Using Assignment Logs to Enhance Self-regulation Skills

Wuttiporn Suamuang and Surachai Suksakulchai

***Abstract*—Self-regulation play a key role on undergraduates' knowledge, skills, and engagement in flipped classroom. However, some students cannot complete assignment due to failure of time management, which is a critical skill of self-regulation (SR). Therefore, a tool is required to support self-regulation. Assignment log is a key tool for maintaining self-regulation, including self-efficacy, time management, and help-seeking. This study aimed to study the usage of the assignment logs in flipped classroom and lecture based-learning on self-efficacy, time management, and help-seeking, compared with flipped classroom and lecture based-learning without the assignment logs. The participants included two groups, which one had 41 undergraduate students and another one consisted of 26 students who are part of an electronic engineering program at a large technical university in Bangkok, Thailand. The ANOVA results revealed that there was different self-efficacy, time management, and help seeking between learning with the assignment log and other lecture-based learning without the assignment log and flipped classroom without the assignment log. Students who have learned with the assignment log perceived self-efficacy and time management more than lecture-based learning method and flipped classroom methods. This study provides insight into the importance of the assignment logs to support students' self-regulation.**

***Index Terms*—Assignment log, help-seeking, time management, self-regulation.**

I. Introduction

Flipped classroom plays a crucial role in undergraduates' knowledge, skills, and engagement [1]. The out-of-class activities allow students to control themselves about the learning process to be suitable for their personal needs and learning styles, which can increase the quality of their learning [2]. In a flipped classroom, self-regulation is a significant variable that can positively maintain undergraduates' academic achievement [3]. Jdaitawi [4] observed the effect of self-regulation (SR) on flipped classroom by comparing to the traditional method as a control group. His results revealed that students had greater self-regulation in the flipped classroom as compared to the control group. He further emphasized the significant role of SR, which support the flipped classroom.

However, self-regulated skills are a challenging for students. Doo and Bonk [5] claimed that instructors should pay more attention on undergraduate students with poor self-regulation in flipped classroom. Some students cannot complete assignment due to failure of time management, which is a critical skill of self-regulation [6]. Time management is related to setting, planning, and managing time to accomplish academic tasks on time [7]. [8] identified that students with high procrastination tend to possess low self-regulation. Some students cannot find assistance for learning or doing assignment in flipped classroom environment, which is another essential component of self-regulation [9]. In addition, self-efficacy for doing an assignment affected time management [10]. Therefore, time management, help-seeking and self-efficacy should be supported for flipped classroom.

Assignment log is a key tool for maintaining self-regulation. It can monitor and track students' assignment practices [11]. Relied on the relevant literature review, Bembenutty and White [11] argued that being homework logs can improve students' self-regulation of learning, motivation, and academic success. They further suggested that assignment logs help students to complete assignments more and succeed in their academics. Instructors should encourage students to use a homework log to record data related to homework completion. Nonetheless, Whalen [12] found that the learning logs did not increase students' understanding of the content but only increased students' attention, diligence, and management. Lai and Hwang [13] worked with elementary students regarding combining self-regulated strategy in the flipped classroom. They analyze the data by ANCOVA method and found that students in the self-regulated flipped classroom had better academic achievement and self-regulation (including task strategies, time management, and help-seeking). Therefore, this study will focus on assignment logs on students' self-regulation, including self-efficacy, time management, and help-seeking because there are few studies focusing on the assignment log and these three constructs. The following research question was

How the usage of the assignment logs in flipped classroom and lecture based-learning improves self-efficacy, time management, and help-seeking, compared with flipped classroom and lecture based-learning without the assignment logs?

II. Literature Review

A. Flipped Classroom

Flipped classroom is defined as "inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa" [14]. It is a popular pedagogical approach, which many instructors applied it into their classes in higher education. The flipped classroom consists of two key elements: out of class activities and in class activities [14]. The overall view of the flipped classroom is illustrated in Figure 1. Firstly, video lectures, worksheet, and individual or

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group work are assigned as homework [14], [15]. Active learning is offered as activities in the classroom. Students were instructed toward many strategies of active learning such as interactive learning activities [14], collaborative learning/ Team-based learning, group work [16], case study, labs, games, simulations, or experiment [17], discussion [15, 18], teacher guidance and peer instruction [18], cooperative learning [19].

