Analyzing Student Learning Behavior in a Blended-Learning Environment in Thai Higher Education

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Abstract

The purpose of this study was to design a blended learning course. This course was implemented at a higher education institution in Thailand. The face-to-face part was designed to teach the knowledge and information literacy skills necessary for living in a digital world. The activities in the classroom comprised both individual and group works. The course content and materials were available in the online part. Activities in the online part emphasized students' self-regulated strategies. Online log data were analyzed to understand student learning behaviors towards blended-learning mode. This study supports the notion that effective blended learning approach can help students to improve their self-regulated strategies.

Keywords: blended learning; blended learning environment; online learning; self-regulated learning; information literacy skill; technology education

INTRODUCTION

There has been an obviously drive to integrate technology in higher education in Thailand in recent years. As in many other countries, a growing number of research studies have found that technology integration in teaching and learning in higher education can help students to access global knowledge available online and can help prepare them to become progressively independent of the teacher, armed with the basic skills to pursue their own lifelong learning. In particular, students are expected to be able to master the effective and efficient use of information. Thus, how to incorporate instructional design principles with the available digital tools and importantly with student learning behaviors has become an important purpose in a higher education setting.

There are many ways that technology can become an integral part of the learning process. Blended-learning education has become of interest for many instructors. Blended learning is a hybrid of traditional face-to-face and online learning instruction occurring both in classrooms and online environment and where the online component becomes a natural extension of traditional learning (Liebowitz & Frank, 2016.

The advantages of applying blended-learning mode in teaching and learning are: 1) students have more flexibility to access learning material from wherever they are and whenever they want;

and 2) students can study on their own pace which helps to balance a classroom that contains both quick and slow learners (Lynch, 2018). Moreover, one of the greatest benefits of the online mode of learning through a Learning Management System (LMS) is data tracking and reporting. LMS can track each step students take throughout the course, including log-in, time spending in each lesson (Bright, 2015). Over the last two decades, the literatures showed that blended learning in higher education as a teaching model has been growing steadily (Alammary, Sheard, & Carbone, 2014; López-Pérez, Pérez-López, & Rodríguez-Ariza, 2011). Studies indicated that blended learning could overcome the limitations of online learning and face-to-face modes of learning, for example, a study in 2011 showed that it had a positive effect on diminishing student dropout rates and a positive effect on students' exam score (López-Pérez et al., 2011). Results of the study in 2019 showed that blended learning helped students to develop their time management skills, reflective thinking, independent decision making and confidence when making presentations in public (Namyssova et al., 2019). A meta study in 2021 revealed that replacing a face-to-face classroom time with an online learning between 30 to 79 percent showed equivalent learning outcomes Muller & Mildenberger, 2021). Several studies have found that blended learning courses made students gain better outcomes than traditional face-to-face courses because students experience the independence and learning autonomy which gave them an opportunity to study on their own pace (Chen, 2022; Sato, Güneş, & Alagözlü, 2020; Murase, & Burden, 2020). Classroom with blended learning environment is a stronger predictor of students' learning outcome than prior achievement at school for university students. With a positive aspect of classroom learning environment, students can learn better (Lizzio, Wilson, & Simon, 2002).

THEORITICAL BACKGROUND

Encouraging students to become self-regulated learners is challenging, since "the intention of most educational systems is to help students not only grow in knowledge and expertise, but also to become progressively independent of the teacher for lifelong learning" (Sadler, 1998, p.82). To be a lifelong learner, self-regulation is an important fundamental process which educator should promote in students so that they become more metacognitively, motivationally, and behaviorally responsible for their own learning (Labuhn, Zimmerman, & Hasselhorn, 2010). It is indicated that effective self-regulation requires learner motivation to learn.

Literatures have mentioned self-regulation to be important elements of success for web-based learners (Eom & Reiser, 2000; Hodges, 2005). Students learning with a web-based environment with self-regulated strategies become more responsible for their own learning, more intrinsically oriented, and more challengeable (Orhan, 2007).

BLENDED LEARNING APPROACH

When the sudden outbreak of Covid-19 occurred, teachers and students had to change their learning practice from face-to-face to online learning mode. However, there were several problems during online learning. For example, students did not have a proper device to study online resulting in falling behind the class during a synchronous mode of learning. Other difficulties were associated with modern technology and applications. Not everyone had good enough information

literacy skills and digital skills to cope with program installation, login procedures, accessing online audio and video, etc. (Xia et al., 2022). Some features, such as, file sharing, annotation, whiteboards are not easy for students to use (Ming et al., 2021). In online learning environment, students also felt that there was a lack of learning community and interaction between friends. They also face difficulty understanding the instructional material which were the major obstacles to online learning (Song et al., 2004). Therefore, many educators suggested that using a mixed method of synchronous and asynchronous modes of learning like blended learning can be the best ways to solve the mentioned problems.

