

IMPLEMENTATION OF SMART LEARNING DURING THE PANDEMIC THROUGH MOBILE FLIPPED CLASSROOM APPROACH

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Recently, the COVID-19 led to the closure of schools and higher learning institutions, causing significant disruptions to the sector. Academicians were required to do a transition to their teaching methods from face-to-face to online approach. Thus, the study aimed to discover a suitability and usability of implementing flipped classroom approach during the pandemic of Covid-19. The data were collected using quantitative method through established instruments called UTAUT questionnaires from Venkatesh. Data collected were analysed using SPSS 23 to find descriptive analysis (percentage, mean and standard deviation) and *t* test. This study involves lecturers from a prominent private higher learning institution in Malaysia located in Selangor. From the population group identified, researcher employed a purposive sampling by selecting 150 lecturers to be involved with various background in technology literacy. Finding from the research shows more than 90% respondents agreed that mobile flipped classroom is suitable to be implemented especially during the COVID-19 pandemic since they are unable to conduct a face-to-face teaching. Future research is recommended to focus on different groups of respondent background including their technology acceptance and field of expertise.

Keywords: *Flipped Classroom, Mobile, Pandemic, COVID-19, Online Class, Usability, ZPTD, UTAUT*

INTRODUCTION

We live in an era where online learning has become the new norm in the education environment, regardless of the platform used. Nowadays, smart learning has become a popular concept in education (Mutizwa et.al., 2023). As mentioned by Cheung et al. (2021), it highlights how contemporary technologies facilitate the efficient and organized acquisition of knowledge and skills for both learners and educators, offering a more convenient learning experience. The rapid change of technology is turning conventional learning techniques into mobile-based learning (Evans & Matthew, 2013). In 2020, there has been a significant increase in tools for smart learning environments. The arena of mobile learning or m-learning has become mainstream and generated much interest in recent years (Lytridis & Tsinakos, 2017). According to Sarrab et al. (2012), Attewell (2005) and Ganesan and Ravi (2019), m-learning refers to the teaching and learning activities which are transmitted to handheld IT and mobile devices such as Personal Digital Assistants (PDAs), smartphones, laptops and tablet PCs.

Due to the COVID-19 pandemic, more than 1.5 billion learners globally were unable to physically attend schools or universities. In 2020, the global education sector experienced a substantial impact from COVID-19, compelling universities to transition their teaching methods to smart learning (Mutizwa et.al., 2023). The strikes of COVID-19 pandemic to the global industries including the education sector, has given a new norm to entirely switch to the digital platforms as it can assist teaching and learning activities (UNESCO, 2020). The whole systems have changed significantly whereby the government need to ensure that their educational systems are able to perform in an alternative way of environment.

Since students have access to technology especially mobile devices, this becomes the intersection where mobile learning and flipped classroom hit its stride. The first example of flipped classroom was introduced in 2007 by Jonathan Bergmann and Aaron Sams to assist their students who missed classes (Oberer, 2016). El Miedany (2019) defined flipped learning as a teaching strategy in which the conventional classroom-based approach is inverted to learner-centred. Students are exposed to the learning material before class to have a prior knowledge of the topic discussed, while the discussion and assessment were conducted during the class session. The practice is opposed to the traditional learning and was conducted using online platform.

LITERATURE REVIEW

Masrek and Shahibi (2019) describes mobile learning as a learning process that fully utilize mobile devices with a global communication technology. According to Lytridis and Tsinakos (2017), the field of mobile learning attracted much interest based on its advantages. Sharpless et al., as cited in Lytridis and Tsinakos (2017), stated that mobile learning, also known as m-learning, offers flexibility, portability, and availability of content at any time. Alam and Aljohani (2020) highlighted that the use of m-learning can assist educational institution to expand learning accessibility whereas improve interactivity of learning behaviour according to learner's time and place. The learners are not limited to a schedule or specific time for a learning session, instead they are free to access learning materials in their own space and time if they carry the devices with them.

Besides, m-learning features ease of use, where learners can use and explore their devices daily without dealing with complicated new tools. It is also able to reduce their cognitive loads and improve speed in performing tasks that are given by the instructor or teacher since the resources are available online. Furthermore, mobile learning eliminates geographical boundaries while at the same time promotes learning collaboration between different groups (Masrom et.al., 2016).

