Combining Online Learning with Gamification: An Exploration into Achievement, Motivation, and Satisfaction of the Undergraduate

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***Abstract*—This research aims to develop online teaching plan through applying gamification. The results reveal learning performance, motivation, and satisfaction of the undergraduate towards the intervention. The sampling group is the undergraduate enrolling in Digital Literacy course in the second semester of the 2020 academic year of 154. The research tools consist of online teaching plan incorporating gamification, achievement test, motivation level evaluation form, and satisfaction survey of the undergraduate with this teaching plan. The results inform that the online teaching plan generates performance according to the specified 80/80 criteria. The learning performance of the undergraduate is significantly higher than that before the implementation of the online teaching plan incorporating gamification at .01. Learning motivation of the undergraduate is significantly different with the statistical level of .01. Also, the undergraduate is highly satisfied with online teaching applying gamification.**

***Index Terms*—Online teaching, gamification, undergraduate.**

I. Introduction

The UNESCO organized the Sustainable Development Goals which have 17 sustainable development goals. Digital comprehension is one of the sub-goals for sustainable development listed in Goal 4.4.2 that is comprehension skills. Digital is one of the skills that is important for a country development towards sustainability and leads to a career and business-like competency [1]

Online teaching can be a combination of teaching via the Internet and face-to-face teaching in a classroom [2] is an alternative with several advantages such as timing and location flexibility. Online teaching is financially worthwhile as it requires small expenses while learners can acquire unlimited knowledge and it can compromise shortage of teachers and educators [3]. In the first semester of 2020, a member of research team has been assigned to teach Digital Literacy course. This course requires 4 hours per week comprising 2 theoretical hours and 2 operational hours. Previously, the researcher arranged traditional classroom which integrates lecturing, individual and group work, and learning in a computer laboratory. Teaching and learning environment was traditional because the teacher and students were in the classrooms at all times. The teacher could control and teach effectively. A few weeks before the opening of the semester, Thai government announced a temporary closure of classroom teaching and imposed online teaching due to global outbreak of Covid-19. The sudden change from traditional to online classroom demands physical and mental adaptations of teacher and students. After a few weeks of online classes, the students were tired of and did not enjoy online teaching. Throughout the semester, the teacher needed to plan, prepare, and create activities to stimulate and attract attention of students [4]. The teacher delivered online lectures and the tasks were assigned to be completed during online classes and after classes. The students decreased class participation such as closing cameras, turn off microphones, no responses to questions, passive responses to teacher and classmates, partial and delayed work submission, and late online class attendance.

Online classes can decrease some limitations and fulfill several demands of students. Nevertheless, online classess carry various disadvantages and limitations. For instance, it is a study approach in which learners are far away from each other which that may lead to lack of interaction or relationship between learners and learners and learners with teachers. Therefore, inspiration and time management skills are needed to mitigate such impacts. Online classes may reduce the role of socialization for learners by teachers and may not be proper for any academic fields where practical skills need to be developed include science, nursing, cooking, and nutrition [3]. Over 92% of learners view that online teaching is low in capacity if its management is not better than traditional classes [5]. Learners feel tired of online learning after only 2 weeks of studying at home [4]. They feel that they learn better in an authentic classroom compared with that in online class [6]. This includes learners' expectations of instructors, courses, and their readiness to give assistance. All of these affect the learners' online learning [7]. The most important factor that influences the feelings of learners and can change their minds from learning in traditional classroom to online learning is satisfaction with online learning [8] Thus, it is essential to put great efforts in supporting happiness of learners during online learning [4]. This includes constructive interaction between learners and teachers [9], encouraging learners to have learning participation and motivation with various approaches [10], designing and planning learning management to optimize learning as a main target of teaching, and stimulating and motivating through online lessons and activities. All of this is necessary which affects the learners' learning success [4].

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In the second semester of 2020, all teachers were assigned to conduct online teaching. The researcher was assigned to conduct an online Digital Literacy course again. It is necessary for the researcher as a lecturer of this course to plan and prepare online teaching differently from previous semesters. This is to encourage and motivate students to have increase in learning interest and cooperation in online learning. In this regard, the researcher chose to arrange online class incorporating gamification for the semester.

