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Informationszentrum (IZ) Bildung
E-Mail: pedocs@dipf.de
Internet: www.pedocs.de

Mitglied der



Promoting Interaction to Enhance Student Perceived Learning and Satisfaction in a Large e-Flipped Accounting Classroom

EVELYN MEI LING WONG^{*1} AND ANN ROSNIDA MD DENI²

☞ This research was conducted to investigate the effects of an e-flipped classroom in promoting interaction to enhance students' perceived learning and satisfaction in a large accounting course. This research examines how e-flipped education, which incorporates pre- and in-class activities, affects students' perceptions of their learning and satisfaction by encouraging learner-content, learner-instructor, and learner-learner interaction. Students enrolled in a second-year management accounting course made up the respondents. A questionnaire with seven indicators presenting each variable was used to gather data. The findings of this study revealed that all three interactions (i.e., learner-content, learner-instructor, and learner-learner interaction) were significant determinants of perceived student learning in the in-class activities, while only learner-content and learner-instructor interactions were the significant determinants of the student perceived learning in the pre-class activities. This study also shows that all three interactions significantly determined students' satisfaction in both the pre-class and in-class activities. Moving forward, a well-designed online course with appropriate interactive activities is vital in promoting a supportive online learning experience.

Keywords: e-flipped classroom, interaction, large accounting class, student-perceived learning, student satisfaction

1 ^{*}Corresponding Author. Sunway Business School, Sunway University, Selangor, Malaysia; evelynw@sunway.edu.my.

2 Educational Development and Innovation Department, Sunway University, Selangor, Malaysia.

Spodbujanje interakcije za izboljšanje zaznanega učenja in zadovoljstva pri študentih v večji e-obrnjeni učilnici pri pouku računovodstva

EVELYN MEI LING WONG IN ANN ROSNIDA MD DENI

☞ Ta raziskava je bila izvedena z namenom raziskati učinke e-obrnjene učilnice pri spodbujanju interakcije za izboljšanje zaznanega učenja in zadovoljstva študentov v večji skupini pri predmetu računovodstva. Preučuje, kako e-obrnjeno izobraževanje, ki vključuje dejavnosti pred poukom in med njim, vpliva na zaznavanje učenja in zadovoljstva študentov s spodbujanjem interakcije med učencem in vsebino, med učencem in učiteljem ter med učencem in učencem. Sodelujoči v raziskavi so bili študentje, vpisani v drugi letnik predmeta poslovnega računovodstva. Za zbiranje podatkov je bil uporabljen vprašalnik s sedmimi kazalniki, ki so predstavljali po eno spremenljivko. Ugotovitve te študije so pokazale, da so bile vse tri interakcije (tj. interakcija med učencem in vsebino, učencem in učiteljem ter učencem in učencem) pomembne determinante zaznavanja učenja študentov pri dejavnostih med poukom, medtem ko so bile le interakcije med učencem in vsebino ter učencem in učiteljem pomembne determinante zaznavanja učenja študentov pri dejavnostih pred poukom. Ta študija tudi kaže, da so vse tri interakcije bistveno določale zadovoljstvo učencev pri dejavnostih pred poukom in pri dejavnostih med poukom. V prihodnje je dobro zasnovan spletni tečaj z ustreznimi interaktivnimi dejavnostmi bistvenega pomena za spodbujanje podporne spletne učne izkušnje.

Ključne besede: e-obrnjena učilnica, interakcija, večja skupina pri predmetu računovodstva, zaznano učenje pri študentih, zadovoljstvo študentov

Introduction

Due to the Covid-19 pandemic, traditional face-to-face classes were conducted either fully online or in hybrid mode. Determining student perceived learning and satisfaction was important in online learning environments during the pandemic, particularly because most students are more used to the traditional face-to-face setting. It is important to understand the effectiveness of online teaching and students' satisfaction with online learning, as these are important indicators of their learning experiences and success.

Ensuring students are engaged in any online courses can be more challenging than in face-to-face on-campus courses (Meyer, 2014). This is because learning does not occur in the same physical location, and interactions are often asynchronous. Because of this challenge, it is vital that instructors employ relevant strategies to ensure that the online course maximises students' experiences and engagement through interactions with other students, the instructor and course content. It is vital that the quality of the interactions between these components become one of the main focuses of online sessions (Meyer, 2014) and that similar emphasis be given to each type of interaction (Moore, 1989). Lack of interactions during online learning can be a serious concern as previous studies have determined the positive influence of interactions on student satisfaction in distance learning (Moore & Kearsley, 1996). Numerous other studies have confirmed the importance of learner-content interaction and learner-instructor interaction; however, learner-learner interaction in the online learning environment remains a topic of debate (Battalio, 2007; Kuo et al., 2014).