In Malaysia, mobile learning begins in 2010 with a prototype developed by Wahab, Osman and Ismail (2010) for primary school students to learn science subject (Masrom et.al., 2016). Then, Wendeson, Ahmad and Harun (2010) established the area by emerging a mobile learning tool for Windows mobile application that consist of five modules, followed by other researchers in computer architecture, Islamic education and many others. However, referring to a study by Ismail, Azizan, and Gunasegaran in 2016 on Malaysian students' readiness towards m-learning implementation, majority of respondents from eleven (11) public universities in Malaysia were moderately ready to use the m-learning tool in their university (Ismail, Azizan & Gunasegaran, 2016). In this context, the students needed more hands-on practise and exposure as they were not familiar with the usage of mobile devices related to learning and cognitive activities.

Statistic from Malaysian Communications and Multimedia Commission (MCMC) shows that the number of mobile phone users are higher than the number of citizens, with 30,379 000 mobile phone users registered compared to 28, 250 000 citizens. The figure clearly exposes that majority of Malaysian own a mobile device and have access to operate on their own (Masrom et al., 2016). This shows that even though the usage of mobile devices is increasing from year to year with 30% of the population is youth (MCMC, 2007), the fact is that mobile learning is still in its infancy among Malaysian learners due to several factors, for example, awareness, policy constraint, pedagogical and technological challenges.

Masrom et al. (2016) indicated that even though the number of mobile learning initiative is growing in Malaysia, the acceptance level whether from educators or learners are still low and require proper planning so that adoption and utilization among Malaysians can be further improved. As a matter of fact, the perception of integrating both mobile technology towards current educational practices in Malaysia is under its initial stage (Kankok et al., 2020).

The flipped classroom model is based on the idea where traditional teaching is inverted. Basically, flipped learning is a reverse methodology from the traditional teaching and learning practices (Abd Rahman, Md Yunus & Hashim, 2019). Generally, what has been done in classrooms is shifted or flipped with what has been done by students outside their classrooms. Thereby, instead of students having their lectures inside a classroom and complete their homework outside a classroom, the flipped classroom approach switches the routine where students can enjoy their lectures outside a classroom, anywhere and anytime by listening or watching videos uploaded by the teacher, while attending a comprehensive discussion or complete the coursework during the class session.

As reported by Hussin (2018), the flipped classroom approach seems relevant to the current tendency of realizing the Education 4.0's nine trends because the characteristics are similar by having personalized learning, studying at their own pace, project-based, independent learning, hands-on and others. Both methodologies have the same direction to shift the major learning responsibilities from the teachers to the learners. Teachers or instructors play a role to facilitate learning and support the student-centred approach. Figure 1.0 shows the flipped classroom model by Baker (2000).

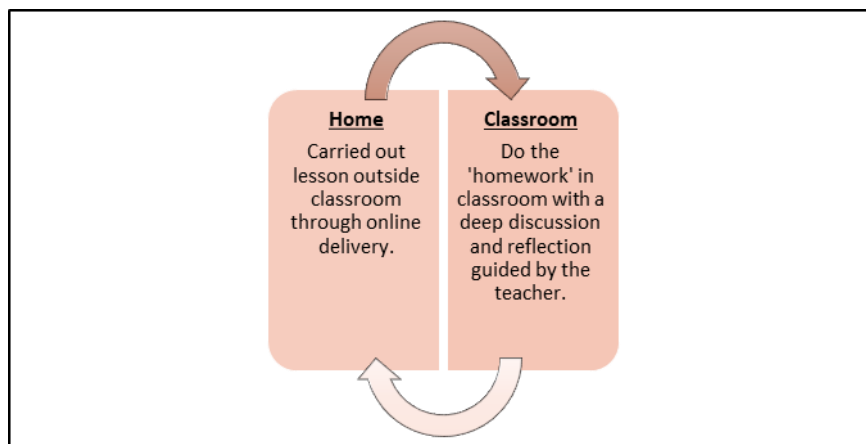


Figure 1.0 Flipped classroom model by Baker

Following several scholars' analysis and studies, there were a number of challenges and constraints identified in implementing a flipped classroom (Betihavas et al., 2016; Shnai, 2017; Lo & Hew, 2017; Du, Fu & Wang, 2014). According to Shnai (2007), challenge in realizing flipped learning is the lack of skills and knowledge among lecturers in realizing the flipped classroom to their students. The implementer or specifically teachers have minimal or

no experience in handling flipped classroom methodology; this requires them to attend training to have better exposure and understanding on flipping. This phenomenon disrupts their confidence in believing that flipped learning is better and effective compared to the classic type of teaching (Wang, Jong & Towey, 2015).

