motivate individuals to think more deeply and actively engage in the learning process, as depicted in the broaden-and-build theory (Fredrickson, 2001). Therefore, instructors have crucial roles in inspiring and actively involving students in finding solutions. Essentially, their engagement efforts facilitate the cognitive-emotional interplay, which in turn encourages the acquisition and integration of knowledge in a meaningful manner. Most importantly, they exhibit a clear direction when interacting with the environment.

Nevertheless, hybrid teaching and learning necessitate instructors struggling with the active engagement of students. Therefore, while evaluating hybrid or online education, teachers expect students to be willing to engage and immerse themselves in various ways. Several studies have indicated that emotional engagement is crucial in predicting cognitive achievement, particularly when examining the domains of cognition and emotion (Dubovi, 2022; Liu et al., 2022).

The engagement skills of students are essential to their learning process. Educators may have difficulties with hybrid instruction, as they must find ways to engage students across two platforms. Every student is responsible for learning; educators must ensure they acknowledge their learning processes. Educators offer valuable guidance and support through scaffolding, facilitating student engagement by fostering communication and soliciting feedback. Instructors affirm their competence and confidence in learning by addressing students by name throughout class. Although students may encounter difficulties outside their comfort zones, they receive support, and the future becomes manageable when they are presented with the necessary knowledge. The Zone of Proximal

Development (ZPD) (Vygotsky, 1978) highlights that students acquire information within an environment that provides support. Therefore, educators significantly influence interactions that promote cognitive growth.

Sense-of-community theory highlights the significance of a sense of belonging in creating an interdependent community (Sarason, 1974). It describes the understanding of students' participation in online learning. On a remote platform, instructors often rely heavily on verbal communication to engage learners, such as calling their names to answer questions. However, they usually fail to sense the learners' feelings through gestures, which makes it impossible for everyone to feel directly attached. Individuals struggle to establish a sense of belonging, interdependence, and mutual commitment, which in turn creates a shared emotional connection and support system, leading to a decrease in engagement (Wang et al., 2023). Hence, Vygotsky's social-cultural theory (Vygotsky, 1978) provides a guide on extra effort in engaging students by not depending on communication only, but cognitively providing opportunities for the students to sense the benefits of getting involved in the communication or activities. The outcome of putting effort together reflects the practitioner's acknowledgement of this theory to enhance personal safety and enjoyment during activities like classroom discussions. Teachers' roles are designing lessons, supporting class interactions, and guiding the content and technology, while students keep to their responsibilities for pedagogical content knowledge (Shulman, 1986).

Face-to-face contact increases the chances of immersive covert and overt communication. Based on eye contact fosters a sense of community, reducing feelings of isolation and demonstrating confidence in receiving assistance when needed. The sense-of-community theory (Sarason, 1974) posits that individuals possess a strong sense of belonging within an interactive, safe environment that encourages their desire to participate. A sense of community consists of four components: membership, influence, integration, fulfilment of needs, and shared emotional connection (McMillan & Chavis, 1986). In terms of membership, instructors and learners must establish a connection; in terms of influence, students must immerse themselves in content that captures their attention; in terms of technology, facilities facilitate the integration of multiple tasks and the fulfilment of needs; in terms of environment, they provide a safe platform for shared emotional connections (Wang et al., 2023).

Teachers must foster a sense of belonging and togetherness (membership) by creating an environment where students are willing to participate and understand the expectations that they share an emotional connection. Teachers need to be creative by putting in a lot of effort, such as arranging activities, providing quality materials (integration and fulfilment of needs), and getting students' attention by communicating with them.

Proper synchronisation encourages remote learners to grab the same opportunities for engagement, collaboration, and immediate feedback as physically present learners. Hence, a flexible hybrid teaching framework, rooted in the theory of a sense of community, addresses the challenges of balancing remote and physical meeting methods while maximising the learning potential of both modalities. The transformation of these four elements into modern, synchronised online learning was evident.

However, various options currently exist for achieving the desired outcomes, indicating the need for further investigation. Therefore, this study was designed to address the following research questions.

Research question one: How do Malaysian lecturers describe their experiences and practices in implementing hybrid teaching?