Gamification is often used for any activities that need to enhance learners' engagement and motivation level. Gamification is applied in education environments to improve learners' performance, engagement, and satisfaction [11]. Gamification is a part of a learning model which helps develop social change and becomes one of the solutions that can enhance teaching and learning efficiency [12]. Gamification is the process of helping learners to achieve learning objectives through play according to the game's rules and then using the game's results to summarize important learning lessons. Its process can also turn learners into knowledgeable persons because the learner is the player themselves. Gamification provides direct experience and enhance behaviors of examining, improving, and finding solutions by themselves [12]. Gamification helps create entertaining learning atmosphere, motivate learning, and increase learning engagement by applying principles of game design and mechanism to non-gaming contexts [13]. This is to motivate learners to participate in activities, join learning, and achieve learning outcomes according to objectives set by an instructor the using game design principles and mechanics. It brings popularity to gamification. However, gamification used for teaching activities must not be too difficult nor complicated. Otherwise, learners will not enjoy learning or may lose confidence. They may feel stressful, helpless, irritated, uncomfortable, and unwilling to participate in the activities. Their negative feelings probably mount; they become distracted or ignorant about gamification [14], [15] that learners are more inclined to playing the game because of the ease of the game rather than the benefit of playing it. It can be concluded that ease of use is a better indicator for learners' attitudes towards playing games. Thus, as for teaching online incorporating gamification, the learner should have an opportunity to pass a level or activities that the instructor has set with a game that is not too difficult. Nonetheless, a game must not be too easy that the learner feel that it is unchallenged. Gamification also has a positive effect on authentic motivation and satisfaction on needs relating to social relationship [16]. This online teaching gives learners an opportunity to explore ways of learning through challenging activities such as competition, reward, advancement, application, and daily analysis. Such opportunity plays an important role in achievement [17]. Online learning combined gamification has a positive effect on learning motivation and understanding of educational contents [18].

According to the information, in the second semester of 2020, the researcher decided to deliver online teaching with gamification. The researcher aimed to motivate learning and bring satisfaction to online learning. The researcher focused on learning performance, motivation, and satisfaction of the students enrolling in Digital Literacy course of Suan Dusit University in the semester.

II. Literature Review

A. Online Teaching

Online teaching is divided into 2 types i.e., synchronous and asynchronous. Synchronous class is a presentation of knowledge including interactions that occur between learners and teachers or learners and learners. This type of class is run concurrently or operated at real time such as using video conference or online chat to deliver voice, picture, or alphabet. Importantly, the interactions occur at the same time. Asynchronous class is an online class that does not happen in the same place or at the same time. Resources are used to facilitate information sharing. Learning activities focus on self-regulated learning. Instructors may produce media in advance. Applications supporting asynchronous classes include Google Classroom, Microsoft Teams, Moodle, and MOOC [19].

Online teaching has two types i.e., synchronous, and asynchronous classes. Synchronous class is online teaching that instructors and learners participate in class activities at the same time. Asynchronous class is online teaching that instructors and learners join class activities at different times. Online teaching has similar elements as that of traditional classroom comprising teachers, learners, content, learning materials, learning resources learning provision process, communication system, information technology network system, and assessment [20].

B. The Concept of Gamification

Gamification combines prominence and advantages of concept, design process, game mechanics, game dynamics, and emotions of players. All of these become an important tool for online teaching. Gamification focuses on creating joy, interest, motivation, satisfaction, and engagement of learners. Consequently, learners know how to solve problems creatively. The approach helps improve emotional, social, and communication skills necessary for work and life such as decision-making, creative, critical thinking, teamwork, and leadership skills. It strengthens cognitive behaviors such as remembering, understanding applying, analyzing, assessing, and creating [12], [13], [21]-[25].

III. Data Collection

The research tool is the plan of online gamification teaching activities for Digital Literacy course. Overall evaluation of the planning suitability by experts is in high level (Mean = 4.28). Finding the efficiency of teaching plan based on the criteria of E1/E2 to evaluate the teaching plan and reach the efficiency level of 80/80 [26].

The student's achievement before and after the online gamification class is assessed through a pre- and post-tests in Digital Literacy course. The related values include item objective congruence (IOC) 0.67-1.00, item difficulty (p) 0.50-0.73, discrimination (r) 0.20-0.73, and reliability 0.86.