Besides that, flipped learning approach increases the time demanded from teachers to create videos and some of them lack the skills to create videos to be uploaded for students' view. According to Lo and Hew (2017), the major problem in a flipped classroom is the increase in teachers' workload to create the flipped learning materials before they start class.

In Malaysia context, there were a few research related to literature review in a flipped classroom as done by Halili and Zainuddin (2015) and Zainuddin and Halili (2016) which contributes valuable information in assisting other researchers to explored in depth about the flipped classroom approach. Muniandy (2018) explored the flipped classroom effectiveness approach on 60 secondary students. The recent study done by Ali et al. (2019) was conducted to determine students' engagement in establishing a flipped learning environment during the ESL class involving undergraduate students. Meanwhile, Ab Rahman, Md Yunus and Hashim (2019) summarize on the overview of flipped learning studies in Malaysia, followed by Halili et al. (2019) about students' learning styles in a mobile flipped classroom.

Theoretical Framework

This study is based on both Community of Inquiry (CoI) framework and Zone of Proximal Teacher Development (ZPTD) from Vygotsky (1978). The selection of ZPTD is to explore in depth how cognitive growth occurs among the Community of Inquiry (CoI) and contribute to a critical thinking skill in using instruction.

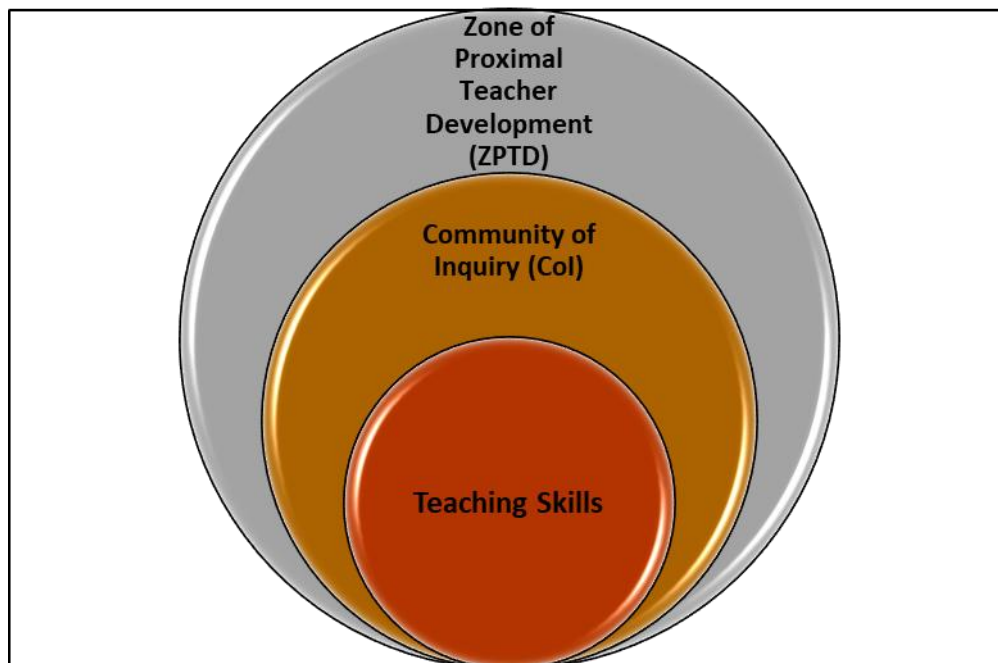


Figure 1.1 Theoretical Framework for the study

The ZPTD indicates on what lecturer can do without any assistance from others and the proximal level they might attain through assistance from more knowledgeable others (supervisor or instruction method). The integration of technology and online learning enables lecturer to become more independent and increase interaction which finally supports the

formation of learning communities. Lecturers also become more independent and increase interaction which finally supports the formation of learning communities; which was the beginning of the Community of Inquiry (CoI) that consist of three elements; teaching presence, cognitive presence; and social presence.