Research question two: Is there any mediation effect of emotion on the relationship between content and engagement as perceived among Malaysian undergraduate students?

3. Methodology

3.1 Research Design and Participants of the Study

This study adopted a mixed-methods research design to investigate the practices of university lecturers and students in implementing hybrid teaching in Malaysia. An embedded case study involves examining a single case that includes multiple distinct units of analysis (Yin, 2003), and it is used when the research describes the features, context, and process of a phenomenon. Like traditional case study

designs, it offers a framework for combining quantitative and qualitative methods within one cohesive research study (Scholz & Tietje, 2002; Yin, 2003). Specifically, an embedded case study approach was employed, integrating qualitative and quantitative data to provide a comprehensive understanding of the phenomenon (Creswell, 2017). To address the first research question, a qualitative method was employed using semi-structured interviews with six Malaysian lecturers (identified as R1 to R6) who had prior experience in hybrid teaching. The interview protocol was validated for trustworthiness and credibility to ensure the reliability of the data collected.

A purposive sampling technique was used to select participants based on their sustained practice of hybrid teaching for at least two years. Informed consents were received from the interview respondents, and each interview lasted approximately 35 minutes and explored the lecturers' teaching practices, instructional strategies, and pedagogical approaches within hybrid learning environments.

A quantitative method was employed to answer the second research question, which involved collecting data using a survey that captured the perceptions of hybrid learning environments, including effectiveness, accessibility, and engagement. Data from 86 Malaysian university students were randomly selected based on the inclusion criterion that they had experienced hybrid learning. Their participation in the survey was voluntary, and informed consent was obtained from all participants in alignment with university research ethics protocols.

3.2 Instruments

The interview protocol involved the related questions for the following research questions. This interview aimed to triangulate the quantitative results. The inputs from lecturers were precious data to support the current practice of hybrid learning by asking, "How do you ensure the proper application of hybrid teaching? How do you ensure the practice of hybrid teaching success?". The input related to hybrid teaching was expected to correspond to the quantitative data and answer the following research question.

Research question one: How do Malaysian lecturers describe their experiences and practices in implementing hybrid teaching?

The instrument (Table 1) in the form of a questionnaire was used to collect quantitative data. It aimed to answer the following research question.

Research question two: Is there any mediation effect of skill engagement on the relationship between participation (interaction engagement) and performance engagement as perceived among Malaysian undergraduate students?

The questionnaire's items were adapted from a previous study (Handelsman et al., 2005) to create 15 items. To check if the items were valid and reliable, the loading values, variance inflation factor (VIF), average variance extracted (AVE), and Cronbach's Alpha were observed in the Smartpls4. The threshold values are more than 0.7 for loading, average variance extracted (AVE) exceeding 0.5, variance inflation factor (VIF) falling below 5, and Cronbach's Alpha exceeding 0.7 (Hair et al., 2014). Table 1 shows that all the loadings were above 0.70, ranging from 0.757 to 0.939, satisfying the threshold value of more than or equal to 0.7. Besides, the VIF was all below 5, Cronbach's Alpha was above 0.70, and AVE was more than 0.5.

Table 1

Questionnaire

Variable	Item (indicator)	Loading	VIF below 0.85 or 0.90	AVE above 0.5	Cronbach Alpha	Rho a
Skill	Attendance: Coming to	0.828	2.585	0.741	0.942	0.944

Variable	Item (indicator)	Loading	VIF below 0.85 or 0.90	AVE above 0.5	Cronbach Alpha	Rho a
	class every day	0.856	3.258			
	Attentive: Able to be attentive in class	0.837	3.166			
	Commit: Making sure to study on a regular basis	0.871	3.463			
	Effort: Putting forth effort	0.877	3.562			
	Homework: Completing all the homework	0.857	3.748			
	Organize: Being organized	0.889	3.426			
	Note: Taking good notes in class.					
Participation	Fun: Having fun in class	0.890	3.563	0.712	0.919	0.930
	HelpAnswer: Helping my classmates to answer questions if they cannot answer.	0.864	2.706			
	IdeaLesson: Providing more ideas during discussions either virtually or in class.	0.816	2.532			
	Participating: Participating actively in small group discussions	0.897	3.658			
	RaiseHand: Raising my hand in class	0.729	2.007			
	Understand: Reading or understanding what others have posted or raised in the discussion group	0.864	2.511			
Performance	Doing Best: Doing the best with a lot of effort to get a good grade for any assigned task.	0.944	2.281	0.874	0.857	0.868
	GoodGrade: Getting a good grade.	0.926	2.281			

