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A PROPOSED CONCEPTUAL MODEL FOR FLIPPED LEARNING

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ABSTRACT

This study developed and tested the efficacy of flipped model that is usable as a strategy for teaching and learning. The concept applied Perceived Ease of Use (PEOU), Perceived usefulness (PU), Teaching Method (TM), task Technology Fit (TTF), Behavioral Attitude (BA) as factors influencing the use of the system (flipped learning). The model made used of Technology Acceptance Model (TAM) and Task-Technology Fit (TTF) to develop some hypotheses and some connected determinants. The result of the survey conducted was tested using SmartPLS software package. The outcome of the investigation indicates that Teaching Method (TM) is the highest determinant factor followed by use intention, perceived usefulness, perceived ease of use, behavioural attitude and TTF. This confirmed that student's belief about the manner through which they are been taught (Teaching method) has a great influence on their performance.

Keywords: *Learning, Flipped Learning, TAM, and TTF*

1. INTRODUCTION

Lately, the educational system has advanced with a vast array of teaching and learning facilities. The traditional technique was dominated by facial appearance but now it is a combination of classroom and virtual additives. This feat was made possible following the advancement in technology which created support to both teaching and learning. According to [1], learning definitions vary across disciplines. For instance, Ormrod [2] explains learning in psychology as a long-term change in mental representations due to understanding, while Menzel [3], a neuroscientist sees learning as the capacity to change behaviour owing to personal understanding in a manner that the new behaviour is better adapted to the changed condition of the environment. Learning is therefore described as a progression towards acquiring information, idea and/or understanding things. Learning is categorized into two; active and passive learning. In passive learning, students receive information from instructor through classroom interaction and viewed as a traditional way of learning. Baepler et al [4], established that active learning is student-centred, as it gives chance for peer interaction and discussions compared to passive learning where the major learning activity revolves around the instructor. Examples of active learning methods are blended learning, flipped learning, and gamification. Flipped also known as inverted is a concept that got its root from an experiment performed by a renowned scientist, Earie Mazar, a Professor of Physics at Harvard University way back 90s. To [5,] [6], [7], [8], [9], flipped learning is defined as an instructional strategy to learning wherein teacher provides learning materials to students to use outside class and then use the conventional face to face period for discussion, researches and every other related interaction. The materials could be accessed online or offline in different formats such as audiovisual or text. This, therefore, shifted the teacher's role from being "sage on the stage to guide on the side" as the learning activity is student-centred. The Figure 1 illustrates activities in a conventional face to face class and flipped classroom.

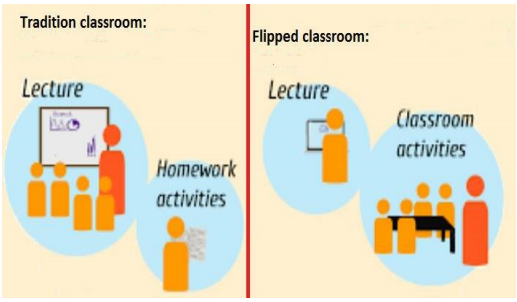

Figure 1: Activities in a conventional face to face and flipped classroom.

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This practice has been widely adopted by educationists. For instance, Bergmann and Sams [6] embrace the model and applied it from kindergarten to senior high school learning. The advantage of this method has been of assistance to those that find study difficult, especially the slow learners. Other researchers accept that flipped classroom inspires students desire to participate in class activities which encourages peer interaction [5, 9, 10, 11]. Flipped classroom create a platform for students to learn at their own pace and convenience as it encourages critical thinking [12],[13],[14],[15]. There are several benefits to this as highlighted by [11]. However, concerns of proponents of flipped classroom arose from the perception of some students who saw the flipped learning as not been comfortable due to some of its challenges which were associated with boredom, [15], [16], [7]. Therefore, this study applies the use of Smart PLS software to investigate in between TAM and TTF the aspect of disengagement (boredom) in a class of students who know what the flipped classroom is all about.