The study on learning motivation of students before and

after the online gamification teaching through the pre- and post-tests in Digital Literacy course is applied from those of [27]-[29]. The item objective congruence (IOC) is 0.67-1.00 and Cronbach's alpha coefficient (α - coefficient) is 0.83.

A student satisfaction survey towards online gamification teaching in Digital Literacy is applied from [30], [31] containing 4 aspects. The item objective congruence (IOC) is 0.67-1.00. The satisfaction survey is used to test reliability of undergraduates enrolling in the Digital Literacy course in the second semester of 2020 who share some similar aspects with the sampling group amounting to 30. The Cronbach's alpha coefficient (α - coefficient) is 0.81.

A. Research and Data Collection

In terms of formulating its lesson plan, the research team determines teaching approaches and activities in the lesson plan by studying and analyzing the related information. The team selects topics for implementing online gamification learning of 9 hours per week. The teaching activities consist of synchronous lecturing, and individual and group activities in an online class for 4 hours. The undergraduate study and fulfill assignments from an asynchronous class of 5 hours per week. Instructors prepare activities, teaching materials and tools as the following.

1) Zoom application is for real-time online lecturing, control class, and communicate with students during a synchronous class for 4 hours per week.
2) Google Classroom and WBSC 2021 applications help create online classrooms for independent studies of students for 5 hours per week.
3) Google Form application is employed for the tests of online learning achievement and motivation.
4) The Google Sheet application enables creating a database for points and rewards of a student which is accessible and examined any time.
5) Google Jamboard application supports online group learning.
6) Mindmap application is for brainstorming to summarize the lesson contents of both individual and group assignments.
7) Kahoot application allows students to create quizzes to independently review their content knowledge and share the quizzes to their classmates in online classes.
8) WheelofName application facilitates randomizing names of students to answer questions or participate in online classroom activities. It also supports student grouping and collecting points and prizes randomly.
9) Microsoft PowerPoint application is a medium for presenting lesson contents of instructor and game for arranging learning activities in the classes.

Implementing a pre-test to evaluate learning achievement of students before and after online gamification teaching in Digital Literacy through Google Form application for 30 minutes.

A 15-minute assessment of student's learning motivation before and after the online gamification in Digital Literacy course.

Organizing teaching activities through activities, media, and tools as prepared.

Notifying the accumulated points and rewards that a student receives and saves the information in Google Sheet application which any students can always access and examine them.

30-Minute post-test through Google Form application to explore learning achievement of students before and after online gamification teaching in Digital Literacy course.

Assessing post-study motivation before and after online gamification teaching of students in Digital Literacy course through Google Form application for 15 minutes.

Assessing students' satisfaction with online gamification in Digital Literacy course through Google Form application for 15 minutes.

B. Data Analysis and Statistics

Comparing students' academic achievement before and after online gamification teaching in the Digital Literacy course through t-test for Dependent Samples.

Comparing students' learning motivation before and after online gamification teaching in the Digital Literacy course through t-test for Dependent Samples.

Assessing satisfaction of students in online gamification teaching in the Digital Literacy course through frequency, percentage, average, and standard deviation.

IV. Results

The results of developing an online gamification teaching plan for the Digital Literacy course for the undergraduate are presented in Table I.

TABLE I: The Effectiveness of Online Gamification Teaching Plan

Number of students	Sub-test scores in classes						Post-test scores 20 points
	1st 10 points	2nd 10 points	3rd 10 points	4th 10 points	5th 10 points	Total 50 points	
30	239	247	245	244	244	1,219	490
E_1/E_2						81.27	81.67

It is found that an online gamification teaching plan for the Digital Literacy course for the undergraduate has efficiency of process (E1) of 81.27 and efficiency of product (E2) of 81.67. Thus, its efficiency amounts to 81.27/81.67 which is in line with the 80/80 criteria.

The comparison of the students' academic achievement before and after the online gamification teaching shown in Table II.

TABLE II: Learning Achievement before and after the Online Gamification Teaching

Sampling group	Test results					
	Before		After		t	P-value
	M	SD	M	SD		
Students	13.37	2.08	17.08	1.30	25.35	.000*

* $p < .01$

The comparison results reveal that learning achievement of the students before and after the online gamification teaching have statistical differences at 0.01. The mean scores acquired after learning are higher than those of before learning.