3.3 Data Analysis

The thematic analysis was employed to analyse qualitative data to address research question one as guided by Miles (2014) and Braun and Clarke (2006). The study involves an inductive strategy by assigning codes and themes supported by the existing literature review. The stages include identifying codes within the data, forming codes, establishing key categories to get themes, and correlating the emergent themes with the previous findings or existing concepts. The quantitative analysis was conducted using SmartPLS4 to address the second research question. The validity and reliability were shown by examining the values of loadings, VIF, AVE, and Cronbach's Alpha. The structural model analysis provided the relationship between constructs.

4. Results and Findings

4.1 Finding 1: Lecturers' Practices

Research question one: How do Malaysian lecturers describe their experiences and practices in implementing hybrid teaching?

The analysis conducted using NVivo 14 (Table 2) found that the lecturers focused on their pedagogical content knowledge and application of technology. Table 2 shows the main emerging themes based on the codes, supported by samples of excerpts and the literature review. The codes were created from excerpts aligned with the literature review, as briefly presented in the table.

Table 2

Themes emerge from the codes and the illustrations

Theme	Code	Samples of excerpts	Literature Review
Pedagogical Content Knowledge	Preparing teaching content	R1: "...I can say that, uh, the preparation for hybrid, uh, learning is very, very important. For example, uh, the pace of each, um, segment in your delivery must be, must not be too long or too short. Okay. It is just, uh, I mean, the duration of the class, supposedly duration, you have two, two hours. You cannot make it all the way two hours, just like giving lectures and something like that. But you have to break it up or.."	Teachers' practice of preparing teaching materials related to the subject matter by selecting, organizing, and presenting subject matter in the hybrid class effectively. It eases students' understanding in the learning (Shulman, 1986).
	file:6 references: 67 27	R2: "...we will upload the, um, slides that we developed, especially for that subject because, um, um, in ...we have, uh, what we call, the PSTP, the, the unit that, um, in charge for the online learning. Ah, so those lecturers who are interested, interested to produce the slide, they- we will join and we will produce the official ones, and it can be reached by all of the lecturers of the students or any persons, uh, from, um, outside..."	
	Monitoring students	R4: "... I engage students by making my classes interactive and dynamic. In a hybrid	Teachers' practice of applying strategies to support student to engagement with content (Ball, Thames, & Phelps, 2008), so that
	file:6		