This study is inspired by Moore's transactional distance theory and will, therefore, focus on all the three types of interaction that Moore (1989) cited: learner-content interaction, learner-instructor interaction, and learner-learner interaction. The purpose of this action research study is firstly to explore the impact of interactions on both the students' perceived learning and their satisfaction. Previous studies investigated the impact of interactions on overall student satisfaction (Kuo, 2014; Kuo et al., 2014; Moore & Kearsley, 1996); however, this study will investigate how these interactions affect students' perceived learning and satisfaction, specifically during pre- and in-class activities. Secondly, many previous studies that investigated the influence of interaction on student satisfaction were conducted in the context of online courses or distance education (Eom et al., 2006; Kuo, 2014; Kuo et al., 2014; Moore, 1989, 1991; Sher, 2009) but limited studies have been conducted to investigate similar links in the context of the e-flipped classroom (eFC). Thirdly, most of the previous studies were conducted in the Western context, while this study is conducted in

an Asian context in which 95% of the students are Malaysian. Lastly, few studies on the area investigated were conducted within the context of accounting education in higher education. The current study is thus vital.

The next section reviews the relevant literature on the importance of all the three types of interaction from the perspective of Moore's transactional distance theory followed by the influence of interaction on student perceived learning and satisfaction and the use of eFC to promote interaction and engagement.

Perceived Learning and Student Satisfaction

Perceived learning is the student's interpretation of his/her capability in understanding the course content and in applying the principles or concepts learned in the course to achieve the course learning outcome (Hiltz, 1988), while, according to Astin (1993), students' satisfaction can be defined as their perception and perceived value towards their college experience and education received while attending an educational institution.

Student satisfaction is an important indicator of the quality of their learning experiences (Moore & Kearsley, 1996) and student success (Noel-Levitz, 2018). Timely feedback from instructors to their learners is viewed as a top priority in improving student satisfaction (Noel-Levitz, 2018). Many researchers have investigated student satisfaction in online courses and distance learning and identified interactivity as one of its key predictors (Bolliger & Martindale, 2004; Hiltz, 1988; Kuo et al., 2013; Sher, 2009). All three interactions (i.e., learner-content interaction, learner-instructor interaction, and learner-learner interaction) were positively associated with how satisfied the students felt and how much they thought they had learned (Bernard et al., 2009).

Learner Interactions

According to Moore (1991, p. 2), transaction distance is the 'physical separation that leads to a psychological and communications gap, a space of potential misunderstanding between the inputs of instructor and those of the learner'. In a previous study, Moore (1989) describes transactional distance theory as interaction or dialogue. Moore's three interactions from the transactional distance theory (i.e., learner-content interaction, learner-instructor interaction, and learner-learner interaction) are one of the learning theories that can be applied to promote effective student engagement; these theories are also known as engagement strategies (Meyer, 2014).

Learner-content interaction is a one-way flow of information from the course content to the student (Moore, 1989). This is a highly active individualised

process that occurs between the student and the course content, either in terms of recorded videos, PowerPoint slides, group discussion, peer review, reflection, and more. Learner-instructor interaction refers to the two-way reciprocal communication between the course instructor and learners by motivating the students to learn and providing guidance and support when needed (Moore, 1989). Moore (1989) further asserted that learner-instructor interaction was highly desirable by many learners as the feedback provided by the instructor is 'especially valuable in responding to the learners' application of new knowledge' (p. 3). Learner-learner interaction refers to the interactions between one student and another or among a small group of students working on any class activities in a collaborative manner (Moore, 1989; Moore & Kearsley, 1996). This will allow students to learn from each other by exchanging ideas (Salas-Rueda et al., 2022) and is indeed crucial in their learning, sometimes even more so, as students may understand their peers' explanations better and easier compared to that of their instructors.

Previous studies have reported the importance of interactions to promote better student satisfaction in online courses (Bickle et al., 2019; McCormack, 2010; Moore & Kearsley, 1996; Wong, 2023a; Wong, 2023b). Online courses with high levels of interactivity result in higher levels of student motivation, improved learning and satisfaction compared to online courses with lesser interactive learning activities (Croxtton, 2014).