Hence, the overlapping of the Zone of Proximal Teacher Development (ZPTD), Community of Inquiry (CoI) framework and teaching skills in this study gives a better direction in identifying usability of an effective instructional method and at the same time helps lecturers to develop their teaching skills in adapting the Industrial Revolution 4.0 challenge of using digital devices as one of their instructional tools.

METHODOLOGY

To identify lecturer's feedback in using mobile flipped classroom approach, quantitative research was outlined by using a questionnaire survey as the main instrument. In this study, a mobile flipped learning with integration of AR platform called zap codes was used as a tool for smart learning approach during the pandemic. The sampling selected are participants who require to answer the questionnaires survey. It employed a non-random sampling technique by using a sequential mixed-method sampling. The selection of sampling was chosen by the head of section which intend to represent the characteristic and behaviour of the overall population. Referring to the population size, the sample size of representative required for questionnaires survey is 150 respondents. The reason for selecting private HLE is because the institution size and a variety of lecturers with various backgrounds that contribute to richer data. Apart from that, their exposure to the technology also varies and contribute to deeper feedback.

As for instrument, the researcher used an established UTAUT questionnaire survey form from Venkatesh with a total of 47 combination questions for pre and post implementation. Literature recommends that UTAUT could justify up to 70% variances related to technology acceptance behaviour (Venkatesh et.al. 2003). The six constructs in the questionnaire are performance expectancy, effort expectancy, social influence, facilitating conditions, attitude and behavioural intention which identifies as direct influence to adopt technology (Kankok et al., 2020). Performance expectancy is a key factor to affect the adoption of mobile learning since individual believe that it can assist them to gain their job performance (Venkatesh et.al., 2012). The UTAUT questionnaire was reviewed and validated by two experts that fulfil the requirements.

After finalizing the instruments, it was uploaded online before being distributed to the participants. At first, the pre-questionnaires were administered before participants start implementing flipped classroom to explore their attitude in practising current methodology. Then, after completing at least one cycle of flipped classroom method, a set of post-questionnaires survey was given to the lecturers to get their feedback and answer related to the usability of flipped classroom approach introduced to them. All questionnaires were distributed online using Google Forms through email and WhatsApp groups.

Quantitative data analysis was used to analyse data from the questionnaires survey that was administered before and after the implementation phase to measure the usability of mobile flipped classroom approach by using the statistical programme called Statistical Package for Social Sciences version 23.0 (SPSS). A Google Forms link was distributed to get pre and post

feedback, while at the same time monitored by the researcher and supervisor to get their fullest commitment in giving the appropriate response.

FINDINGS AND DISCUSSION

To expedite the researcher’s work in reporting the findings, the scores were divided into three main categories: high, medium and low. The positive response was considered as ‘*strongly agree*’ and ‘*agree*’ while ‘*strongly disagree*’ and ‘*disagree*’ were reflected as a negative response. Meanwhile, the feedback of ‘*neither agree nor disagree*’ were deliberated as a neutral response.

Table 1: Performance Expectancy

Performance Expectancy

Item	Percentage (%)					Mean	SD
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree		
Participant’s Performance Expectancy							
PE1	0	0	16.7	66.7	16.7	4.00	0.58
PE2	0	0	16.7	63.3	20.0	4.03	0.61
PE3	0	0	16.7	56.7	26.7	4.10	0.66
PE4	0	0	16.7	70.0	13.3	3.96	0.55
PE5	0	0	26.7	50.0	23.3	3.96	0.71
PE6	0	0	16.7	63.3	20.0	4.03	0.61
PE7	0	0	16.7	66.7	16.7	4.00	0.58
PE8	0	3.3	16.7	60.0	20.0	3.96	0.71
PE9	0	0	10.0	50.0	40.0	2.30	0.65
PE10	0	16.7	16.7	60.0	6.7	3.56	0.85

This construct was meant to measure the ability to improve the performance using mobile flipped classroom approach and consisted of 10 items. From these findings, more than 80% respondents agree and strongly agree that flipped classroom able to improve their individual performance in teaching. This feedback indicated that a large group of respondents have the confidence in applying mobile flipped-classroom approach which able to lessen their time related to teaching matters. It also increases their performance because they can conduct teaching activities using virtual platform and resume classes as usual. The findings show that mobile flipped classroom usage is significant to their performance expectancy.