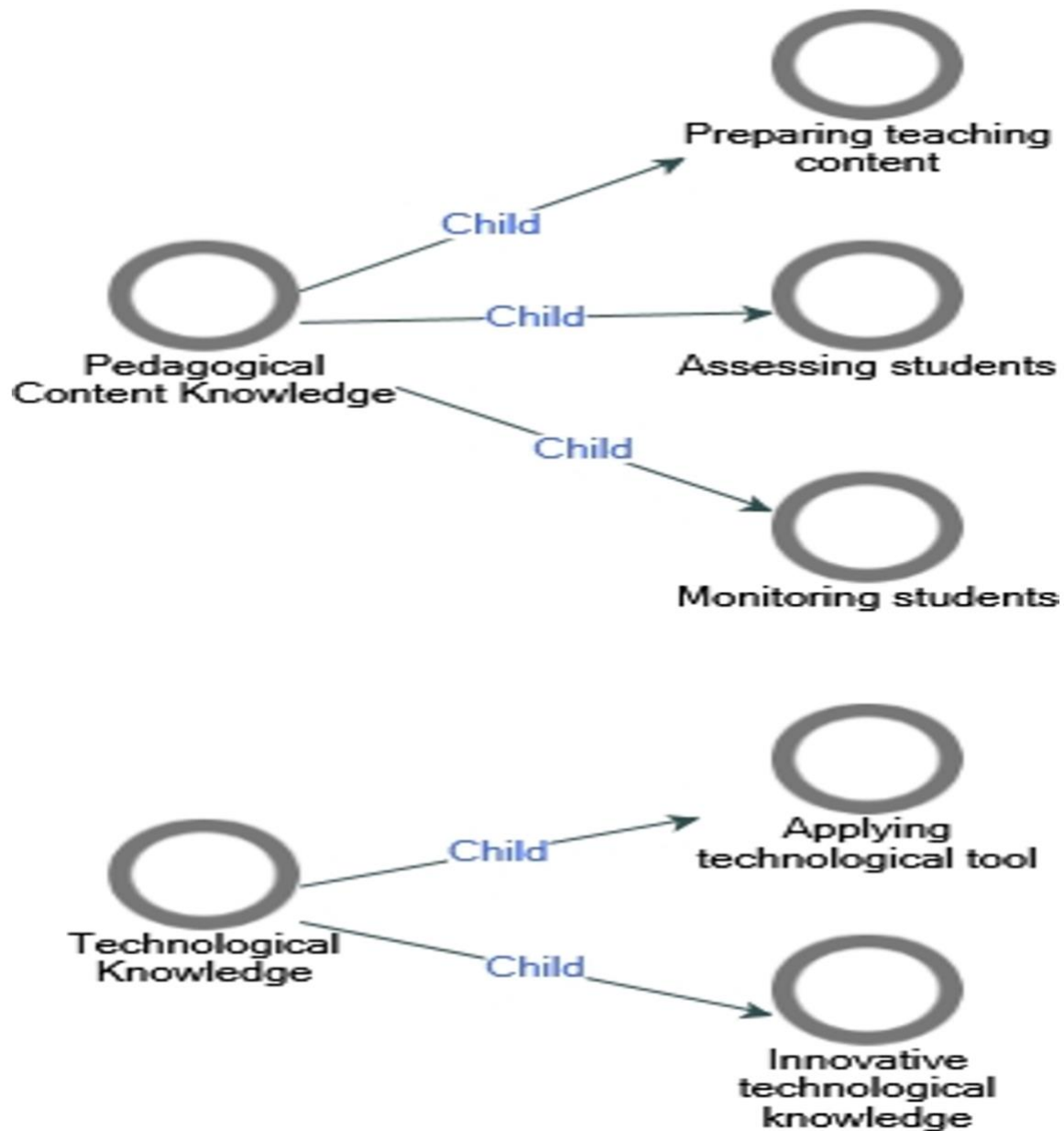
Theme	Code	Samples of excerpts	Literature Review
	references: 33	environment, I utilize discussion boards, live polls, and breakout rooms for collaboration. I make sure that both online and in-person students have equal opportunities to participate, whether through Q&A sessions or group work. This encourages active engagement from all students..."	they were able to make connection of their learning.
	Assessing students file:3 references: 7	R6: "...for the quizzes, uh, you know, I have Quizizz, I have Kahoot! and, uh, the other, uh, game platforms where they have to play the games and then, you know, just to make it interesting and whatnot, and to expose them to those kind of platforms..."	Teachers' practice of getting feedback from students to gauge and guide their understanding (Black & Wiliam, 1998).
Technological Knowledge file:6 references: 23	Applying technological tool file:6 references: 20	R4: "...I use a combination of interactive tools, such as live polls and discussion forums, to keep students engaged. I enjoy hybrid teaching because it offers the best of both worlds, combining the strengths of face-to-face interaction with the convenience of digital tools..."	Teachers' practices with proficiency of using technological tools (Mishra & Koehler, 2006) as introduced in TPACK.
	Innovative technological knowledge file:1 references: 3	R2: "...So that's why I, um, last time, I, I try to search, I have, I haven't start to test the app. I try to search, um, is there any platform or apps that student can type, uh, and post? Then we can all of, all of us, we can see the questions without knowing who is posting the questions. Because some students, they are trying to, to ask, you know, they think that their question is a stupid question or a silly question. That's why they don't really dare to open their mouth."	Teachers' practices of using digital tools to enhance students' engagement (Koehler et al., 2014).
Performance file:3 References: 3		R4: "...Hybrid teaching has been shown to significantly enhance student learning by offering multiple modes of	Teachers' observation of students' achievement (Shaha et al., 2015)

Theme	Code	Samples of excerpts	Literature Review
		content delivery. Students can learn at their own pace and review recorded lectures or additional resources as needed."	