Some studies reported learner-content interaction as the most important determinant of student satisfaction in online learning compared to learner-instructor interaction and learner-learner interaction (Chejlyk, 2006; Keeler, 2006). According to Tuovinen (2000), learner-content interaction is reported as the most important interaction as it is where student learning takes place. Therefore, students tend to prioritise learner-content interaction rather than the learner-instruction interaction or the learner-learner interaction in online courses (Conrad, 2002). Similarly, Kuo (2014) reported that learner-content interaction was the only significant determinant of African American students' satisfaction in an accelerated online course offered by a university in the United States. Kuo et al. (2014) also found learner-content interaction to be the strongest determinant of student satisfaction in a fully online setting.

Many studies have reported the significant impact of learner-instructor interaction on student satisfaction and perceived learning in online courses (Fredricksen et al., 2000; Moore, 2014; Sher, 2009). According to Sher (2009), learner-instructor interaction is one of the most critical factors in enhancing student satisfaction in an online course. This is in line with the findings of Battalio (2007), who concluded that learner-instructor interaction was the most required interaction in his summary from several online studies. The timeliness and quality of

instructor feedback have been proposed as the reason learner-instructor interaction is a major predictor of student satisfaction (Walker & Kelly, 2007). Parahoo et al. (2013) found similar results in Saudi Arabia, where faculty interactions had a significant impact on the satisfaction of male students, especially in terms of faculty empathy, availability of faculty and promptness of faculty feedback. Other studies with similar findings are reported by Goh et al. (2017). For example, Fredericks et al. (2004) and Gray and DiLoreto (2016) also found a significant impact of learner-instruction interaction on student-perceived learning. However, the relationship between learner-instructor interaction with student satisfaction appears inconsistent in the studies by Hamdan et al. (2021), Kuo et al. (2014), and Li and Jhang (2020), as the interaction between learner and instructor was not found to be a determinant of students' satisfaction in their online learning.

In contrast, some studies have suggested that improved student satisfaction and learning can be achieved by integrating learner-learner interaction, which is necessary for a better online learning experience (Mabrito, 2001; Sher, 2009). Mabrito (2001) stimulated features of the face-to-face classroom in the online business writing course with the inclusion of an asynchronous discussion forum, as well as synchronous discussion and collaborative learning via sharing of research and draft in progress, to promote interactive learning experiences in the online business writing course. This study concluded that in order to enhance the online learning experience and boost student satisfaction, learner-learner interaction is crucial (Mabrito, 2001). The findings of this study were replicated in other studies on learner-learner interaction, for example, Goh et al. (2017) and Parahoo et al. (2015). A recent study by Li and Jhang (2020) also found similar results whereby learner-learner interaction is evident and positively related to promoting student satisfaction in the online course due to the collaborative group assignment in the online course. Previous studies also suggested learner-learner interaction to be a significant determinant of perceived learning and satisfaction in online courses (Fredericksen et al., 2000; Moore, 2014). Findings in some other studies, however, reported that learner-learner interaction is not essential and may be negligible in online courses as it has no effect on students' satisfaction (Gray & DiLoreto, 2016; Kuo et al., 2014).

Despite the varying outcomes, these studies show that the different types of interactions have some impact on perceived learning and students' satisfaction. These studies also imply that the effects of interactions are very much context dependent. This highlights the complex nature of online learning and the importance of having more research in the area, hence the current study.

e-Flipped Classroom

The traditional flipped classroom (FC) in a face-to-face setting has garnered much acceptance and has been widely adopted to promote active learning and student-centred learning, improve student performance and engagement in the learning activities, as well as promote self-regulated learning and allow students to retain information for a longer time (Garner & Chan, 2019; Gilboy et al., 2015). The FC, which encourages student-centred learning, exchanges lecturing time with hands-on learning activities. Students are required to prepare before the flipped class by watching pre-recorded video lectures and attempting pre-class activities at their own pace. During the in-person session, students connect further by focusing on discussing and applying the concepts learned and engaging in interactive group activities.

Class size and the level of learner-instructor interaction or engagement have been suggested by Garner and Chan (2019) as factors that may influence the effectiveness of the traditional FC. In contrast, a study done by Wong et al. (2019) found that the traditional FC implemented in a large first-year financial accounting course with almost 300 students was successful at promoting engagement by allowing learners to interact and discuss the lesson with other learners with the course instructor, as well as interaction with the course content. The study shows that despite the class size, the FC was effective in promoting students' engagement, most probably because of its design and planning.

As suggested by Barbera et al. (2013), the course design is one of the most influential variables on student satisfaction and perceived learning. This is extended to the context of the FC (Chan et al., 2018). A badly designed FC might affect students' readiness to adopt flipped learning and leave a bad impression on its effectiveness.