The percentage of the integration of synchronous and asynchronous modes of learning in blended learning can be shown in Table 1.

Online	Face-to-Face	Type of course	Description
0%	100%	Offline class	Course with no online technological used. Content is delivered in writing or orally.
1 to 29%	71 to 99%	Online enhanced learning	Course with web-based technology to facilitate what is essentially a face-to-face course. Use of a course management system (CMS) or web pages to post the syllabus, an assignment, for example.
30 to 79%	21 to 70%	Blended/ Hybrid learning	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically with online discussions, and some face-to-face meetings.
80+%	0 to 20%	Online	A course where most or all of the content is delivered online, typically without face-to-face meetings

Table 1. The integration of online and face-to-face learning (source: The Sloan Consortium, as cited in Setyaningrum, 2019. p. 2)

The literature revealed that a blended learning course can be designed by interwoven layers: 1) a physical (or structural) layer; and 2) a pedagogical layer. A physical layer represents modality and media, for example a pattern of switching between online and face-to-face activities. Online activities take place by using Learning Management System (LMS). The pedagogical layer is by various methods, such as, active learning activities, community interactions, and online content interaction (Graham, 2021).

THE FOCUS OF THE STUDY

This study focused on the design and implementation of a blended learning course. Since blended learning is one of the learning environments that allow students to learn on their own pace. They can manage and control their learning activities which is related to their self-regulation of learning. To motivate students to engage in learning activity, the researcher applied a gamification theory to the online part of the course. Self- and peer- assessment and feedback activities are used in the online part to reinforce student to become a self-regulated learner. The online part of this course was implemented on Moodle (LMS). The large number of students' behavioral data left in LMS can be accumulated as web-log files, extracted as valuable information, and finally utilized to

improve students' learning achievement (Jo & Kim, 2013). The online log data in this study were then analyzed to understand student learning behaviors.

METHODOLOGY

Course content

"Life in a Digital World" course was used in this study. This course was compulsory for all for first-year undergraduate students. Course content comprised: digital citizenship; information literacy skills which are information search, information evaluation, information synthesis, referring to information; and information communication and presentation; plagiarism; information technology in daily life; and Digital security. This course lasted for one semester of 15 weeks.

Blended learning approach design

The first week of the course was an orientation. Teacher informed students that all course content and materials are in the online part. Students can log-in to the system whenever is convenient for them to study. During the first six weeks, there were face-to-face activities in the classroom emphasizing skills needed for being a good digital citizen in this 21st Century. However, students had to parallelly study and completed the exercises in the online part. The next six weeks after the mid-term examination, teacher assigned student to work on a project that they had to apply information literacy skills on reviewing the literature related to topics they had chosen, and writing a review article. Students studied the content related to this project in the system and submitted their assignment to the system. Then they had to participate in a peer-assessment activity, at the same time they could assess their own work for improvement too. The design of this blended learning approach can be seen in Figure 1.