After conducting the data analysis among the codes, three codes were identified as contributing to the emergence of the theme "Pedagogical Content Knowledge", and two codes were identified as contributing to the emergence of the theme "Technological Knowledge". Figure 1 shows the codes for the first two themes. "Performance" has only one code, not interpreted in Figure 1.

Figure 1

Themes emerge from the codes using NVivo



The lecturers agreed that they focused on practices of preparing content so that students could follow a lesson plan. Nevertheless, independent students might need more guidance. The lecturers also put effort into engaging students by providing them with input to ease their responses so that they could sense the classroom environment within their learning community. This situation was expressed among the lecturers. The excerpts are as follows:

R5:"... I think we should give clear instructions on what you want them to do and be prepared to let them go in their own directions. Then come back at the end of the class to reflect on their work.."

R4:"... The content I prepare is typically comprehensive and well-structured, aligned with the course learning objectives. I use multimedia elements in my presentations to cater to different learning styles. However, I encourage students to explore beyond the materials provided, engaging in self-directed learning to enhance their understanding..."

Besides, while the lecturers emphasized the importance of preparing quality materials, they were putting in the effort to fully apply the technological tools to ensure the implementation of hybrid teaching. This was interpreted as follows:

R2: "I will also conduct the online class using the um webcam and all the settings."

R3: "...if you want to conduct a hybrid class, we need to have a room that is equipped with all the facilities for the hybrid class. For example, a bigger screen, um, maybe a camera or maybe all the equipment for the hybrid class."

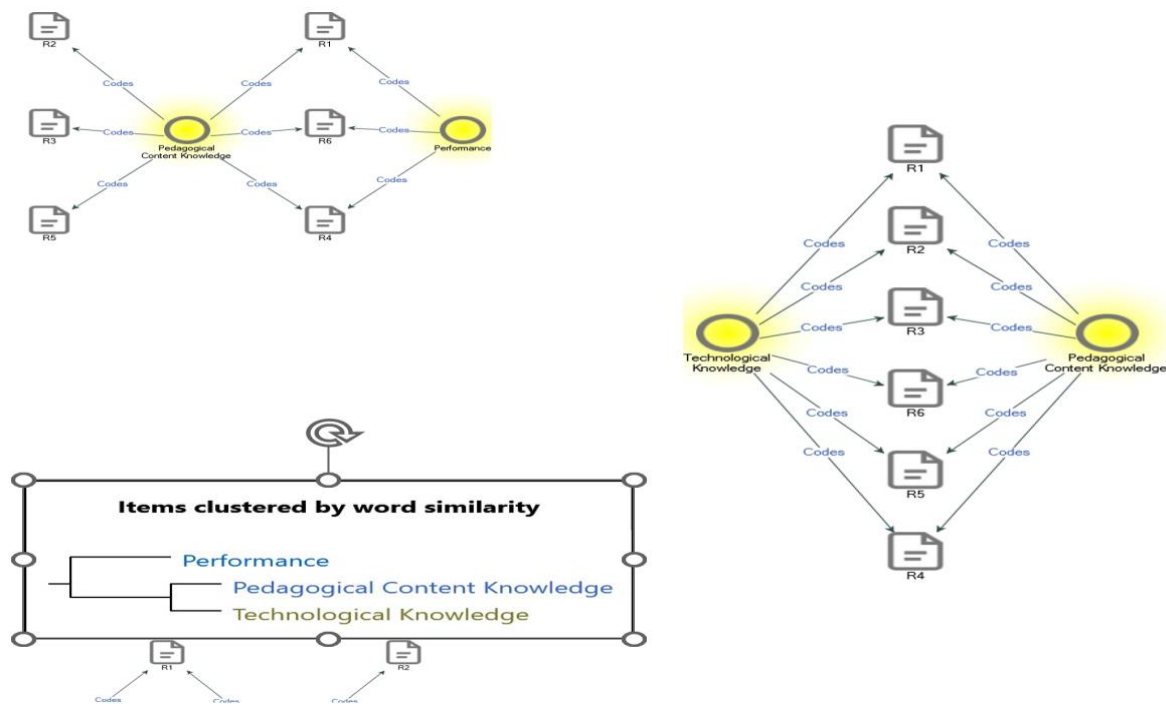
With all these efforts, they were satisfied and satisfied with their contributions, ensuring students were fully engaged in the class and perceived that their students performed well in learning.