Effort Expectancy

Table 2: Effort Expectancy

Item	Percentage (%)					Mean	SD
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree		
Participant’s Effort Expectancy							
EE1	0	0	6.7	73.3	20.0	4.13	0.50
EE2	0	0	26.7	46.7	26.7	4.00	0.72

Item	Percentage (%)					Mean	SD
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree		
EE3	0	0	33.3	56.7	10.0	3.76	0.62
EE4	0	0	0	86.7	13.3	4.13	0.34

In effort expectancy, a questionnaire was developed to explore the ease of use of the technology introduced to them; specifically mobile flipped learning using *zapcode* among the participants. There were four items developed to measure their effort in using flipped approach. Based on the findings, more than 70% of respondents responded that mobile flipped classroom is easy to use, and they understand the positive impact of adopting the method into daily teaching activities. Therefore, it can be summarized that flipped classroom is easy to use and practical to be implemented as one of their teaching methodologies especially in managing online classes during the pandemic. The respondents require minimum supervision to apply this new approach.

Social Influence

Table 3: Social Influence

Item	Percentage (%)					Mean	SD
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree		
SI1	10	23.3	56.7	10	0	2.66	0.80
SI2	10	26.7	30	33.3	0	2.86	1.00
SI3	0	6.7	23.3	70	0	3.63	0.61
SI4	6.7	46.7	46.7	0	0	2.40	0.62
SI5	10	76.7	13.3	0	0	2.03	0.49
SI6	10	80	10	0	0	2.00	0.45

There were six items to measure the social influence variable into the usability of flipped classroom. Social influence means an individual feels the importance that the others believe he or she should use the new system. The findings show that less than 70% respondents agree to the item measured. This shows uncertainty of lecturer in deciding the impact of implementing flipped classroom to their social life, except for item S13 which they agreed that supervisor will subsidize a full sustenance towards their efforts in implementing mobile flipped approach. From the score and percentage reported, it can be concluded that social influence does not contribute a huge impact to their social life in using or applying a mobile flipped classroom into their daily teaching. It does not recognize by their top management as an added value. Based on the findings, it shows that social influence does not have any significant influence towards flipped-classroom usage.

Facilitating Condition

Table 4: Facilitating Condition

Item	Percentage (%)					Mean	SD
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree		
Participant's Facilitating Condition							
FC1	0	0	3.3	93.3	3.3	4.00	0.26
FC2	0	0	0	96.7	3.3	4.03	0.18
FC3	0	0	0	66.7	33.3	4.33	0.47
FC4	0	0	26.7	50	23.3	3.96	0.71
FC5	0	0	16.7	70	13.3	3.96	0.55
FC6	0	0	0	63.3	36.7	4.36	0.49

Facilitating condition refers to a situation which the organizational and technical infrastructure is required to support the existence of technologies. There were six items developed to measure the infrastructure provided. Based on the findings, more than 90% participants are positively satisfied and feel pleased with the facilities provided to them, either pre, during or post mobile flipped classroom implementation. Except for item FC4 and FC5, the percentage is below than 85% and lower than others, but it still reveals that flipped classroom is compatible to be used especially during pandemic and fit their teaching style. In summary, findings show that facilitating condition contribute a significant influence on mobile flipped learning approach among respondents. Respondents are satisfied with the facilities provided to them in adapting flipped classroom as one of their teaching practices and encourage them to implement it continuously for teaching and learning activities.

Attitude

Table 5: Attitude

Item	Percentage (%)					Mean	SD
	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree		
Participant's Attitude							
A1	0	0	6.7	73.3	20	4.13	0.50
A2	0	0	10	60	30	4.20	0.61
A3	0	0	16.7	76.7	6.7	3.90	0.48
A4	0	0	0	86.7	13.3	4.13	0.34
A5	0	0	16.7	60	23.3	4.06	0.63
A6	0	0	0	73.3	26.7	4.26	0.44

Item	Percentage (%)					Mean	SD	
	Participant's Attitude	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree			Strongly Agree
A7		0	0	16.7	66.7	16.7	4.00	0.58
A8		0	0	30	63.3	6.7	3.76	0.56
A9		0	0	20	70	10	1.90	0.54

Attitude becomes one of the important constructs since it plays a significant role to the individual's intention to use the technologies. Attitude was chosen because according to UTAUT, it points the individual's feeling about performing the targeted behaviour. From the statistic, it shows more than 80% respondents have a good attitude towards the use of flipped approach during the pandemic. In item A8, 30% lecturers were undecided whether to continue using mobile flipped classroom or remain to their current practices. This was only happened to minority group of lecturers, based on their performance, teaching experience and other related matters. Respondents with greater age were not familiar to adapt technology into their teaching practices and have less skills in managing devices, which cause them not interested to continue mobile flipped classroom approach.