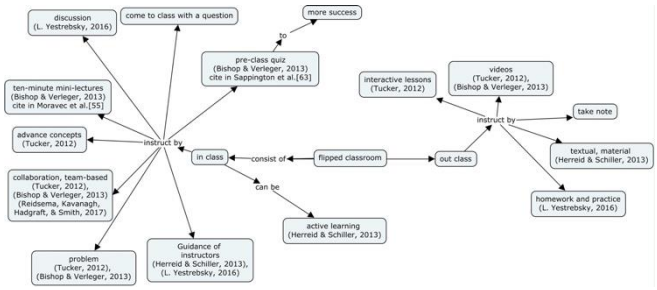

Fig. 1. The overall view of the flipped classroom.

Out-of-class activities

In the current study, the instructor has designed and developed all the material needed for the course. Students can access the content video, lab sheets, and assignments via ThaiMOOC, which is the online learning system. Table 1 showed Mean and total times devoted to watching the videos and completing the questionnaires. The number of videos of each week range from three to seven depending on the topic. Each video took no more than ten minutes. The videos encompass the main content in terms of theory and practices, examples, assignments, and the lab sheet. Students were allowed five or six days to watch and summarize the videos and to undertake the assignments. The assignments were submitted and uploaded through the Facebook group. The instructor checked students' assignments and provided them with feedback before the class would begin.

TABLE I: TIMES DEVOTED TO WATCHING THE VIDEOS IN THE

Topics	**Number of videos**	**Video time (mins.)**			
		content videos	Example videos	Assignment video	Total time
Topic 1	7	28	16	9	53
Topic 2	6	13	9	10	32
Topic 3	6	20	12	15	47
Topic 4	6	14	18	6	38
Topic 5	7	24	17	3	44
Topic 6	5	9	10	9	28
Topic 7	4	10	12	6	28
Topic 8	5	14	13	6	33
Topic 9	3	9	10	-	19
Total	49	141	117	64	322

In-class activities

Instructors designed in-class activities with student-centered and active-learning, which offered using project-based learning. These activities were oriented toward a combination of the students' self-learning and cooperation and have the purpose of the development of a series of knowledge, competencies, and skills. Students have to undertake the micro-project assigned by instructors within three hours of class time. They can consult with their peers and exchange their ideas and submit the micro-project before the end of class time. After that, the instructor summarized the content and asked questions to students.

B. Self-regulation in Flipped Classroom

The flipped classroom plays a crucial role in undergraduates' knowledge, skills, and engagement [1]. The out-of-class activities allow students to control themselves about the learning process to be suitable for their personal needs and learning styles, which can increase the quality of their learning [2]. In a flipped classroom, self-regulation is a significant variable that can positively maintain undergraduates' academic achievement [3]. Past studies reported that learning with the flipped classroom supported students' help-seeking [3]. Jdaitawi [4] observed the effect of self-regulation on flipped classroom by comparing to the traditional method as a control group. His results also revealed that students had greater self-regulation in the flipped classroom as compared to the control group. He further emphasized the significant role of self-regulation, which support the flipped classroom. Lai and Hwang [13] worked with elementary students regarding combining self-regulated strategy in the flipped classroom. They analyze the data by ANCOVA method and found that students in the self-regulated flipped classroom had better academic achievement and self-regulation (including task strategies, time management, and help-seeking).

C. Assignment Log

Assignment log was adapted from Bembenutty and White [11]. In the current study, assignment log was designed on the google drive of students' university accounts. The interface contained user-friendly, and it is easy to enter the data. Figure 2 presents the assignment log. The students would fill in the information relating to their plan for doing assignments. It relates to assignment name, estimation of time spent, time spent, and source of finding assistance to complete an assignment, obstacles during undertaking assignments, and how students solve the problems and self-evaluation for satisfaction in assignment completion. Students will report their assignment activities weekly regarding all kinds of assignments, both in and outclass via their google drive.