In contrast, the eFC is seen as the current trend and has started to make its way as one of the strategies to promote active learning and engagement in online learning, especially during the Covid-19 pandemic (Playfoot, 2021; Stöhr et al., 2020). The pre-class activities for the eFC are similar to those of the traditional FC, in which students are to engage with prepared materials before the in-class session. In the eFC, the in-class activities will be conducted entirely online. Thus, the eFC combines both the asynchronous and synchronous teaching.

There are a few aspects to be considered when conducting eFCs. For one, the absence of face-to-face sessions highlighted the importance of synchronous sessions in any online learning. Knapp (2018), who examined the use of video conferencing in promoting interaction in a flipped online master programme, found that the use of synchronous sessions had successfully promoted interactions as if students were in a face-to-face classroom setting. Phillips and

O’Flaherty (2019) reported the importance of having a competent tutor who is both content-confident and consistent in content delivery as well as trained in using the features available in the virtual classroom to improve student satisfaction with the flipped online nursing course. Recent studies on e-flipped learning show that the eFC is as effective as the traditional one, particularly in improving student satisfaction and perceived learning (Ismail & Abdulla, 2019; Playfoot, 2021; Wong, 2023b).

The Purpose of This Study

Prior studies that examined the relationship between interactions and students’ overall perceived learning and satisfaction were mostly focused on online courses or distance learning in the Western context and were mostly non-accounting-related. The literature review also found that those studies on FC investigated traditional FC, and very few examined the impact of interactions in eFC.

The current study was conducted to fill these gaps. Its main objective was to investigate the impact of interactions in an eFC on students’ perceived learning and satisfaction in the pre-class activities as well as the in-class activities. In supporting this purpose, the primary research objectives are as follows:

- *Objective 1:* To investigate the correlation between interaction (learner-learner interaction, learner-instructor interaction, and learner-content interaction), student-perceived learning, and student satisfaction in eFC instruction.
- *Objective 2:* To investigate the relationship between interaction and student-perceived learning in eFC instruction.
- *Objective 3:* To investigate the relationship between interaction and student satisfaction in eFC instruction.

Method

This study was designed as correlational research to enable the researchers to evaluate the relationships and effects between dependent and independent variables.

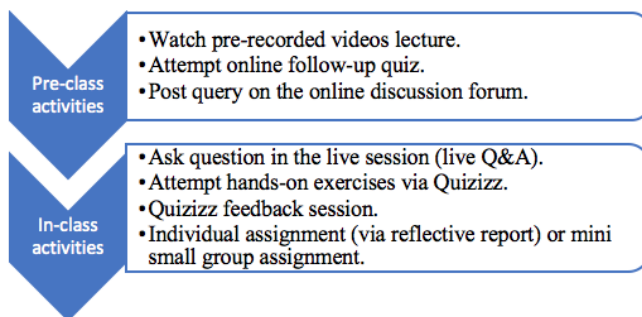
Participants and the Background of This Study

For students majoring in Accounting and Finance in Malaysian business schools, this Management Accounting course is a required second-year course. Over the course of the 14-week course, the eFC was administered during the

two-hour lecture period from Week 2 to Week 6 (a total of five e-flipped sessions). The eFC instruction conducted in this course can be summarised in Figure 1.

Figure 1

Activities conducted in the eFC instruction



Instruments

The online survey was collected in Week 6 of the course after the end of the last e-flipped lecture class. A total of 151 students (82%) consented to participate in the study. There were three scales used in the online survey: 1) interaction scale, 2) perceived learning scale, and 3) student satisfaction scale.

Interaction Scale

The interaction scale was adapted from Kuo et al. (2014). It requires students to rate their level of interaction with either other students or instructors or the course content in this eFC. This scale comprises three subscales: learner-learner interaction (LLI), learner-instructor interaction (LII), and learner-content interaction (LCI), with a total of 18 items. The items are on a 5-point Likert scale, where '1' indicates strongly disagree, and '5' indicates strongly agree. Each subscale has strong reliability, as indicated by the Cronbach alpha reliability values for this study, which vary from 0.84 to 0.89. High ratings suggest a high level of interaction, while low ratings denote a low amount of interaction.

Perceived Learning Scale

In this study, students' perceived learning is measured twofold: perceived learning on 1) pre-class activities and 2) in-class activities in the eFC. These two scales are self-developed survey questionnaires comprising 10 items with 4 items and 6 items for the pre-class activities and in-class activities, respectively.