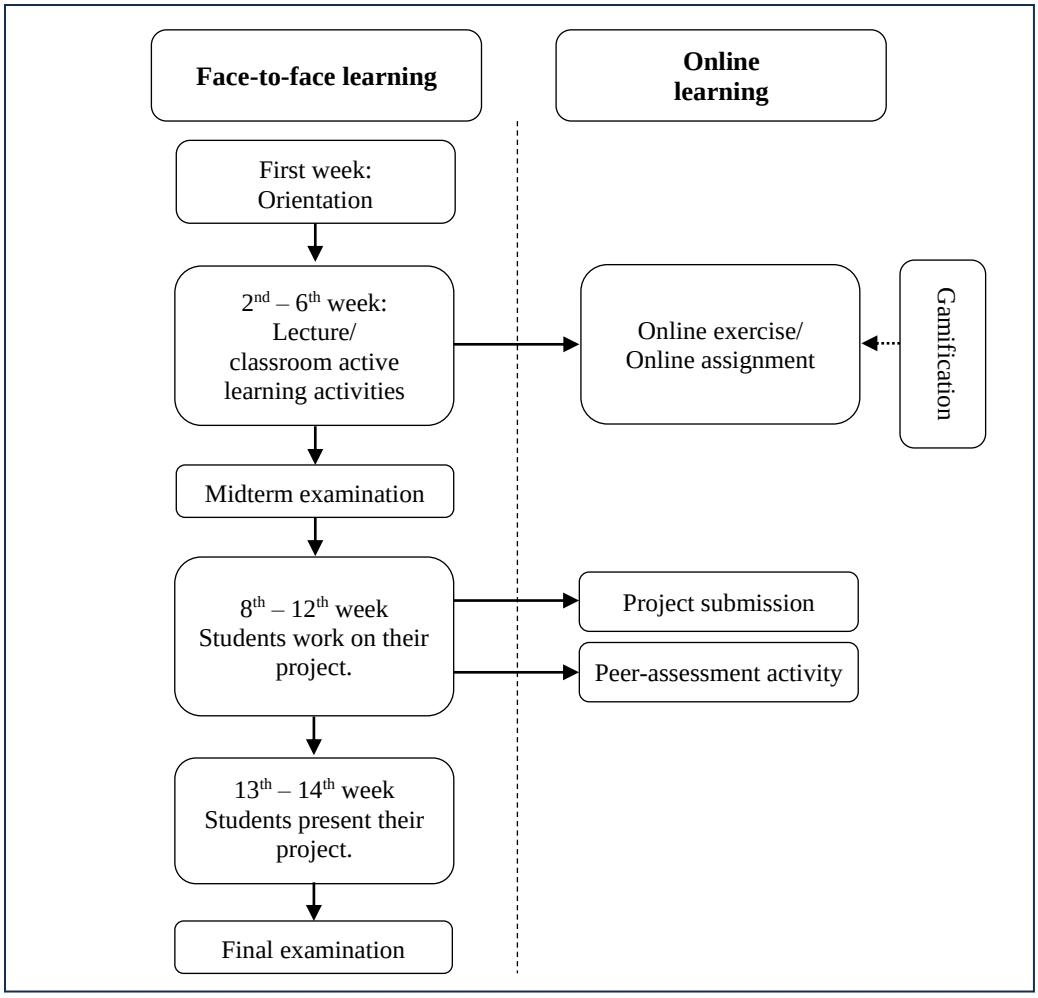

Figure 1. The design of blended learning approach

Gamification concept was applied to the online part. Students gained points and badges from activities they participated in the online courses. For example, when students were asked to read an article then took a quiz on LMS, they gained some points. When their accumulated points reach the criteria, their levels were up. This gamification concept made them feel like they were playing game which they could receive points, badges, and level. As the literature shows that gamification can motivate and engage students in online learning (Poondej & Lerdpornkulrat, 2016). Moodle, a free open-source software package, was used as a Learning Management System (LMS) for the online part. Students could access this course by using either their tablet, mobile phone, or computer.

Participants

2,697 students registered to this course since this course was compulsory for all first-year undergraduate students. Students were assigned to twenty-nine sections. There were 13 teachers for this course. All teachers followed the same process for a blended-learning approach.

DATA ANALYSIS

Log data in Moodle including log-in time, log-in frequencies, log-in regularities, lesson visit, and assignment completion were used to analyze to understand student learning. Data were analyzed in terms of the average times each student viewed each topic, and number of times students logged-in and spent in the system hourly. These log data were presented in tables and graphs format.

RESULTS

This section presents the implementation of the online part of this course (http://course.ilc.swu.ac.th). There were eight lessons, six exercises, and two assignments in the online part. During the face-to-face class, teacher might ask student to log-in to the system to access some learning materials available online. The course content was always available to access for the whole semester; however, each exercise had its own deadline. For the assignment, students had to submit their own assignment to the system during the submission phase then assess their peers' assignment during the assessment phase. The system randomly assigned papers to all students to assess. This was a double-blind peer review process. One paper was assessed according to a given rubric by five students and one student assessed five papers. After the review process, the system calculated a score each student got from peer-assessment and a score they got as being a reviewer. In our previous study, we measure the changes of students' self-efficacy in information literacy skills by comparing between a group of students who used this system for peer-assessment activity and a group of students who did not used this system but got only feedback and assessment score from teachers. We found that this peer-assessment activity helped to enhance student's self-efficacy in information literacy skills (Lerdpornkulrat et al., 2019).

Students' online log file from LMS was analyzed to further understand students' learning behaviors. Table 2 presents the average numbers of view times per each student for each topic. Figure 1 presents number of times students logged-in to the system presented by time slot from 0:00 a.m. to 11:59 p.m. As shown in Figure 2, on average of each day, students spent time in the online part mostly during 8:00 p.m. to 1:00 a.m. of the next day.