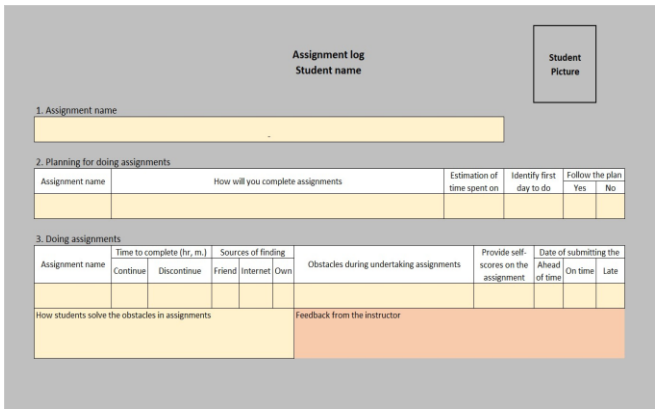

Fig. 2. The assignment logs.

D. Using Assignment Logs to Increase Self-regulation

An assignment log or learning log is a key material for monitoring and tracking students' assignment practices [11, 20]. It represents a journal of students' learning, which encourages students to perceive their weak and strong skills and connect to prior personal learning backgrounds [20]. Students can set their learning goals and evaluate their learning performance before and after their courses [13]. In [21]' s study, he explored using online learning logs on metacognitive strategies and found that using online learning logs to reflect their learning stimulates metacognitive strategies, awareness, organization and planning, monitoring and evaluation. For examples, students manage their learning and monitor their own learning when they employ online learning logs.

E. Lecture-Based Learning

Most teaching approaches used in Thai higher education are lecture learning, which emphasizes transferring knowledge from instructors to students via an oral presentation. Moreover, instructors may use academic materials, such as PowerPoints, transparencies, and slides, to help students understand the knowledge contents [22] and show the example of problem-solving. The information is presented in terms of principles, concepts, ideas, and theoretical knowledge relating to an issue [23]. The duties of students during learning are to take note of the content and memorize it later. When students misunderstand or are not clear about the content, they can raise their hands to ask the instructors questions. Therefore, this kind of teaching approach is suitable for a large class as well as abstract concepts or content, which is hard to understand. This approach takes advantage of instructors for controlling time, making them complete the entire content of objective in the curriculums [24].

III. Methodology

A. Participants and Context

The study relied on Purposive sampling, which allows samples to provide their information and participate in the experiment willingly [25]. The participants included two groups, which one had 41 undergraduate students who enrolled in the Embedded System Course and another one consisted of 26 students who enrolled in the Digital Circuit Design course. Both courses are part of an electronic engineering program at a large technical university in Bangkok, Thailand. It is delivered in one, three-hour session, once per week. The same instructor taught both courses. In each course, evaluations were based on a mid-term and final each worth 30% as well as individual assignments and a project worth 40%.

B. Research Framework

The dependent variables were self-regulation skills (i.e., SE, time management, and help-seeking). The independent variable was teaching method (four groups), in which lecture-based learning without the assignment log and flipped classroom without the assignment log were identified as a control group. The control groups were taught before midterm. Lecture-based learning and flipped classroom with using assignment logs was defined as a treatment group and were taught after midterm. Figure 3 shows the research framework.

In the experiment, students who enrolled in Digital Circuit Design had been taught by lecture-based learning for the first nine weeks, while in week 10-17, students used assignment logs. Students who registered in Embedded System learned by flipped classroom because students would practice in the class while learned the theory content out of the class by watching the video. Assignment logs were used after midterm for Embedded System (8 weeks).

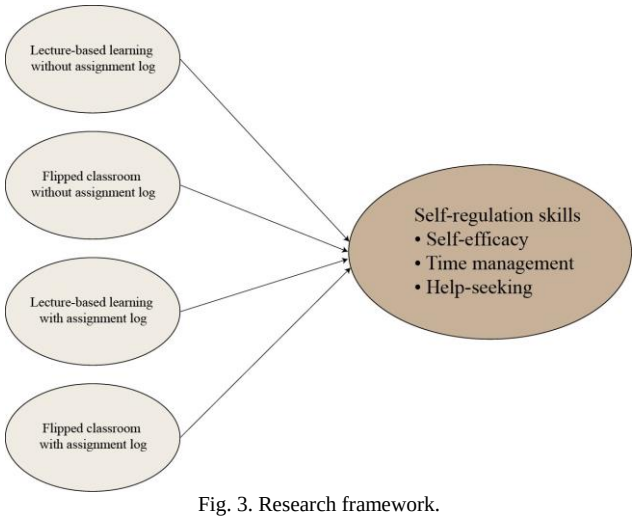

Fig. 3. Research framework.