Both these scales required students to rate their perceived learning in e-flipped instruction on a 5-point Likert scale ranging from '1' (strongly disagree) to '5' (strongly agree). The Cronbach alpha also indicated a strong convergence for both scales, with 0.86 for its reliability coefficients. High scores on the scale indicate high perceived learning towards the eFC activities, while low scores indicate low perceived learning towards the eFC activities.

Satisfaction Scale

Similar to the above, the student satisfaction scale comprises two separate scales asking students to rate their satisfaction with both the pre-class and in-class activities in the eFC. These two subscales are also self-developed survey questionnaires comprising a total of 10 items, with 4 items and 6 items for pre-class activities and in-class activities, respectively. These two scales required students to rate their satisfaction level during this eFC on a 5-point Likert scale ranging from '1' (strongly disagree) to '5' (strongly agree). Internal consistency reliability, as estimated with Cronbach alpha for the two scales, was reasonably high: 0.84 for both scales. High scores indicate high student satisfaction with the eFC instruction, while low scores indicate low student satisfaction with the eFC instruction.

Data Analysis

Descriptive statistics were used to analyse the Likert scale responses, and SPSS software (version 25) was used for statistical analysis. To determine whether there was a relationship between the pre-class and in-class activities of the eFC and the learner-learner, learner-instructor, learner-content interactions, student-perceived learning, and student satisfaction, the Pearson correlation was computed. In addition, one-way analyses of variance (ANOVA) and multiple regression analyses were used to examine the effects of learner interaction with instructor, content, and other learners on student satisfaction and perceived learning in pre-class and in-class activities in the eFC instruction.

Results

Descriptive Analyses of Interactions, Perceived Learning and Student Satisfaction in e-Flipped Classroom Instruction

Table 1 indicates the mean score, midpoint, or median, standard deviation and reliability information for each scale based on the sample collected in this study. All three types of interaction had mean scores ranging from 3.48 to 4.07, with learner-instructor interaction ($M = 4.07$, $SD = 0.55$) having the highest mean score and higher than the median. This is followed by learner-content interaction ($M = 3.91$, $SD = 0.76$) and learner-learner interaction ($M = 3.48$, $SD = 0.65$), which had the lowest mean score, with both of these scales had an average mean score slightly below their median.

Students perceived learning on the pre-class and in-class scales as high, with mean scores of 4.08 ($SD = 0.63$) and 3.98 ($SD = 0.62$), respectively. Students perceived learning in the pre-class had an average mean score higher than the median score of 4.0, while the perceived learning for the in-class activities had an average mean score slightly lower than the median score by 0.02. Both the students' satisfaction with the eFC instruction for both pre-class and in-class activities was high, with a mean score of 4.11 ($SD = 0.70$) and 4.05 ($SD = 0.61$), respectively. For the satisfaction subscale, the average mean score was higher than the median score of 4.0, as reflected in Table 1 below.

Table 1

Descriptive statistics

	Mean	Median	SD	α
LCI	3.91	4.0	.76	.89
LII	4.07	4.0	.55	.84
LLI	3.48	3.5	.65	.87
PL - Pre-class	4.08	4.0	.63	.86
PL - In-class	3.98	4.0	.62	.86
SS - Pre-class	4.11	4.0	.70	.84
SS - In-class	4.05	4.0	.61	.84

Note. LCI - learner-content interaction, LLI - learner-learner interaction, LII - learner-instructor interaction, PL - perceived learning, and SS - student satisfaction.

Relationship Between Interactions, Perceived Learning and Student Satisfaction in e-Flipped Classroom Instruction

Objective 1: Correlations between interactions, perceived learning, and student satisfaction in e-flipped classroom instruction

From Table 2, all three interactions with students' perceived learning in the pre-class and in-class activities have moderate positive relationships except for learner-learner interaction during pre-class activities, which has a weak positive relationship with perceived learning. Learner-content interaction ($r = 0.59, p < 0.01$) correlated the greatest with the student's perceived learning on the pre-class activities, while learner-instructor interaction ($r = 0.61, p < 0.01$) correlated the greatest with the student's perceived learning on the in-class activities in this eFC. This shows that the pre-class and in-class activities that promote interaction between learners with content, learners with the instructor, or learners with another learner may also promote students' perceived learning.