2. RELATED LITERATURES

Flipped learning has been widely adopted by educationists in various field. For instance, Triantafyllou and Tinicenko [17] introduced flipped learning approach in a statistical class for Media Technology students, at the University Copenhagen. He observed that students in the discipline (which is more of Art and Humanities) are less advantage in the statistical course when compared to other students with a science background and as such, need to bridge the gap. The research found that classroom activities become more interactive as the in-class session was mainly used for meaningful discussion when the statistical course was flipped leading to 62.1% success against the previous record of 9.43% in the conventional. Charles-ogan *et al*. [9] researched on students' performance in a mathematical flipped and traditional class respectively at Hallmark Academy Secondary School, Rivers State, Nigeria. One hundred students were considered in the survey conducted and the outcome shows that flipped classroom provides an opportunity for peer instruction, equipped students on their subject before the face to face class and in overall boost performance. The research also found that flipped learning is not gender discriminatory, as performance is not related to the sex of the students. [6] embrace the model in kindergarten all through to senior high school education practice to assist those that find study difficult, especially the slow learners. The study found that each student moves at his/her pace in a flipped class as the instructional materials could be read in multiple folds, video pause and rewind as the case may be while going through their notes, thus creating an avenue for a more interactive session during the in-class period. McLaughlin *et al.* [7] tested flipped learning in a Pharmaceutical school and found that students could learn on their own, while teacher guides them in solving problems, students work as a team, self-reflection, case studies prompt active discussion, while reflection helps students to explore attitudes and values.

2.1 Theoretical Framework of Flipped Classroom

Flipped learning consist of two (2) major parts; interactive group (in class activity) and direct computer-based instruction (outclass). The framework is basically made up of Human interaction and student-centred learning that give rise to the interactive classroom activities at one end, just as the computer-based learning and teacher-centred learning, which also set in motion the explicit instructions at the other end. It is important to state that in flipped learning, the emphasis is the non-usage of face to face class session to introduce course but rather to review already introduce the subject, hence flipped classroom is seen as promoting student-centred learning. Elazab and Alazab [18] and Bishop and Verleger [19] stressed the importance of the student-centred learning approach in an inverted class. The research explained that without the student–centred learning, the flipped classroom cannot be in existence. Refer to figure 2. The in-class activities require human interaction to drive the system, while the out-class component is systematically run through technological innovation. However, conceptualizing flipped classroom solely on the use of computer technologies, including audio-visual discussion for pre-class activities could be an erroneous belief as the in-class activities is an important determinant of either the success or failure of flipped learning [18 and 19]. Figure 2 gives a typical representation of the framework. Two (2) IS theories, TTF and TAM were proposed in the study.

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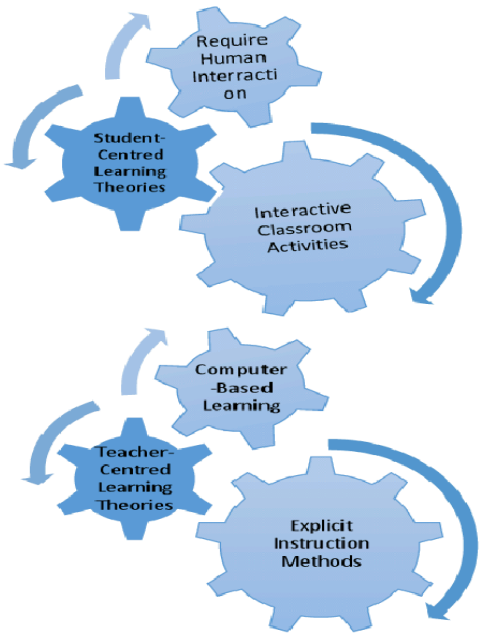

Figure 2: Flipped Classroom Theoretical Framework [18] [19]

2.1.1 Technology acceptance model

Technology Acceptance Model (TAM) define user response in accepting technology in performing a job. In a fresh tool/innovation, a number of factors determine the acceptability of such tool and the task to perform [20]. This paradigm shows how a technology's features affect personal belief of a technology. It specifically examines the influence of four variables on actual usage of technology, including Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude toward use, and Behavioral intention or willingness to use the technology. PU explained handlers' opinion on how the deployment of a technology would increase performance when carrying out a job, while PEOU point the level an operator considers that adoption of a device is free of struggle [20]. Based on forgoing, user desire to embrace a technology is influenced by his/her belief on the ease and usefulness of such tool. The intention on it part equates willingness to utilize the system and mediates the real system usage. As such, PU and PEOU are believed to have a constructive impact on willingness to approve and/or accept the technology [20] [21].

