A Study on the Learner's Satisfaction of on-line PBL classes in Korean College

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Abstract

The quick move to non-face-to-face education caused by the sudden attack of the COVID-19 led to many problems such as faculty's burden and stress from the planning and designing of suitable on-line classes, technology system problems for both students and faculty and students' complaints of the low quality of education. Especially Project-based learning (PBL) has more challenges because it is learners-centred and is usually done in face-to-face environment. The primary purpose of this study is to investigate the factors affecting the learner's satisfaction of non-face-to-face on-line PBL classes in terms of interaction and learner's factors during the attack of COVID-19 pandemic. The data Was collected through questionnaires, from 175 undergraduate students at S women's university who took the on-line PBL classes. SEM (Structural Equation Model) was used for empirical test using SmartPLS. The results of the empirical analysis reveal that interaction and media utilization self-efficacy are likely to predict learner's satisfaction.

Keywords: COVID-19, On-line PBL class, Satisfaction, Interaction, IT self-efficacy, Motivation

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1. Introduction

The pandemic of COVID-19 has been on the rise around the world and its effects have changed the normal life in all countries. This all-encompassing change and its impact have been phenomenal in term of maintaining social distancing and educational organizations have also suffered from its negative impact (Choudhary Zahid Javid et al., 2021). COVID-19 has resulted in colleges being shut all across the world, making students out of the classroom as a compulsory safety measure to combat this pandemic (Ghada Refaat El Said, 2021). Colleges rapidly have shifted from the face-to-face delivery mode of different courses and programs to the on-line delivery mode. Courses are conducted on-line via different platforms, including its internal on-line classroom system, video conferencing and open on-line education platforms. On-line education provides solutions to crisis, but the shift from physical classrooms to on-line ones nonvoluntarily created many challenges and difficulties.

On-line education has been recognized as one of the effective educational methods due to its ubiquitous and flexible educational environments. However quick move to on-line education caused by the sudden attack of the COVID-19 led to many problems such as faculty's burden and stress from the planning and designing suitable for on-line classes, technology system problems for both students and faculty and students' complaints of the low quality of education (Seo et al., 2020). The urgent and nonvoluntary imperative to 'move on-line', caused by the Covid-19 has added to the stresses and workloads experienced by college staffs who were already struggling to balance teaching, research, and service obligations, not to mention the work-life balance (Chrysi Rapanta et al., 2020).

Problem-based learning (PBL) can be the most challenged type in colleges because it is learners-centred and is usually done in face-to-face environment. PBL has been an increasingly integral part of education reform around the world (James Cheaney and Tomas S., 2005). PBL is a learner-centred constructivist approach to learning that facilitates the construction of a conceptual network of knowledge in students, which can be then applied in a wide range of practical settings (Creedy and Hand, 1994; Cruickshank and Olander, 2002). However, non-face-to-face on-line PBL classes, especially, have more challenges rather than other types of classes, because PBL is usually conducted in a face-to-face setting. Even though PBL has been shown to be effective for promoting student competencies in self-directed and collaborative learning, critical thinking, self-reflection and tackling novel situations, the need for face-to-face interactions at the same place and time severely limits the potential of traditional PBL (Manwa et al., 2013).

1.1. Purpose of study

The primary purpose of this study is to examine the affecting factors of learner's satisfaction in non-face-to-face on-line PBL classes during the attack of COVID-19 pandemic. This study focuses on learner's factors and interaction based on prior researchers regarding on-line education and PBL.

1.2. Literature review and research model

PBL is the use of a 'real world' problem or situation as a context for learning. The purpose of PBL is to encourage learners' development of critical thinking skills, a high professional competency, problem-solving abilities, knowledge acquisition, the ability to work productively as a team member and make decisions in unfamiliar situations, and the acquisition of skills that support self-directed life-long learning, self-evaluation, and adaptation to change (Albanese and Mitchell, 1993; Ryan and Quinn, 1994). PBL is collaborative, constructive, contextual, and self-directed. Therefore, PBL as an approach to instruction has attracted much attention across disciplines in higher education (Mohammed Saqr et al., 2020) and much research have experienced that the PBL approach to teaching and learning has a significant number of positive impacts on learners (Anna Caroni and Anna Nikoulina, 2021).