The results of comparing learning motivation of students before and after the online gamification teaching are informed in Table III.

TABLE III: LEARNING MOTIVATION BEFORE AND AFTER THE ONLINE GAMIFICATION TEACHING

Dimensions of motivation	Motivation					
	Before		After		t	*P-value*
	M	SD	M	SD		
1. Studying plan	2.94	0.67	3.78	0.71	16.60	.000*
2. Operational responsibility	3.14	0.55	3.71	0.70	13.22	.000*
3. Studying interest	3.03	0.68	3.66	0.67	11.28	.000*
4. Teaching activities	2.96	0.63	3.75	0.72	16.30	.000*
Overall	**3.02**	**0.67**	**3.72**	**0.70**	**20.93**	**.000***

* $p < .01$

The results of comparing motivation of students before and after the online gamification teaching reveal statistical difference at the level of 0.01. The level of post-study motivation is higher than that of the pre-study on average. In comparing each dimension of learning motivation of students from the online gamification teaching, the result reports that all dimensions are significantly different at the statistical level of 0.01. The mean of post-study motivation is higher than that of the post-study.

The analysis of survey on students' satisfaction on online gamification teaching discloses the results in Table IV.

TABLE IV: THE RESULTS OF SATISFACTION SURVEY ON THE ONLINE GAMIFICATION TEACHING

Dimensions of satisfaction	Results		Satisfaction level
	M	SD	
Learning activities	3.89	0.71	High
Learning atmosphere	3.95	0.74	High
Understanding contents	3.74	0.71	High
Instructors	3.78	0.70	High
Total	**3.84**	**0.72**	**High**

The satisfaction survey on the online gamification teaching show results in high levels. Its mean stands at 3.84 and standard deviation reaches 0.72. The highest satisfaction is on learning atmosphere of 3.95 with standard deviation of 0.74, followed by learning activities of 3.89 with standard deviation of 0.71. The satisfaction on instructors achieves 3.78 with standard deviation of 0.70 and understanding contents attains 3.74 with standard deviation of 0.71.

V. CONCLUSION AND DISCUSSION

The plan for the Digital Literacy course considers understanding of students, determining the learning objectives that the instructor requires the students to reach, structuring learning experience according to priority from easy to difficult contents, specifying applications, media, and resources to be used, and setting rules of teaching activities that learners need to follow [25]. The instructor adopts mechanics and dynamics of gamification and feelings of players such as points, leaderboards, levels, rewards, and joy to motivate the students [13], [24]. This aligns with the study of [30] that develops the online gamification teaching plan whose efficiency corresponds to the criteria of 80/80. The results go with the study of [30] that the efficiency of online teaching gamification plan reaches the determined criteria. The digital tools are used in online gamification teaching activities such as Google Meet, Google Classroom, and Kahoot [23].

The online gamification teaching for the Digital Literacy course enhances learning achievement of students compared with that before the implementation. This reveals that both synchronous and asynchronous online teaching approaches promote learning achievement of students. In this regard, an instructor needs to arrange activities for students to participate, act, and learn happily. This notion aligns with the study of [32] finding that utilization of online teaching requires efforts and cooperation from different parties. [33] discloses that online teaching needs a design of unique learning activities and assessment corresponding to the nature of online learning. This study shares similar perception with the study of [34] mentioning that instructors usually give lectures during online teaching without arranging activities that students can participate in. Thus, this online gamification teaching arranges the activities drawn upon the design process and game mechanics which is applying games in an educational setting [12] to increase participation and satisfaction of students [35]. When students participate in challenging and fun activities, the effectiveness of online gamification teaching will be increased. Gamification is a process enhancing the students to achieve learning objectives through rules and agreements of games. The results are used for learning summary [12]. Gamification is a form of learning innovation that helps drive social changes and becomes a solution that can change learners to knowledgeable persons as learners are players who receive direct experience. Gamification promotes behaviors of examining, improving, and finding solutions by themselves [36]. The approach encourages the students to have some preparation before attending the classes. This stimulates participation in lecturing and activities of students which leads to increasing learning effectiveness [37].