Additionally, the results demonstrated that all three interactions had moderately favourable associations with students' satisfaction with the in-class and pre-class activities. Among the three interactions, learner-learner interaction correlated the least with student satisfaction in both the pre-class activities and in-class activities with $r = 0.45, p < 0.01$ and $r = 0.44, p < 0.01$, respectively. However, it seems that learner-content interaction ($r = 0.65, p < 0.01$) correlated the greatest with student satisfaction with the pre-class activities, while the learner-instructor interaction ($r = 0.60, p < 0.01$) correlated the greatest with the student satisfaction with the in-class activities in the eFC. This shows that the pre-class and in-class activities conducted during the eFC, which promote interaction between learners with content, learners with instructors, or learners with learners, may also enhance students' perceived satisfaction.

Table 2

Correlations between interactions, perceived learning, and satisfaction

	LCI	LII	LLI	PL - Pre-class	PL - In-class	SS - Pre-class	SS - In-class
LCI	1						
LII	.60**	1					
LLI	.46**	.47**	1				
PL - Pre-class	.59**	.48**	.37**	1			
PL - In-class	.52**	.61**	.51**	.60**	1		
SS - Pre-class	.65**	.54**	.45**	.77**	.70**	1	
SS - In-class	.52**	.60**	.44**	.56**	.87**	.72**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Objective 2: Relation between interaction with student perceived learning in e-flipped classroom instruction

Multiple regression was conducted to determine whether the three interactions (i.e., learner-content interaction, learner-instruction interaction, and learner-learner interaction) predict student perceived learning on the eFC instruction for both the pre-class and in-class activities. Regression results indicated that the model with the three interactions significantly predicted student-perceived learning for both the pre-class activities and in-class activities in the eFC instruction with $F(3,147) = 30.342, p < 0.001$ and $F(3,147) = 40.475, p < 0.001$, respectively. The model accounts for 37% of the total variance in student-perceived learning on pre-class activities and 44% of the total variance in student-perceived learning with the in-class activities in the eFC.

Nevertheless, a closer examination of the model's coefficient estimates revealed that, as Table 3 illustrates, the learner-learner interaction was not a significant predictor ($p > 0.05$) of students' perceptions of their own learning from the pre-class activities. After the learner-learner interaction was eliminated from the model, the findings revealed that $F(2, 148) = 44.876, p < 0.001$, which explained 37% of the variance in how students rated their learning on the e-flipped pre-class activities. This indicates that the model is marginally stronger in the absence of learner-learner interaction and has no effect at all.

Learner-content interaction was found to be more significant among those significant predictors in the pre-class activities. In contrast, the learner-content interaction was the weakest of the three interactions during the in-class activities, while the learner-instructor contact was the strongest and most significant.

Table 3

Results summary of regression analysis (N = 151)

	<i>B</i>	Std Error	<i>b</i>	<i>t</i>	<i>p</i> -value
PL - Pre-class					
LCI	.378	.070	.453	5.386	.000
LII	.197	.097	.171	2.031	.044
LLI	.080	.074	.082	1.081	.281
PL - In-class					
LCI	.143	.065	.175	2.213	.028
LII	.435	.089	.386	4.863	.000
LLI	.235	.068	.247	3.449	.001

Note. The variance inflation factors (VIFs) are all below 2.

Objective 3: Relation between interaction with student satisfaction in e-flipped classroom instruction

Regression results indicated that the model with the three independent variables of interaction significantly predicted student satisfaction for the pre-class activities in the eFC with $F(3, 147) = 42.908, p < 0.001$ and accounted for 46% of the total variance in student satisfaction with the eFC pre-class activities. The regression results also revealed the model significantly predicted student satisfaction with the in-class activities with $F(3, 147) = 34.809, p < 0.001$ and accounted for 40% of the total variance in student satisfaction with the eFC in-class activities. Hence, all three interactions (i.e., learner-content interaction, learner-instructor interaction, and learner-learner interaction) were significant predictors of student satisfaction with both the pre-class and in-class eFC activities, as shown in Table 4.

Learner-content interaction was once again the most important factor of student satisfaction with the pre-class activities among those significant predictors, whereas learner-learner interaction was the least significant. The learner-instructor interaction was the greatest and most important indicator of student satisfaction with the in-class activities, which is consistent with the findings on perceived learning. In terms of predicting their level of satisfaction with the in-class activities in the eFC, the learner-learner interaction was similarly found to be the weakest of the three interactions.

Table 4

Results summary of regression analysis (N = 151)

Variables	B	Std Error	b	t	p-value
SS - Pre-class					
LCI	.427	.072	.463	5.931	.000
LII	.244	.100	.192	2.447	.016
LLI	.155	.076	.144	2.035	.044
SS - In-class					
LCI	.164	.065	.205	2.508	.013
LII	.443	.090	.402	4.901	.000
LLI	.144	.069	.155	2.092	.038

Note. The VIFs are all below 2.