2.1.2 Task-Technology Fit (TTF)

The model is another example of Information System (IS) theories. The theory state that task and technology to be used must not be at variance so as to achieve result [22] [23]. This explained divergent views of whether PEOU and PU could determine to continue use of the technology. Meanwhile, TTF is one of the models that generally utilize the theoretical model for assessing how information system prompts performance, measuring use effects, and judging the match between the task and technology characteristics. Both task characteristics and technology characteristics can influence the TTF, thus decides users' performance and usage [24].

2.1.3 Task-Technology Fit and Technology Acceptance Model

TTF explained how task and technology characteristics influence technology use results. Meanwhile, TTF is anchored on the belief that a good match between the technology and the task to be performed could result in higher usage, while technology characteristics also have a positive effect on TTF. Lee *et al*. [25] found that merging the TAM with TTF give better descriptive influence than the separate use of either of the theory. As such the study proposed the combination of TTF in TAM model. TAM basically concerns the transient convictions and attitude before or after the acceptance of flipped classroom, thus a great result of utilizing flipped classroom is expected when there is a match between task and technology. Hence, task-technology adjustment hypothesis can make up for the deficiency of the TAM in this regard. The combination of the two models (TTF and TAM) gave a more clarification to the variation of IS usage than either the TAM or TTF display alone [26].

3. RESEARCH MODEL AND HYPOTHESES

3.1 Perceived Ease of Use (PEOU)

This construct explains the user trust that using flipped classroom will not be accompanied by any difficulty. A typical example of PEOU is the ease of getting skills in flipped. For instance, previous studies have shown that the construct contributes significantly to behavioural attitude [27]. Also, PEOU could affect the continued intention to use the flipped classroom.

3.2 Perceived Usefulness (PU)

This described the confidence that using an innovation/concept could improve/step-up users' capacity [28]. Therefore, this is seen as the level to which a user understands that using flipped classroom is capable of improving learning system. According to [30], explained that PU is a construct that has been noted to have an effect on attitude. Similarly, PU could affect the continued intention to use the flipped classroom.

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3.3 Teaching Method (TM)

Teaching method using video and text tutorials have been argued to play a pivotal role in teaching/learning. Zhang *et al*. [31] established the positive influences of audiovisual materials on students' learning process. This ensures familiarity with the subject, thus leading to the usage of the in-class period for discussion and/or interactive session. Thus, we propose that TM has positive influence on attitude and continue intention to use.

3.4 Task-Technology Fit (TTF)

In understanding students' intention in using the flipped classroom, attention is placed on individual interaction with the system and task-oriented actions related to the system. This then shows that the key to users' evaluation of the system lies in the individual technology fit and the task-technology fit. Task-technology fit is explained as the match between task and technology as it relates to user intended job to perform [22]. Therefore, TTF is said to have a positive effect on both behavioural attitudes and continue intention to use.

3.5 Behavioral Attitude and Continue Intention

Attitude is keyed to the desire to sustain the use flipped classroom [28]. Therefore, attitude towards using flipped classroom can be viewed as the degree to which a user connotes a positive or negative feeling in the system. Relatedly, [24] maintained that the connection between attitude and intention as enumerated in the TAM implies that attitude serves as an assessment inclination to behaviour.

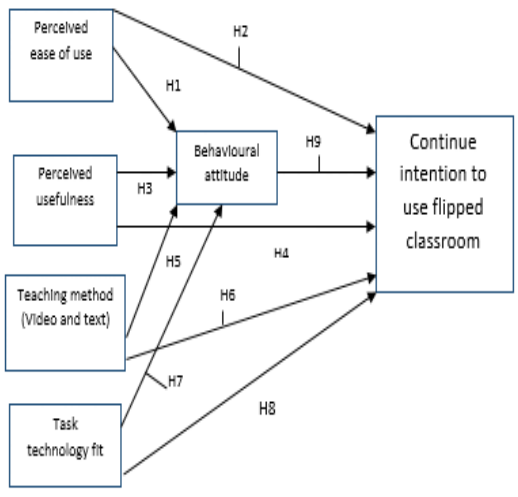

Figure 3: Proposed Research Model

This leads to the following hypothesis

H1: PEOU has a positive effect on behavioural attitude.
H2: PEOU has a positive effect on continue intention to use flipped classroom
H3: PU has a positive effect on behavioural attitude.
H4: PU has a positive effect on continuing intention to use the flipped classroom.
H5: TM (video and text) has a positive effect on behavioural attitude.
H6: TM has a positive effect on continuing intention to use the flipped classroom.
H7: TTF has a positive effect on behavioural attitude
H8: TTF has a positive effect on continuing intention to use the flipped classroom.
H9: Attitude has a positive effect on the continuance of usage of the flipped classroom.