R1: "... those who can score the subject, uh, was the one who actively engage in class. I mean, they really understand the discussion, so they can score..."

The result of "items clustered by word similarity" (Figure 2) shows that "Technological Knowledge" and "Pedagogical Content Knowledge" at the lower joined line have closely related terms. They shared a high degree of similarity in their text. "Pedagogical Content Knowledge" and "Technological Knowledge" influence performance. These themes were the two main focuses in the teachers' practices as the comparisons in Figure 2 shows that all responses (R1, 2, 3, 4, 5, and 6) responded consistently on both aspects, indicating "Pedagogical Content Knowledge" and "Technological Knowledge" showed a close relationship as the lecturers focused these two at the same time while practising in class. Besides, Figure 2 suggests that performance is often discussed concerning "Pedagogical Content Knowledge" and "Technological Knowledge". In this context, "Pedagogical Content Knowledge" has a more decisive influence on performance as the analysis showed they were in the same colour.

Figure 2

Items cluster analysis and comparisons of codes in hybrid teaching practices



The findings were proven from the excerpts retrieved from all the respondents. Overall, this study found that university lecturers focused on pedagogical content knowledge to engage students while ensuring the full implementation of the existing technological tools. Even though they were coping with the constraints of limited access to the internet, they believed that with more effort in the pedagogical content knowledge, they could cope with the environment and students' practices of hybrid learning.

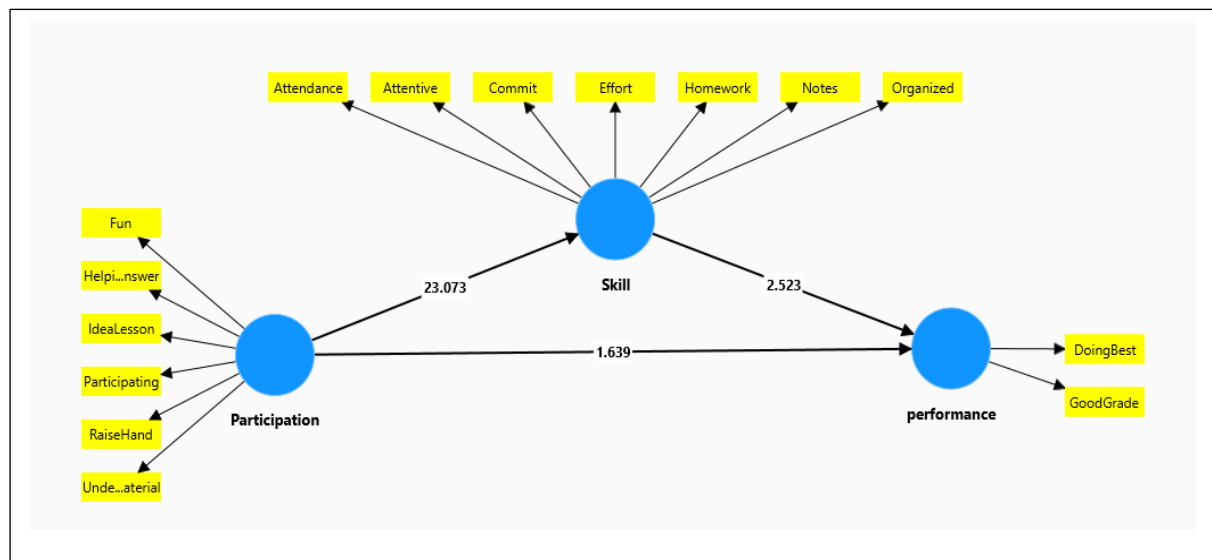
4.2 Finding 2: Students' Practices

Research question two: How do students practice hybrid learning based on mediation effect of "Skill Engagement" on the relationship between "Participation" (Interaction Engagement) and "Performance Engagement"?