Although research has shown that on-line PBL classes advance academic learning, on-line PBL classes involve various requirements regarding educational and technological content (Orit and Dina, 2021). Generally, moving courses online requires more than the digitalization of face-to-face classes; teaching and learning on-line require different approaches. PBL requires a transition from teaching to learning

and from teacher-centred approaches to learner-centred approaches. The on-line PBL classes must maintain student focus, which fosters their interest, curiosity, and deep learning (Hill et al. 2004; Keeton, 2004). Thus, combining PBL and the on-line setting is complex and poses several challenges (SavinBaden, 2007).

PBL is usually conducted in a face-to-face setting, but On-line settings can support PBL as they can facilitate personalized learning regardless of time and space boundaries, making learning more flexible and attractive (Şendağ & Odabaşı, 2009). Therefore, learner's factors and interaction should be considered as the most important determinants of learner's satisfaction in non-face-to on-line PBL classes.

First of all, learner's role is very important in non-face-to-face on-line PBL classes. Effective learning in non-face-to on-line PBL classes can be achieved by learner's self-study and control. In PBL, learners are no longer given lectures or notes, but they have to learn their own based on the problems. Learners in non-face-to-face on-line classes study class materials and post their comments on class board by controlling learning speed by themselves (Jun, 2017; Seo et al., 2020). Learner's motivation is a very important factor in non-face-to on-line PBL classes, because all those learning tasks should be done in an on-line environment. Motivation contributes to accomplishment, endurance, and satisfaction in studying.

Motivation affects the learner's attitude and behavior in classes (Victoria López-Pérez et al., 2011), and that is, learner's motivation is probably the single most important element of learning (Jacob Filgona et al., 2020). A non-face-to-face on-line class requires more motivation than a traditional face-to-face course. Rather than having a set-aside time for students to focus exclusively on their learning by going to class, the learning experience is brought to the learner's home where it must compete against many obstacles such as social interruptions, housework, and entertainment (James Cheaney and Tomas, 2005). Taking non-face-to-face on-line PBL classes require more learner's motivation. Learner's motivation is, therefore, a key to success in non-face-to-face on-line PBL implementation (Nor Farida Harun et al., 2012).

IT self-efficacy is another learner's important factor in non-face-to-face on-line classes. Self-efficacy is people's perceptions of their ability to accomplish a task or an activity successfully, and it can be applied specific domain like computer related sectors. Bandura suggests that a domain-specific version of self-efficacy is more accurate and works better as a concept than general self-efficacy (Bandura, 1997). When it comes to digital technology, different concepts can be used to make self-efficacy more domain-specific such as IT self-efficacy. That is, IT self-efficacy is the person's belief in their ability to use the computer (Petty and Loboda, 2011). IT self-efficacy is people's decision and conviction in their ability to successfully carry out a specific task, using a computer to execute an action that is necessary to manage prospective situations (Nwobu et al., 2016). IT self-efficacy plays an essential role among the students and teachers. Higher levels of IT self-efficacy have a more systematic approach to studying and more willing to put effort into their studies resulting in satisfaction (Jun, 2017; Ove and Vibeke, 2021). Because all learning tasks are processed via on-line network, IT self-efficacy is necessary for effective learning in non-face-to-face on-line PBL classes.