Discussion

This study attempted to understand the relationship between learner-content, learner-instructor, and learner-learner interaction with student-perceived learning and student satisfaction in the pre-class and in-class activities in an eFC. Consistent with prior research on the significance of interactions on students' satisfaction in online courses (Kuo et al., 2014; McCormack, 2010; Moore & Kearsley, 1996), the findings of this study have confirmed the importance of interactions in an online FC instruction and emphasise the importance of all interactions: learner-content, learner-instructor, and learner-learner interaction. The nature of the interaction may differ from study to study, but the overall principle of the importance of interactions in online learning, either in asynchronous or synchronous learning, remained consistent. This study contributes to the literature on the significance of interactions on students' perceived learning and their satisfaction in the online learning environment, especially in the classroom where e-flipped instruction is adopted.

The findings in this study also found that all three interactions are significant determinants of student-perceived learning in in-class activities; however, only learner-content and learner-instructor interaction are found to be significant determinants of student-perceived learning in the pre-class activities in this e-flipped instruction. This study also found that the three interactions in this study are significant determinants of student satisfaction in both pre-class and in-class activities. As such, the results from this study supported the transactional distance theory of Moore (1989; 1991) and Moore and Kearsley (1996), who have highlighted the importance of the three interactions as an engagement strategy in an online learning environment.

Learner-Content Interaction

Consistent with the literature, our study reported learner-content interaction as a significant determinant of both student-perceived learning and satisfaction in pre-class and in-class activities (Chejlyk, 2006; Keeler, 2006; Kuo, 2014; Kuo et al., 2014; Tuovinen, 2000).

During the pre-class activities, students' learning takes place via the pre-recorded video lectures. Understandably, this has resulted in the students prioritizing learner-content interaction more than the interaction with other learners or with their instructor (Conrad, 2002). The online follow-up quiz may have further enhanced students' engagement with the content as they would need to refer to the pre-recorded video when attempting the quiz.

The in-class activities, which included 1) an activity with Quizizz, an online quiz platform, and 2) an individual reflective report, or 3) a small group discussion, may have further motivated students to engage with the content. For example, the activity with Quizizz may have helped students evaluate and reinforce their understanding of what they have learned prior. The individual reflective report would further help them engage with content as they were asked to summarise learned concepts and concepts with which they were still struggling. In addition, the small group discussion, which required them to discuss assignment questions with their peers, may have further reinforced their engagement with content. This shows that the design activities may have enhanced learner-content interaction, which had a positive impact on students' perceived learning and satisfaction in this eFC.

Learner-Instructor Interaction

Our study discovered that 1) learner-instructor interaction significantly determined student perceived learning and satisfaction in both the pre-class and in-class activities, and 2) learner-instructor has the strongest positive relationship with perceived learning and student satisfaction in the in-class activities. In this regard, the result of this study deviates from prior studies by Hamdan et al. 2021; Kuo, 2014 and Li and Jhang, 2020. The study done by Li and Jhang (2020), for example, reported learner-instructor interaction as not a significant predictor of student satisfaction in the online social work undergraduate classroom. The authors found that the results could be affected by the content of the interaction, which could be due to an inexperienced instructor who taught the course online for the very first time and had put more focus of the interaction on course administration-related issues than content-related interaction.

There are several potential reasons for the departures of the results in this study as compared to the above studies and in supporting the significance of learner-instructor interaction in the online learning environment. Firstly, the eFC was designed to promote learner-instruction interaction, particularly through instructor's feedback, for example:

1. Instructor's feedback to students' questions and confusion with content through the online discussion forum (pre-class).
2. Instructor's automated feedback for the online follow-up quiz (pre-class).
3. Instructor's feedback for questions posted during the Q&A session (in class).
4. Instructor's feedback for the Quizizz activity (in-class).

5. Instructor's response to students' individual reflective reports or the small group discussion on the assignment (in class).

The feedback received from the instructor and the (nearly) immediate response to students' queries may have a positive impact on student's perceived learning and satisfaction with both the pre-class and in-class activities. Perhaps students could have been satisfied with their learning experiences, as many different means are made available for them to get feedback from their instructor, as the instructor plays a crucial role in reaffirming students' understanding of the principles and concepts learned (Moore, 1989). This shows that the instructors' timely feedback, as recommended by Chickering and Gamson (1987), seven principles for good practices in undergraduate education, remains important when supporting learning in an eFC environment.