The scores point out that attitude give a significant influence on the mobile flipped learning usage among lecturers since majority of the score item has exceed more than 90%. Based on the findings, it can be summarized that the participants have a positive attitude towards implementing the mobile flipped classroom since they feel it was enjoyable, pleasant and interesting to be adapted as one of the teaching practices.

Behavioural Intention

Table 6: Behavioural Intention

Item	Percentage (%)					Mean	SD	
	Participant's Behavioural Intention	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree			Strongly Agree
BI1		0	0	26.7	70	3.3	3.76	0.50
BI2		0	0	33.3	63.3	3.3	3.70	0.53
BI3		0	0	26.7	53.3	20	3.93	0.69

Behavioural intention can be interpreted as a measure of the strength of one's intention to perform a specific behaviour towards the introduced methodology or intervention. Based on the statistic, more than 65% lecturers have a positive behaviour to maintain using mobile flipped classroom more frequently during their teaching process. This is a positive sign and feedback from participants towards the present of mobile flipped classroom method introduced to them. It shows a good intention and engagement in practising flipped classroom, especially during the pandemic.

From the scores and findings reported above, it can be summarized that some items required consideration to be implemented but majority of the items were accepted positively with percentage scores of more than 60% to the *agreed* and *strongly agreed* scales. This indicates

that most of the respondents put their recognition into the new approach and acknowledged the mobile flipped classroom as one of the options to conduct teaching activities in the institute particularly amid the pandemic.

A paired-samples t-test was employed to compare the lecturer’s usability in using the existing current approach integrated with online learning and their usability and acceptance in implementing a mobile flipped learning module.

Table 7: Paired Sample T-Test

		Mean	Standard Deviation
Pair 1	PEbefore	3.22	0.475
	PEafter	3.79	0.543
Pair 2	EEbefore	3.76	0.216
	EEafter	4.03	0.143
Pair 3	SIbefore	3.59	0.685
	SIafter	2.59	0.609
Pair 4	FCbefore	3.09	0.226
	FCafter	4.10	0.186
Pair 5	Abefore	3.11	0.165
	Aafter	3.81	0.734
Pair 6	BIbefore	3.57	0.098
	BIafter	3.79	0.119

From the findings, it can be concluded that lecturers are satisfied with the use of mobile flipped classroom to be integrated into their daily teaching activities, especially when comes to physical classes constraint. In fact, they believe that this approach able to improve the teaching and learning process. This is in line with Hoshang et.al. (2021) which stated that flipped classroom increase teacher’s performance while at the same time enhance the process of teaching and learning. Besides, the use of mobile devices in flipped classroom has gained much consideration from the lecturer since it can attract student’s attention during the class session, as also stated in the study by Abuhmaid (2020). In summary, the paired t-test findings indicate that there was an improvement in lecturers’ performance expectancy, effort expectancy, social influence, facilitating condition, attitude and behavioural intention after the implementation of mobile flipped classroom into their teaching activity. Most of the score shows positive feedback towards the implementation of smart learning during the pandemic through mobile flipped classroom approach.

CONCLUSION

This study investigated the usability of mobile flipped learning module among lecturers during the pandemic. Mobile flipped classroom training was conducted in four stages which was designed based on the Community of Inquiry (CoI) and Zone of Proximal Teacher’s Development (ZPTD) model. During the earliest stage P1, lecturers were encouraged to build their rapport and create a sense of belonging among the communities. At this stage, it is a platform to perceive the lecturer’s ability to fix a task on their own without any assistance and

a *proximal* level they might achieve through strategically mediated support from others more capable (Warford, 2011).

Moving to the next stage in PII, lecturers were encouraged to practice their cognitive competencies whereby the exploration and integration of new ideas take place. They shared their own prior experience followed by a comprehensive briefing and exposure by the instructor about mobile flipped classroom. This is followed by PIII, in which lecturers demonstrate their capabilities in using pedagogical knowledge and skills acquired from the previous stage whereby lecturers were given a space to practically apply and implement their new knowledge gained, also known as ‘theory into practice’ stage.