Interaction by instructors should be involved for making up for learner's lack of concentration and solving problems which are accompanied by PBL. Interaction between learners and instructor plays a great role in effective learning tasks by spurring learner's motivation and providing feedback. It leads to learner's active participation and results in learner's satisfaction (Min et al, 2015; Jun, 2017). PBL requires considerable knowledge, effort, persistence, and self-regulation on the part of the students, so facilitator plays a critical role in helping students in the process by shaping opportunity for learning, guiding students, thinking, and helping them construct new understanding (Ranjana Tiwari et al., 2017). Unlike lecture-based learning, the PBL method let students to have more interactions with each other while the instructor becomes a coach or a facilitator. In turn, instructors support and guide the students through a successful project (Peter Alex, 2019). In PBL the instructor serves as a facilitator

who gives feedback, challenges students' understanding of concepts without dominating the group, monitors group dynamics, manages conflicts, knows when and when not to intervene, and empowers students (Mierson, 1998). The role of the instructor as facilitator is more difficult and time-consuming in a distance-education PBL setting than in a face-to-face BL setting. That is, the success of non-face-to on-line PBL classes require that the role of the instructor as a facilitator, guide and discussion moderator be clearly explained at the beginning of the process (Donnelly, 2006).

Table 1.: *Affecting factors of leaner's satisfaction in non-face-to-face on-line PBL*

	Factor	Definition (Items)	References
Learner's factors	1. IT self-efficacy	Learner's perception of IT utilization capability (3)	Jun (2017), Ove and Vibeke (2021), Petty and Loboda (2011),
	2. Learner's motivation	Learner's psychological state for trigging learning tasks (5)	Nor Farida Harun et al. (2012), Jun (2017), Seo et al. (2020)
	Interaction	Facilitating activities for classes by instructors (4)	Min et al. (2015), Jun (2017), Peter Alex (2019)

Based on studies mentioned above, interaction and learner's factors (learner's IT self-efficacy and learner's motivation) were identified as affecting factors of learner's satisfaction in non-face-to-face PBL classes as Table 1.

The primary purpose of this study is to investigate the factors affecting the learner's satisfaction of non-face-to-face on-line PBL classes in terms of interaction and learner's factors as Figure 1 and Hypotheses were set as Table 2.
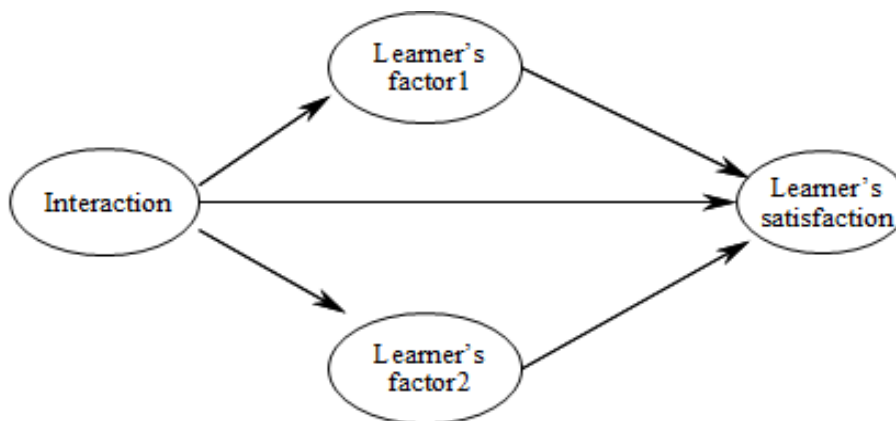

Figure 1. *Research model*

Table 2: *Hypotheses*

Hypothesis	Content
H1	Interaction will have a positive effect on learner's motivation.
H2	Leaner's motivation will have a positive effect on learner's satisfaction.
H3	Interaction will have a positive effect on learner's IT self-efficacy
H4	Leaner's IT self-efficacy will have a positive effect on learner's satisfaction.
H5	Interaction will have a positive effect on learner's satisfaction.

2. Research Methods

2.1. Data collection

A questionnaire was used to collect data for this study targeting the students who took the PBL classes in S university of Korea. The instruments measuring the constructs were adapted from the extant literature. The items were measured on a 5-point Likert scale using from 1 ('strongly disagree') to 5 ('strongly agree').