Secondly, students may have valued instructor's content knowledge as she was an experienced instructor for this course. This is very much in line with the findings of Bolliger and Martindale (2004) and Phillips and O'Flaherty (2019), both who have highlighted instructors who teach in the online courses and the virtual FC should be a good instructor and an effective teaching staff.

Thirdly, since the e-flipped instruction was conducted with a combination of both asynchronous (with pre-class activities) and synchronous (with in-class activities) instruction, the instructor's presence may have been further enhanced. The strong presence of the instructor during pre-class and in-class activities has been appreciated by the students, which could possibly affect their learning positively and result in more satisfied learning.

Learner-Learner Interaction

The finding of this study revealed that learner-learner interaction is also a significant determinant of student-perceived learning for the in-class activities and a significant determinant of student satisfaction for both the pre-class and in-class activities, which is essential in student learning and cognitive development (Moore, 1989; Rawas et al., 2020). However, our study found that learner-learner interaction does not significantly affect student-perceived learning and may be negligible in the pre-class activities as it has no effect on perceived learning, similar to that of Alqurashi's (2019) finding. It is not surprising that learner-learner interaction is not a significant predictor of student-perceived learning in the pre-class activities. This probably could have been due to the design of the pre-class activities, where learner-learner interaction has not been taken into consideration when designing the e-flipped instruction.

Perhaps another reason could be that students find it more reliable to ask the course instructor through the online discussion forum than asking their peers, as their course instructor is a course expert (Dixson, 2010).

Our findings revealed that learner-learner interaction significantly predicted student satisfaction in both the pre-class and in-class activities, which contradict those reported by Gray and DiLoreto (2016), who discovered that learner-learner interaction significantly impacted student-perceived learning but did not significantly affect student satisfaction. Kuo et al. (2014) reported that learner-instructor and learner-content interaction were significant predictors of student satisfaction, but learner-learner interaction was not when group activities were not required for learners. Our study conformed with this finding, as when the live Q&A session and mini small group assignment activities were incorporated as part of the in-class activities, these activities could have encouraged and supported learner-learner interaction. This is also in line with McCormack (2010), who reported that different forms of technology and assignments when used appropriately, enhance communication, and promote quality learning. There is no clear explanation as to why students were satisfied with the learner-learner interaction in the pre-class activities, though they did not find that these resulted in perceived learning. Perhaps students had discussed the content of the pre-recorded video and the online follow-up quiz with their peers outside of class, which is beyond the scope of this study.

Conclusion

This study has contributed to the literature that the strategy and the design of a course are important to promote interaction that results in learning and student satisfaction. A carefully designed course and crafted class activities undoubtedly can influence and promote the interaction among learners with course content, instructor and peers in any classroom setting. Bernard et al. (2009) and Moore (1989) both shared similar opinions regarding instructional design as one of the ways to foster increases in the quality of interactions. Thus, we echo Moore (1989), who states that proper planning using different types of activities and different communication mediums is warranted to ensure the maximum effectiveness of each type of interaction that is most suitable for different course areas or specialisations. The study also shows the importance of an instructor's presence and feedback, particularly in an eFC environment.

This is the first study to have examined all three interactions and have reported the significance of them on student-perceived learning in in-class activities and student satisfaction in both the pre-class and in-class activities,

though only learner-instructor and learner-content interaction are significant determinants in the pre-class activity in the online course using an eFC strategy. Therefore, the result of this study has contributed to the field of online education and shows that it is possible to have all three interactions be a significant predictor of students' perceived learning and satisfaction if the appropriate activities are implemented and incorporated into the design of the course to promote these types of interactions.

However, this study has some limitations. It was conducted in only one cohort of second-year management accounting students and was only conducted once. Future studies should involve a bigger cohort of students, perhaps from different disciplines and different years of study. Data collection may be done more than once for comparison, which may have helped derive better conclusions. Despite this, as this is action research, the sampling and data gathered are adequate to inform the researcher on what worked and what did not work in the eFC for improvement purposes.

Disclosure Statement

The authors have no conflict of interest to declare.

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Biographical note

EVELYN MEI LING WONG is a senior teaching fellow in the field of accounting at the Sunway Business School, Sunway University, Malaysia. With a dedicated focus on advancing accounting education, she conducts research into innovative pedagogical approaches, diverse assessment methods, and the integration of technology to enrich teaching and learning experiences.

ANN ROSNIDA MD DENI, PhD, is an Educational Developer at the Educational Development and Innovation Department, Sunway University. She strategises and supports the professional development of Sunway academics and leads the Postgraduate Certificate in Higher Education Practice. Her research interests include professional development in higher education, technology to support learning, blended learning practices, and international students.