4. RESEARCH METHODOLOGY

In the research, a survey is used to investigate the hypotheses generated in the previous section. Meanwhile, questionnaire development and data collection are explained hereunder

4.1 Questionnaire Development

The questionnaire was divided into two sections: demographic and measurement of constructs in the proposed research model. A 5-Likert scale ranging from strongly agree to strongly disagree was used to measure all the constructs. Perceived ease of use (PEOU) with three questions, PE1, PE2 and PE3 adopted from Wu and Cheng [29], Perceived Usefulness (PU) with two questions, PU1 and PU2 from [23], Teaching method (TM) with 2 questions. Similarly, behavioral intention has two developed questions adopted from Chang [26] just as the last construct continue use intention (CIU) has three questions adopted from Wu and Cheng [29]. See Table 1 in Appendix A for the developed questions.

4.2 Data Collection

Students who understood the concept of the flipped classroom were the target participants of the research. The questionnaire was developed for undergraduate students of the faculty of Built environment, Universiti Teknologi Malaysia. A total of fifty (50) questionnaires were duly completed and returned.

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4.3 Data Analysis

Data collected was analyzed using Partial Least Square (PLS). The statistical analysis software package used was SmartPLS. Students questionnaire responses were treated with the statistical software SPSS. The Composite reliability (CR) was used to assess the dependability of the items and constructs validity and consequently, studied the strength and direction of the relationships among the hypothetical constructs.

5. RESULT AND DISCUSSION

The result of each component shows that the Average Variance Extracted (AVE) and the Composite Reliability (CR) is above the minimum threshold of 0.5, just as the Composite Reliability (CR) for each construct equally exceed the minimum threshold of 0.7. [32] argue that AVR and CR must be greater than 0.5 and 0.7 respectively for the construct to be valid, thus the result is in consistence with [32]

Table 2: Result of AVE and CR

Constructs	Ave	CR
Behavioral Attitude	0.5505	0.7834
Use Intention	0.6422	0.832
Perceived Ease of Use	0.5658	0.7954
Perceived Usefulness	0.608	0.8202
Task Technology Fit	0.5975	0.7288
Teaching Method	0.6305	0.8354

5.1 Discriminant Validity

This was assessed on the squared correlations between variables and their respective average variance extracted. According to [32], the average variance shared between one construct and its measures must exceed the variance shared by the construct and another construct in the model. Therefore, Table 3 in Appendix A shows that the extracted average variance for the variables is reliably greater than the off-diagonal squared correlation. Hence, suggesting satisfactory discriminant validity among variables.

5.2 Partial Least Squares (PLS)

The PLS data analysis was entirely based on the results interpretation methodology described by [33] as the measurement model was investigated, with regards to individual item loadings, internal consistency, convergent validity and discriminant validity. Following to this, the structural model is assessed [33]. Meanwhile, some variables that were not scientifically significant were removed. Figure 4 in Appendix A is the result of the PLS analysis of the proposed model.

5.3 Path Model

The aim of the study is to assess the fundamental or analytical connections between the constructs, and afterwards, confirm or disconfirm the study's theoretical model and hypotheses. The power of these relationships is validated by the amount of variance explained as well as the inner model's path coefficient sizes and their significance. Figure 4 represents the analytical results of the structural model.

5.4 Structural Model and Significance of the Path Relationship

Investigation of the inner model as shown in Figure 4 revealed that perceived ease of use has the strongest influence on behavioural attitude (0.372) followed by task-technology fit (0.240). Important to state that none of the constructs was negative showing that the respondents believe in their use, although teaching method recorded a low value (0.194). Similarly, the behavioural attitude has a strong influence on continue intention use of flipped classroom (0.362). The path coefficients show the path and strength of the relationships between the variables. Meanwhile, the criterion of path relationship in the model was met as the magnitude of the standardized path coefficient is more than the minimum 0.1 value.

6. CONCLUSION

The research has examined various determinants that stimulate students' intention of use of flipped classroom based on the proposed model. These determinants include Teaching method, Perceived ease of Use, Perceived Usefulness and TTF. The outcome of the investigation indicates that Teaching Method (TM) is the highest determinant factor followed by use intention, perceived usefulness, perceived ease of use, behavioural attitude and TTF. This confirmed that student's belief about the manner through which they are been taught (Teaching method) has a great influence on their performance. Further study should be carried out on the improvement of perceived ease of use and behavioural attitude.