Topic	#views	#students	Avg. view/ student
Content			
Digital citizen	14,335	2,419	5.93
Writing a review article	9,542	1,781	5.36
Information searching	11,893	2,292	5.19
Information synthesis	10,187	2,062	4.94
Referring to information	11,172	2,510	4.45
Information evaluation	9,406	2,157	4.36
Ethic and law	8,518	2,078	4.10
Digital security	8,104	2,079	3.90
Exercise			
Referring to information	64,074	2,492	25.71
Ethics	51,187	2,415	21.20
Information searching	47,005	2,510	18.73
Digital citizen	41,428	2,609	15.88

Digital security	34,436	2,390	14.41
Information evaluation	29,197	2,427	12.03
Assignment			
Digital technology in daily life	49,157	2,518	19.52
Wring a review article	37,378	2,531	14.77

Table 2. Log data showing number of views for each topic

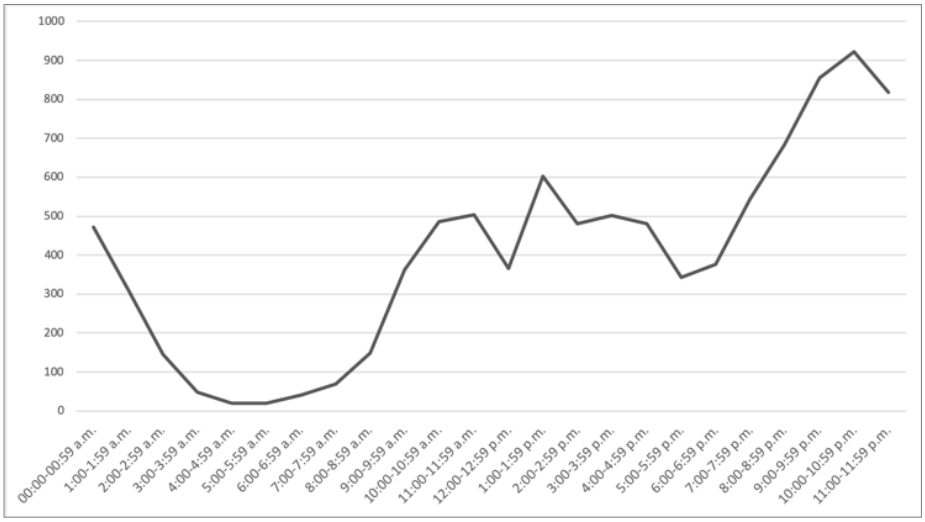

Figure 2. Number of times students logged-in to the system by time slot

DISCUSSION AND CONCLUSION

The purposes of the current study were to design and implement a blended-learning course and to analyze the online log file to understand students' learning behaviors. In a face-to-face part, the course was designed for students to participate in actively classroom activities for both individual and group works. In an online part, the course was designed by using gamification concept to motivate students to engage in online learning activities. Results from our previous study in 2016 indicated that applying gamified learning activities can increase student engagement in learning (Poondej & Lerdpornkulrat, 2016; Poondej & Lerdpornkulrat, 2020). Peer-assessment activity used in the online part increased student self-efficacy in information literacy (Lerdpornkulrat et al., 2019). These activities were intended to assist students to set goals, regulate their learning, monitor their effectiveness in the course, and to use different learning strategies that help students control and regulate their own cognition and behavior during the blended learning process (Orhan, 2007).

As the results shows that students often logged into the system during 9:00 p.m. to 1 a.m. This means that when student had autonomy on their time management, they preferred to do the task in the nighttime. A recent study in 2023 revealed the relationship between early morning university classes with students' impaired sleep and academic performance that the number of days per week students had morning classes was negatively correlated with grade point average. The findings suggest concerning associations between early morning classes and learning outcomes (Yeo et al., 2023). Results from this study can help the teacher in designing the course content, face-to-face classroom activities, and online activities. Teacher can apply the 'flipped

classroom' method to their class by assigning the students to get ready and study the online content before coming to the class. Then the teachers can set up active learning activities in the classroom, for example encouraging students in discussion activities, using peer-teaching activity by letting students teach each other, playing some games to support them to understand the content, etc. After the face-to-face activities, the teachers should let the students manage their time to study or do the exercises online on their own pace, so that they feel that they have an autonomy on their own learning. They can manage their own time. This process could encourage their self-regulation behavior in learning. Consistently, the recent studies showed that the majority of students take blended learning as an effective way to develop leaner autonomy. Educators and instructional designers should coach the students to practice the process of learning rather than providing them what-to-do instructions. However, teachers should still pay an irreplaceable role in the blended learning environment (Chen, 2022). Additionally, the finding from this study could provide valuable insights for teachers and educators who want to design a blended learning course in higher education to better fit student learning behaviors and to enhance students' self-regulation strategies.

The researcher believe that blended learning experience could be promoted more in higher education and improved by incorporating further online active learning activities to engage students in online learning, such as applying problem-based learning, project-based learning, or case-based learning. The further study should try to include the active learning activities in the online part then analyze student engagement and motivation in online leaning.

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