To test the mediation of "Skill Engagement" on the relationship between "Participation" (interaction engagement) and "Performance Engagement", path coefficients of the relationship were observed using Partial Least Squares Structural Equation Modelling (Figure 3). The model involves an independent variable named "Participation" (Interaction Engagement), a dependent variable named "Performance Engagement", and a mediating variable named "Skill Engagement".

Figure 3

Mediation effect of Skill Engagement on the relationship between Participation and Performance Engagement



The following results (Table 3, 4, & 5) provide results, the path coefficients, and significance levels for the direct and indirect effects of "Participation" on "Performance Engagement" that are mediated by "Skill Engagement".

Table 3 shows the direct effect results among the three variables (Participation, Skill Engagement, and Performance Engagement). The path coefficient for the relationship between "Participation" and "Skill Engagement" was significant with $\beta=0.883$, $t\text{-value} = 23.073$ and $p\text{-value} = 0.000 < 0.01$, indicating that students' participation was highly influenced by skill engagement. Similarly, the path coefficient for the relationship between "Skill Engagement" and "Performance Engagement" was significant with $\beta=0.531$, $t\text{-value} = 2.523$, and $p\text{-value} = 0.012 < 0.01$, indicating that students' "Skill Engagement" was moderately high and impacted "Performance Engagement". Nevertheless, the path coefficient of the relationship between "Participation" and "Performance Engagement" was insignificant with $\beta=0.346$, $t\text{-value} = 1.639$, and $p\text{-value} = 1.011 > 0.01$. It indicated that students actively participating in the hybrid class did not promise to increase their performance.

Table 3

Path coefficient of the direct effects

	Hypothesis	Path Coefficient	t-value	p-value	Decision
H1	Participation -> Skill	0.883	23.073	0.000	Supported
H2	Participation-> Performance	0.346	1.639	0.101	Not Supported
H3	Skill > Performance	0.531	2.523	0.012	Supported

These results suggest that teachers should focus on **providing input that enhances skills** while engaging students to participate in hybrid activities.

The indirect effect (Table 4) of "Participation" on "Performance Engagement" with "Skill Engagement" is presented in Table 4. The indirect impact ($\beta_{\text{indirect effect}} = 0.442$) was calculated from the interaction between "Performance Engagement" and "Skill Engagement" as illustrated below:

$$\beta_{\text{indirect effect}} = \beta_{\text{participation} \times \text{skill}} \times \beta_{\text{skill performance}} = 0.883 \times 0.531 = 0.469$$

The analysis (Table 4) shows that the indirect effect is significant with t-value = 2.406, $\beta = 0.469$, p-value = 0.016 < 0.05.

Table 4

Path coefficient of the indirect effects

	Hypothesis	Path Coefficient	t-value	p-value	Decision
Indirect effects	Participation -> Performance	0.469	2.406	0.016	Supported
Specific indirect effects	Participation -> Skill -> Performance	0.469	2.406	0.016	

Since the direct effect (0.346) was not significant ($p = 0.101$), but the indirect effect (0.469) was substantial, it confirmed that "Skill Engagement" fully mediates the relationship between "Participation" and "Performance Engagement". The total effect (0.815) was observed from the following calculation:

$$\begin{aligned} \text{Total effect} &= \text{Direct Effect of Participation on Performance} + \text{Indirect Effect of Participation on Performance} \\ &= 0.346 + 0.469 \\ &= 0.815 \end{aligned}$$

The following result (Table 5) shows the total effect ($\beta = 0.815$) of "Participation" on "Performance Engagement" with "Skill Engagement" as the mediating variable, with t-value = 15.217, p-value = 0.00 < 0.05.