After conducting the usability survey, quantitative findings show positive feedback by which lecturers agreed that mobile flipped classroom approach is usable especially during the pandemic. The finding also indicates that this new approach gives an improvement to their current teaching practices. Findings revealed that the mobile flipped learning approach was accepted by the lecturers to become one of their teaching approaches, even though it was their first experience trying this method. These positive responses give a clear ‘*signal*’ to the management to consider flipped classroom as one of the pedagogical approaches in the institution by providing ample training and exposure. This was supported by a few studies which indicated that flipped classroom is suitable to become a new approach and a good practice during the pandemic (Latorre-Coscolluela et.al.,2021; O’Flaherty & Phillips, 2015). It was also agreed by Divjak et al. (2022) that agreed the integration of technology makes flipped classroom appropriate to be used for non-face-to-face class session. These findings were able to support the teaching and learning system in Malaysia, particularly in the higher learning institution to transform their pedagogical approach from teacher-centred to a student-centred in supporting the higher order thinking skills among students.

To build upon this study, further research is recommended to focus on different groups of respondent background including their technology acceptance, expertise and institution to get broader findings and information on the use of the mobile flipped learning approach from different perspectives.

REFERENCES

- Abd Rahman, Siti Fatimah and Yunus, Melor Md and Hashim, Harwati, An Overview of Flipped Learning Studies in Malaysia (December 2019). *Arab World English Journal (AWEJ)*, 10(4), 194-203. December 2019.
- Abuhmaid, A. M. (2020). Teachers' Perceptions on the Impact of Flipped Learning on Student Learning and Teacher's Role in Jordanian Schools. *Universal Journal of Educational Research*. 8(3), pp. 1007-1016.
- Attewell, J. (2005). From research and development to mobile learning: Tools for education and training providers and their learners. Paper presented at the *4th World Conference on m-learning Cape Town, South Africa, October 25-28*. Retrieved September 2018 from <http://www.mlearn.org.za/CD/papers/Attewell.pdf>.
- Baker, J. W. (2000). The “Classroom Flip”: Using web course management tools to become the guide by the side. In J. A. Chambers (Ed.), *Proceedings of the 11th International Conference on College Teaching and Learning* (pp. 9-17). Jacksonville, FL: Florida Community College at Jacksonville.

- Betihavas, V., Bridgman, H., Kornhaber, R., & Cross, M. (2016). The evidence for ‘flipping out’: a systematic review of the flipped classroom in nursing education. *Nurse Education Today*, 38, 15–21.
- Cheung, S.K.S., Kwok, L.F., Phusavat, K., & Yang, H.H. (2021). Shaping the future learning environments with smart elements: Challenges and opportunities. *International Journal of Educational Technology in Higher Education*. 18(16), pp. 2-9. <https://doi.org/10.1186/s41239-021-00254-1>
- Du, S.C., Z.T. Fu, and Y. Wang, The Flipped Classroom-Advantages and Challenges. *Proceedings of the 2014 International Conference on Economic Management and Trade Cooperation*, 2014. 107: p. 17-20.
- Divjak B., Rienties B., Iniesto F., Vondra P., Žižak M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: Findings and future research recommendations. *International Journal of Educational Technology in Higher Education*, 19(1), 9. [10.1186/s41239-021-00316-4](https://doi.org/10.1186/s41239-021-00316-4).
- El Miedany Y. (2019) *Flipped Learning*. In: Rheumatology Teaching. Springer, Cham. https://doi.org/10.1007/978-3-319-98213-7_15
- Evans, R., Matthew, A. (2013). A New Era: Personal Technology Challenges Educational Technology. *30th Ascilite Conference*. Macquarie University, Sydney.
- Ganesan, P.K. & Raja, V. (2019). *Mobile Learning*. Digital Education, Poland:APH Publishing Corporation.
- Halili, S.H. & Zainuddin, Z. (2015). Flipping The Classroom: What We Know and What We Don't. *The Online Journal of Distance Education and e-Learning*, January 2015. 3(1), 15-22.
- Hoshang, S., Abu Hilal, T. & Abu Hilal, H. (2021). Investigating the Acceptance of Flipped Classroom and Suggested Recommendations. *Procedia Computer Science*. 184 (2021), pp. 411–418.
- Hussin, A.A. (2018). Education 4.0 Made Simple: Ideas for Teaching. *International Journal of Education & Literacy Studies*. 6(3), 92-98.
- Ismail, I., Azizan, S.N. & Gunasegaran, T. (2016). Mobile Learning in Malaysian Universities: Are Students Ready? *International Journal of Interactive Mobile Technologies*. 10(3), 17-23.
- Kangkok, J., Ambotang, A. S., & Kariming, N. F. A. (2020). Mobile Learning Adoption: A perspective from a Form Six Students in Sabah, Malaysia. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 5(12), 314 - 332. <https://doi.org/10.47405/mjssh.v5i12.563>
- Latorre-Coscolluela, C., Suárez, C., Quiroga, S., Sobradiel-Sierra, N., Lozano-Blasco, R., & Rodríguez-Martínez, A. (2021). Flipped Classroom model before and during COVID-19: using technology to develop 21st century skills. *Interactive Technology and Smart Education*. <https://doi.org/10.1108/ITSE-08-2020-0137>.
- Lo, C.K. & Hew, K.F. (2017). A critical review of flipped classroom challenges in K-12 education: Possible solutions and recommendations for future research. *Research and Practice in Technology Enhance Learning*. 12(4), 1-22.