C. Instruments and Data Collection

The instrument was assignment logs. Assignment logs are a schedule for students to fill the information relating to their plan for doing assignments. The assignment log form used in the study was applied from Bembenutty and White [11]; Zimmerman, Bonner [26]. It relates to assignment name, estimation of time spent, time spent, and source of finding assistance to complete an assignment, obstacles during undertaking assignments and how students solve the problems and self-evaluation for satisfaction in assignment completion. Students filled the assignment logs after Digital and Embedded class weekly via google drive.

The survey relating self-regulation skills were adapted from Midgley, Maehr [27] for self efficacy, Xu [28] for time management and Pintrich, Smith [29] for hep-seeking. Three dimensions of self-regulation skills were measured; self-efficacy had five items, time management included four items, and help-seeking consisted of two items. To assess reliability, Cronbach's alpha is used widely to measure degree of intercorrelation of the items. Cronbach's alpha value of self-efficacy presented 0.83. Cronbach's alpha of Time management and help-seeking were 0.76 and 0.73, respectively. Summarizing the instruments is shown in table 2. Students replied to the survey during pre- and post-learning of each experiment session. Students spent ten to fifteen minutes to complete it via an online survey and were informed that the survey was anonymous. The scores would not affect any students' grades.

TABLE II: INSTRUMENTS USED IN THE CURRENT STUDY

Measure	No. of items	Characteristic	Cronbach's alpha
• Self-efficacy	5		0.83
• Timemanagement	4	Five-likert	0.76
• Help-seeking	2	scale	0.73

D. Data Analysis

Descriptive statistics were used to test assumptions. For an example, using skewness is to check normality. In terms of inferential statistics, it refers to using data from the sample group to infer or predict the results in population or situations in the future. To deal with multiple dependent and independent variables, the following techniques were performed in this study [30]. Data analysis in this section involved Analysis of variance (ANOVA) in determining means difference between an independent variable, which has three or more groups/levels, and a dependent variable. ANOVA compared differences in self-regulation skills by four group. Moreover, post-hoc tests using Turkey approach was employed to determine "how the means differ from each other" [31].

IV. RESULTS

In order to determine how assignment log affects self-regulation skills, compared with lecture-based learning method and flipped classroom learning. One-way analysis of variance (ANOVA) was employed with four teaching methods as independent variables (including lecture-based learning without the assignment log and flipped classroom without the assignment log, lecture-based learning with the assignment log, and flipped classroom with the assignment log) and self-regulation skills as dependent variable (including self-efficacy, time management, and help seeking). Table 3 presents mean and standard deviation of each teaching method on self-efficacy, time management, and help-seeking.

The ANOVA results revealed that the significant difference of teaching methods on self-efficacy ($F(3, 132) = 5.83$, $p < 0.001$), time management ($F(3, 132) = 2.76$, $p < 0.05$), and help-seeking ($F(3, 132) = 3.02$, $p < 0.05$) were found with medium effects, $\omega^2=0.12$ for self-efficacy, and $\omega^2=0.06$ for time management, and help-seeking. The normality violation was found in this study. However, homogeneity was no concern. Table 4 demonstrates the effect of the teaching methods on self-efficacy, time management, and help-seeking. To examine teaching method differences, Post-Hoc procedures using Tukey adjustments found that there were different self-efficacy, time management, help-seeking between learning with the assignment log and other lecture-based learning without the assignment log and flipped classroom without the assignment log. Students who have learned with the assignment log perceived self-efficacy and time management more than lecture-based learning method and flipped classroom methods. However, they perceived help-seeking lower than lecture-based learning method without the assignment log and flipped classroom without the assignment log. Therefore, pertaining to the finding earlier, the assignment log positively impacted only self-efficacy, time management, and help-seeking.