2.2. Participants

176 responses were used as a basis for the findings of this study. 67 respondents were freshmen, 6 respondents were sophomore, 85 respondents were junior, and 17 respondents were senior.

2.3. Analysis

SEM (Structural Equation Model) was used for empirical test using SmartPLS. PLS is an extremely powerful multivariate analysis technique that is ideal for testing structural models with latent variables. This is a convenient and powerful statistical technique considered appropriate for many research situations (Henseler et al., 2009), suitable for studying complex models with numerous constructs (Chin, 1998). The dimension of the sample is more than 10 times greater than the maximum number of paths directed to a construct (Gefen and Straub, 2005), and therefore PLS can be considered adequate for estimation. This technique is known to have minimal restrictions in terms of residual distributions and sample sizes when compared to other SEM such as covariance-based techniques (Chin, 1998).

3. Results

3.1. Measurement

The measurement model was assessed for (i) construct reliability, (ii) indicator reliability, (iii) convergence validity, and (iv) discriminant validity. Table 3 lists the average variance extracted (AVE), composite reliability (CR), Cronbach's alpha values, loading. As shown in the Table 3, all the constructs have composite reliability and Cronbach's alpha is greater than 0.7, suggesting the constructs' reliability (Straub, 1989). The indicator reliability was evaluated based on the criteria that loading should be higher than 0.6 and that every loading below 0.4 should be eliminated (Churchill, 1979). All loadings are higher than 0.6 and statistically significant at 0.05, confirming a good indicator reliability of the instrument. The convergence validity was tested with AVE, and all constructs compared positively against the minimum acceptable value of 0.50 (Henseler et al., 2009; Fornell and Lacker, 1981).

Table 3: *Confirmatory factor analysis*

Construct	Factor loadings	Composite Reliability	AVE	Cronbach′α
Learner's factor 1 (IT self-efficacy)	0.856	0.908	0.767	0.848
	0.861			
	0.909			
	0.703			
Learner's factor 2 (motivation)	0.648	0.866	0.565	0.806
	0.797			
	0.832			
	0.765			
Interaction	0.876	0.947	0.817	0.925
	0.917			
	0.906			
	0.914			
	0.879			
Learner's satisfaction	0.866	0.953	0.801	0.938
	0.916			
	0.892			
	0.921			

The discriminant validity between constructs was checked on the basis of the rule that the square root of every AVE should exceed the correlation among any pair of latent constructs (Fornell and Lacker, 1981) as seen in Table 4.

Table 4: *Discriminate validity*

	Learner's factor 1	Learner's factor 2	Interaction	Learner's satisfaction
Learner's factor 1	(0.767)			
Learner's factor 2	0.465	(0.565)		
Interaction	0.521	0.508	(0.817)	
Learner's satisfaction	0.457	0.434	0.531	(0.801)

* Numbers in parenthesis are AVE

As shown in the Table 3, 4, the measurement model results indicate that the model has acceptable construct reliability, indicator reliability, convergence validity, and discriminant validity ensuring that the constructs are statistically distinct and can be used to test the structural model.

3.2. Hypotheses testing

The analysis of hypotheses and constructs' relationships were based on the examination of standardized paths using the bootstrap resampling method (Taylor and Todd, 1995; Paul and Olson, 1987). The results are summarized in Table 5.

Interaction was found to be significantly related to learner's satisfaction satisfaction (β = 0.341, t-value = 3.437) and all learner's factors (IT self-efficacy and motivation). While learner's factor1 (IT self-efficacy) has positive effect on the learner's satisfaction (β = 0.202, t-value = 1.998), learner's factor2 (motivation) has not. It can be implied that motivation is not important because non-face-to-face on-line PBL classes were nonvoluntarily. Therefore, hypotheses 1, 2, 3 and 5 are supported, but hypotesis 4 is not supported.