The online gamification teaching in the Digital Literacy course raises learning motivation of students in relation to studying plan, operational responsibility, studying interest, and teaching activities. The results align with the study of [4] exposing that the main target of learning design and plan is to maximize learning of students. Building motivation through online lessons and activities is essential and has effects on learning achievement of students. This approach helps encourage students to have some preparation before attending classes which stimulate participation in lecturering and activities and then lead to increase in learning effectiveness [37]. Gamification applies elements of games in non-game domains and becomes popular for any activities that need to boost participation and motivation of students in an educational setting to increase learning achievement, participation, and satisfaction of students [11]. Gamification creates a fun learning environment and fosters learning

motivation and engagement of students [12], [13], [38]. This teaching method motivate students to participate in learning activities and achieve learning outcomes according to the objectives set by an instructor. Such result corresponds to the study of [28] informing that the students have higher motivation compared with that before attending the online gamification teaching.

Researchers have found that instructors play an important role in successful online teaching. In addition to planning and preparing for teaching, an instructor needs to arrange teaching activities and give advice including support to the students willingly. This is a way to promote learning motivation. This notion supports [4] reporting that it is essential that an instructor puts a great effort in creating mental comfort for students during the online learning such as good interaction between learners and instructors [9] An instructor should encourage and motivate students to participate in the classes with different methods [10]. In this regard, design and plan of learning management is to maximize learning of students which is the main target of an instructor. Creating motivation through online teaching and activities is there necessary leading to learning achievement of students. To promote success and benefits of online gamification teaching [39] inform that its activities must not be too difficult nor complicated because the students may feel bored, insecure, stressful, desperate, irritated, uncomfortable, and unhappy to participate in the activities. Their feelings may become more intense such as distracted and desisted which make them not want to learn through the online gamification teaching any longer [14]. Consequently, in arranging the online gamification teaching, the students should have opportunities to pass criteria or activities with the level of medium difficulty. That is, it should not be too easy to spare some challenges for students.

After implementing the online gamification teaching for the Digital Literacy course for 5 weeks according to the research plan, it is found that the students are still interested in and demand this type of online teaching. A few weeks after stopping the delivery of online gamification teaching, the students have decrease in learning motivation and keep requesting the online gamification teaching approach. The students' behaviors correspond to the studies of [12], [13] notifying that the online gamification teaching creates fun learning environment which fosters learning motivation and engagement of learners.

The students' satisfaction level of online gamification teaching for the Digital Literacy course is high both in overall picture and dimensions. The highest satisfaction is on learning atmosphere followed by learning activities, instructors, and understanding contents. The satisfaction aligns with [38] informing that the online gamification teaching creates a high level of learning motivation of students, and they are highly satisfied with the learning activities. This high level of satisfaction goes along well with [40] reporting that the gamification can raise satisfaction level of application users. The result also supports the study of [30] mentioning that students have high satisfaction level after learning through gamification-based teaching. A prominent advantage of gamification is allowing students to have happy learning. Once students learn happily, they will have satisfaction with learning and participating in activities. This online gamification teaching focuses on stimulating independent self-study through participating in sharing ideas, and individual and group activities set by an instructor. Online gamification teaching is a tool that can stimulate learning because this integrated learning emphasizes participation of students [30] general, students will be tired of online teaching after two-week learning [4].

VI. Recommendations on the Use of Research Results

The management of education institutions can apply the research results of arranging online gamification teaching to their develop knowledge and capacity of instructors and administrators in relation to writing the online gamification teaching plan and arranging the online classes resulting in learning achievement of students based on their increasing motivation and satisfaction from the online classes.

Teacher colleges can utilize the research results as information to develop curriculums and courses for teaching preservice teachers. The institutions can also develop curriculums for training any teachers and related persons who are interested in the online gamification teaching.

Lecturers, teachers, and instructors of all levels can apply the research results as a resource for individual development relating to writing an online gamification teaching plan and arranging learning activities to enhance learning achievement of students through raised motivation and satisfaction from online learning.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Jira Jitsupa and Mutita Takomsane studied literature review, created the evaluation form, collected and analyzed the data and wrote paper. Sasanun Bunyawanich checked academic writing. Nualsri Songsom and Prachyanun Nilsook advised had approved the final version.

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