TABLE III: DESCRIPTIVE STATISTICS OF SELF-EFFICACY, TIME MANAGEMENT, AND HELP-SEEKING

Variable	Teaching method			
	Lecture-based learning class (n=26)		Flipped classroom (n = 41)	
	Without assignment log	With assignment log	Without assignment log	With assignment log
Self-efficacy				
• Mean	3.23	3.49	3.41	4.00
SD	0.59	0.77	0.74	0.63
Time management				
• Mean	4.23	4.33	4.12	4.58
• SD	0.71	0.68	0.6	0.58
Help-seeking				
• Mean	3.92	3.65	3.66	3.47
• SD	0.63	0.56	0.53	0.70

TABLE IV: ANOVA RESULTS — DIFFERENCES OF SE, TM, AND HS ON THE TEACHING METHODS

Variance	SS	df	MS	F-ratio
Self-efficacy (SE)				
• Between Groups	8.66	3	2.89	5.83***
• Within Groups	65.31	132	0.49	
• Total	73.97	135		
Time management (TM)				
• Between Groups	3.44	3	1.15	2.76*
• Within Groups	54.79	132	0.42	
• Total	58.23	135		
Help-seeking (HS)				
• Between Groups	3.41	3	1.14	3.02*
• Within Groups	49.65	132	0.38	
• Total	53.06	135		

Note(s): *** $p < 0.001$, * $p < 0.05$

V. DISCUSSION

The current results showed that there were significant differences in time management and help-seeking between lecture-based learning without assignment log and lecture-based learning with the assignment log. Students who have learned using the assignment log perceived self-efficacy and time management more than the lecture-based learning and perceived help-seeking lower than the lecture-based learning. Using the assignment log, students were assigned assignments in and out of class and used the assignment log to set goals relating to assignments. Therefore, homework assignment also offers advantages in increasing efficacy beliefs about learning [32]. Completing homework assignments, students have to use self-regulation strategies, i.e., time management and help-seeking. Lai and Hwang [13] investigated by combining the self-regulated strategy into flipped learning. Their findings found that the students had greater performance in goal setting, task strategies, time management, help-seeking, self-efficacy and self-regulation and academic achievement. However, the current findings in

terms of help-seeking are inconsistent with the study by Lai and Hwang [13]. This result may be explained that using the assignment log may support students' learning affecting seeking helps more than learning using lecture-based learning only.

VI. Limitation

The experiment took place in a small size (67 participants) and the only field of STEM education that the results may not be representative of the students in other fields, e.g., Liberal arts, Humanities, Social Sciences, therefore, the readers may consider the results in terms of relevance to their own learning environment. Future studies might investigate other fields, e.g., Liberal arts, Humanities, Social Sciences and should use the same subject area to compare using assignment log on self-regulation.

VII. Implication

Instructors can adapt the assignment log in various courses, especially as online learning and flipped classroom. This study provides insight into the importance of the assignment logs to support students' self-regulation. Instructors may be able to tackle and monitor uncompleted assignments via the assignment logs, and to provide students feedback for obstacles that happened during undertaking assignments. Using the assignment log encourages undergraduates' students to increase self-efficacy, time management, and help seeking. Thus, instructors and educators should consider the assignment log to apply it in teaching to be the most benefits for students.

VIII. Conclusion

Self-regulation is a significant variable that can positively maintain undergraduates' academic achievement. However, some students cannot complete assignment due to failure of time management, which is a critical skill of self-regulation (SR). Therefore, a tool is required to support self-regulation. Assignment log is a key tool for maintaining self-regulation, including self-efficacy, time management, and help-seeking. The current results revealed that students who have learned with the assignment log perceived self-efficacy and time management more than lecture-based learning method and flipped classroom methods. This study provides insight into the importance of the assignment logs to support students' self-regulation. Hence, instructors can adapt the assignment log in various courses, especially as online learning and flipped classroom.

Conflict of Interest

The authors declare no conflict of interest

Author Contributions

Wuttiporn Suamuang was in charge of developing the questionnaire as well as the assignment log. Moreover, she not only collected and analyzed the data but also wrote the current article. Surachai Suksakulchai was responsible for designing research methodologies, experiments, and pre- and post-tests for data collection and had approved the final version.

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