- Masrom, M., Nadzari, A. S., & Zakaria, S. A. (2016). Implementation of Mobile Learning Apps in Malaysia Higher Education Institutions. *E-Proceeding of the 4th Global Summit on Education, Malaysia*, 15 March 2016, 268-276.
- Muniandy, V. (2018). Effectiveness of Flipped Classroom on Students' Achievement and Attitudes towards English Language in Secondary School. *Journal of Innovative Technologies in Education (JITE)*, 2(2018), 9-15.
- Mutizwa, M.R., Ozdamli, F., Karagozlu, D. (2023). Smart Learning Environments during Pandemic. *Trends High. Educ.* 2023, 2, p. 16–28. <https://doi.org/10.3390/higheredu2010002>
- Oberer, B. (2016). 'Flipped MIS'. The Mobile Flipped Classroom Approach Shown In The Example Of MIS Courses. *International Journal of u and e-Service, Science and Technology*, 9(3), 379-390. <http://dx.doi.org/10.14257/ijunesst.2016.9.3.36>.
- O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: a scoping review. *Internet and Higher Education*. <https://doi.org/10.1016/j.iheduc.2015.02.002>.
- Sarrab, M., Elgamel, L. & Aldabbas, H. (2012). Mobile Learning (M-Learning) And Educational Environments. *International Journal of Distributed and Parallel Systems (IJDPS)*, 3(4), 31-38.
- Shnai, L. (2017). Systematic Review of Challenges and Gaps in Flipped Classroom Implementation: Toward Future Model Enhancement. *16th European Conference on eLearning*. 484-490.
- UNESCO Global Education Coalition. 2020. Available online: <https://en.unesco.org/covid19/educationresponse/globalcoalition>
- Venkatesh (2013) and Alshehri, M.A. (2012). Using the UTAUT Model to Determine Factors Affecting Acceptance and use of e-Government Services in the Kingdom of Saudi Arabia (Unpublished doctoral dissertation). Griffith University, Mount Gravatt, Australia.
- Wang T., Jong MS., Towey D. (2015) Challenges to flipped classroom adoption in Hong Kong secondary schools: Overcoming the first-and second-order barriers to change. *Teaching, Assessment, and Learning for Engineering (TALE)*, IEEE. <http://dx.doi.org/10.1109/TALE.2015.7386025>.
- Warford, M.K. (2011). The zone of proximal teacher development. *Teaching and Teacher Education*. 27(2011), 252-258.
- Wendeson, S., Wan Ahmad, W. F., & Haron, N. S. (2010). Development of mobile learning tool. *Paper presented at the Proceedings 2010 International Symposium on Information Technology - Visual Informatics, ITSIM'10*, , 1
- Zainuddin, Z. & Halili, S.H. (2016) Flipped Classroom Research and Trends from Different Fields of Study. *International Review of Research in Open and Distributed Learning*, 17. <https://doi.org/10.19173/irrodl.v17i3.2274>