Table 5

Total effect of the path analysis

	Hypothesis	Path Coefficient	t-value	p-value	Decision
Total effects	Participation -> Performance	0.815	15.217	0.000	Supported

5. Discussion

The qualitative results revealed that the lecturers had put much effort into teaching pedagogical content. They struggled to prepare good learning content and believed it could guide students to respond

(skill engagement). Furthermore, the lecturers' reminders guided them in the right direction throughout the learning process. To ensure student progress, lecturers provided assessments during their teaching. The quantitative results showed that skill engagement significantly explained the positive relationship between students' participation or interaction engagement and their perceived learning performance. The findings suggested that students should practice skill engagement to ensure a significant impact on their learning, while lecturers provide support.

The findings concluded that a hybrid teaching and learning environment involves students and educators working together to achieve a specific learning objective. Educators must strengthen their pedagogical content knowledge by cultivating a sense of community to create an interdependent environment (Khakimova & Kayumova, 2022). Their role becomes essential when students show their identities disengaged across the platforms, having reduced commitment and feeling less supported. Even though in-person students adhere to the established learning framework, their remote counterparts struggle to facilitate effective in-class communication and responsiveness, as evidence indicates that online students exhibit lower levels of engagement. As a result, educators are committed to enabling students to assume responsibility for their learning by using their engagement abilities to focus and participate effectively.

The quantitative and qualitative findings have created opportunities for further investigation into ways to engage students in hybrid teaching and learning. The lecturers utilised the material in this study to achieve the learning objectives. They put extra effort into the preparation by enriching materials to create a unique environment. When students recognise the significant benefits they can derive from the materials, as posited in the path analysis (quantitative analysis), the environment becomes more favourable, demonstrating the influence of skill engagement. As evident in previous studies, the significant material brings in motivation (van Dulmen et al., 2023). When combined with engagement elements, the attractive material can stimulate students' participation with a sense of community, leading to the appreciation of the outcomes of active learning (Grijpma et al., 2022; McMillan & Chavis, 1986).

On the other hand, this study found that using technology enables a student-centred approach to teaching. Using technology does not guarantee favourable outcomes in education, but implementing specific approaches can lead to some achievement in the teaching process. Focusing on student approaches offers significant advantages (Kerimbayev et al., 2023). Therefore, to produce innovative content in hybrid teaching, teachers' efforts in designing their instruction may need to be interactive (Haleem et al., 2022).

A metacognitive awareness of monitoring one's abilities greatly influences an ongoing learning process (Flavell, 1979). Therefore, lecturers must allocate additional time to prepare adequately, capture students' attention, and remind them effectively. In this study, the lecturers observed that their pedagogical approach to conducting the lesson influenced the students' responses. One of the approaches involved encouraging students to participate in answering questions during class. They also encouraged students to communicate personally through multiple media, ensuring that all students were actively engaged in developing their knowledge. The lecturers' caring nature has fostered a sense of community in the engagement. The relationship between lecturers' interaction with students gives skill engagement support (Gherghel et al., 2023; Sagayadevan & Jeyaraj, 2012).

6. Conclusion

This study elucidates the concerns associated with activities in a hybrid classroom. Presently, lecturers emphasising pedagogical content comprehension recognise the significance of quality teaching materials, illustrating the necessity of developing compelling content and integrating technology to promote student engagement and performance. This study highlights the necessity for lecturers to consistently encourage student skill engagement to enhance overall progress and confidence in academic accomplishment. Therefore, altering pedagogical subject knowledge is crucial in a hybrid instructional setting.

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8. Co-Author Contribution

The authors affirmed that there is no conflict of interest in this article. Author 1 contributed to the conceptualisation, project management, and drafting of the manuscript. Author 2 and Author 3 carried out the data collection (quantitative and qualitative data) and data analysis. Author 4 assisted in the revision process and enhanced the overall quality of the manuscript. Author 5 undertook language editing and proofreading, ensuring the manuscript's clarity, coherence, and grammatical accuracy prior to submission, while Author 6 assisted in writing the discussion section.

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