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Table 1: Result of PLS Analysis of the Model

Constructs	Items	Measures	References
Perceived ease of use	PEOU1	Learning in flipped classroom is easy	Wu & Chen (2017); Chang (2010)
	PEOU2	Access to materials in flipped classroom is not difficult	
	PEOU3	Interaction in flipped classroom is clear and understandable	
Perceived use	PU1	The learning method encourage sharing ideas	Wu and Chen (2017); Kim et al. (2010)
	PU2	I believe flipped classroom improve my learning performance	
Teaching method	TM1	The video and text tutorials are helpful for me in flipped classroom	Zhang et al., 2016
	TM2	Short video clip eliminate challenge of boringness in flipped classroom	
Behavioural attitude	BA1	I am satisfied using flipped learning approach	Kim et al. (2010); Chang (2010)
	BA2	I believe that using flipped learning is a good idea	
Continue intention use	CIU1	I intend to continue to use flipped learning approach in the future	Wu &Chen (2017)
	CIU2	My intentions are to continue using flipped in the future, at least as active as today	
	CIU3	I accept flipped classroom and will suggest its continual use	

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Table 3: Discriminant validity

	BA	Use intention	PEOU	PU	TTF	TM
Behavioral Attitude	0.7419					
Use Intention	0.3623	0.8013				
Perceived Ease of Use	0.4314	0.1907	0.7521			
Perceived Usefulness	0.1788	-0.0612	-0.0293	0.7787		
Task Technology Fit	0.4162	0.2592	0.271	0.0674	0.7729	
Teaching Method	0.2118	0.3587	0.0032	-0.2604	0.311	0.7768

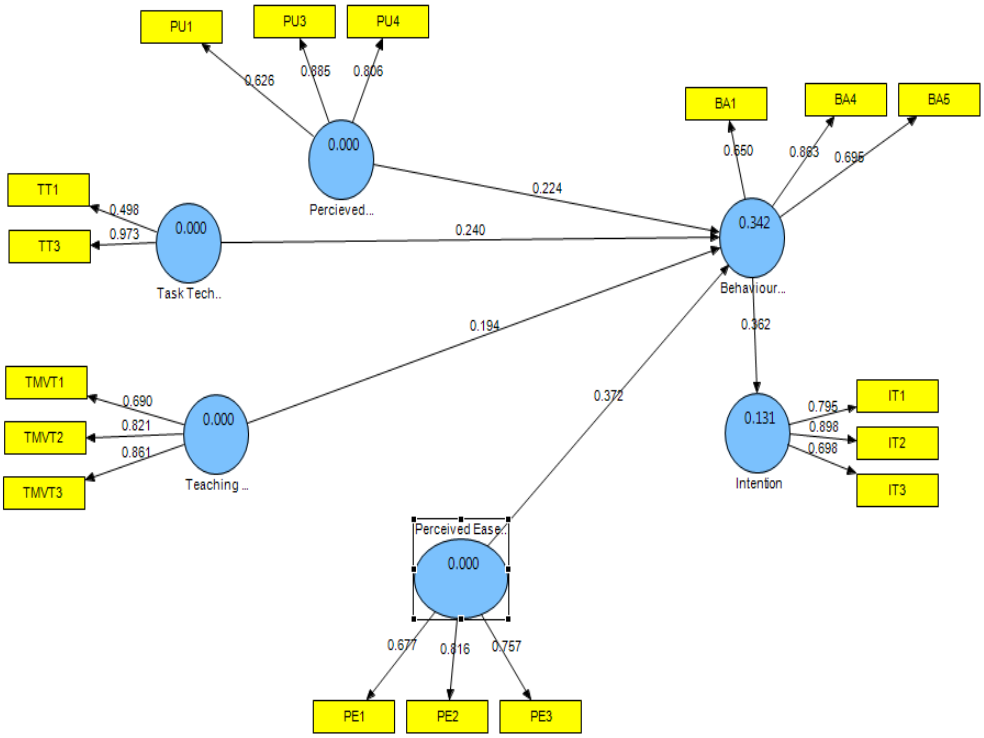

Figure 4: Result of PLS Analysis of the Model