Table 5: *Result of hypotheses testing*

Hypothesis	Path	Estimate (β)	t-value	Result
H 1	Interaction → Learner's factor 1(IT self-efficacy)	0.521	5.578**	Accept
H 2	Learner's factor 1(IT self-efficacy) → Learner's satisfaction	0.202	1.998**	Accept
H 3	Interaction → Learner's factor 2 (motivation)	0.508	6.641**	Accept
H 4	Learner's factor 2 (motivation)→ Learner's satisfaction	0.167	1.441	Reject
H 5	Interaction → Learner's satisfaction	0.341	3.437**	Accept

Learner1 R^2 = 0.271, Learner 2 R^2 = 0.258, Learner's satisfaction R^2 = 0.346
** $p<0.01$, * $p<0.05$

Mediating effect was examined using Sobel test(http://quantpsy.org/sobel/sobel.htm) (Kim K. S., 2013). According to the result of Soble test, t-value of 'Interaction → IT self-efficacy → learner's satisfaction' is 1.881, and t-value of 'Interaction → motivation → learner's satisfaction' is 1.408, which means mediating effect of IT self-efficacy is significant (p<0.1), but mediating effect of motivation is not significant. İt implies interaction has positive effect on the learner's satisfaction not only directly but also indirectly through learner's IT self-efficacy.

4. Discussion

The Covid-19 pandemic has raised significant challenges for the higher education community worldwide. A particular challenge has been the urgent, unexpected, and nonvoluntarily request for previously face-to-face university courses to be taught on-line (Chrysi Rapanta et al., 2020). It requires more challenges and different educational approaches. PBL is, especially, has more challenges rather than other types of classes, because PBL is usually conducted in a face-to-face setting and learner-directed learning. Research also has shown that it seems difficult to incorporate PBL in an on-line classroom (Anissa and Kimberly, 2017).

Therefore, the research question is 'Will PBL be effective in non-face-to-face on-line environment?' and the primary purpose of this study is to investigate the affecting factors of learner's satisfaction in non-face-to-face on-line PBL classes in terms of interaction and learner's factors (IT self-efficacy and motivation).

The empirical results indicate that interaction and learner's IT self-efficacy are important determinants of learner's satisfaction in non-face-to-face on-line PBL classes. İnteraction was found to be significantly related to learner's satisfaction (β = 0.341, t-value = 3.437), learner's IT self-efficacy (β = 0.521, t-value = 5.578), and learner's motivation (β = 0.508, t-value = 6.641). Therefore, instructors should provide timely feedback and encourage class participation and motivation. Using SNSs is very

useful for enhancing interactive learning activities. SNS can provide various opportunities in building community in the modern era, including in the field of education (Dwi Sulisworo et al., 2021).

5. Conclusion

College authority should provide several teachings promotions programs and IT literacy programs for effective non-face-to-face on-line PBL classes as well. However, learner's motivation was not founded to be significantly related to the learner's satisfaction in non-face-to-face on-line PBL classes. It is implied that non-face-to-face on-line PBL classes were nonvoluntarily and compulsory during the COVID-19 pandemic. As non-face-to-face on-line classes have become accustomed, both learners and instructors will perceive that non-face-to-face on-line learning environment is not compulsory but voluntary. Learner's motivation can affect the learner's satisfaction as previous research result that successful implementation of PBL primarily lies in the students' motivation to persist during the learning processes. Therefore, it is a vital role of instructors to stimulate students to be motivated and help them to adopt mastery orientation and develop motivation. Hence, it enables students to find the fun of learning using PBL teaching methods and to discover and reap its benefits.

The results imply that PBL is still an effective education tool even in non-face-to-face on-line learning environment. This paper has the originality and value in that it examines the learner's satisfaction in non-face-to-face on-line PBL classes in terms interaction and learner's factors (IT self-efficacy and motivation). If further study targets several colleges for generalization and considers the difference of media which learners use for on-line PBL classes, more sophisticated analysis can be done.

ACKNOWLEDGEMENT

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