

Student Engagement in Learning Software Engineering Subject using Gamification Approach: A Case Study

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Abstract— The purpose of this paper is to investigate student engagement in learning software engineering subject with gamification approach. Software engineering subject is offered during the early year of three years towards earning a Bachelor Degree in Computer Science in most of local universities in Malaysia. This subject requires student pay attention to lectures, memorize terms and understand the concept. The passive session leads little engagement from the students. To overcome this problem, gameful design approach is introduced. The subject of the study comes from 59 students undertaking software engineering subject from computer science background from one public university in Malaysia. All students will be experienced gamification. At the end of the semester, the students are given a set of questionnaires. The findings revealed that Kahoot can engage and motivate students in learning particularly in subjects that involve lots of theoretical terms and need to do lots of reading. The initial study and findings can be used to add alternatives and improve the teaching and learning process for subject that involve lots of terms.

Index Terms—gamification, software engineering, computer science, engagement.

I. INTRODUCTION

Software engineering subject is very important to every computer science student as it gives an overview about the principles, techniques and process required for development and construction of computer software. Nowadays the common traditional teaching and learning in software engineering subjects is quite dull and monotonous due to the nature of the software engineering is mostly on the theoretical part. These drawbacks of the traditional approach affect the software engineering student engagements elements such as in participation, performance and emotional. In order to improve and enhance student engagement in software engineering class, a gamification approach is introduced. The proposed approach is said can encourage students to learn more effectively and proactively. In this study, the gamification mechanism is used in the teaching and learning process particularly for Software Engineering subject. We gathered feedback from 59 students who takes Software Engineering Problems and issues arise from software engineering fresh graduates such as poor in communication skills, leadership style, ego, gender issue, poor documentation skills,

misinterpretation of requirements and incorrect requirements [5]. This could be due to many causes, but one of them is engagement in learning the subject.

Gamification on the other hand refers to service design aimed at providing game-like experiences to users, commonly with the end-goal of affecting user behavior by providing gaming experiences [4].

Gamification methods have been applied in various environments and for different purposes such as enterprise work- places, education, pervasive health care, e-commerce, human resource management and many more. The studies indicate that gamification can lead to increase user activity and participation.

In this study, we examine the student engagement in learning software engineering subject using gamification approach versus the traditional approach that have been applied in the software engineering education nowadays.

Since gamification can be defined as the concept of introducing gaming elements to non-gaming activities. Games are well known as entertaining and attracting activities which engaged people to look forward to it [1].

Gamification is also said to engage learners more than traditional learning. Student engagement is classified into four elements that are skills, participation, performance and emotional [2].

A. Kahoot

Kahoot! is a free online student response system designed to allow instructors or teachers to create question-based learning games, discussions and surveys. Researchers find out that Kahoot! can engage students through game-like pre-made or impromptu [6]. In order to use Kahoot!, instructors need to create an account before creating a quiz. Student do not need to create an account and can access the quiz through any device with a web browser. The game like quiz features is the key that engage the students. Student's answer is displayed in the graph form and points are awarded to the fastest respond. The name of the top five students is listed after each attempt. At the end of the session, the winner's total number of answer is displayed. Instructor collects and save the data and review the student's answer.

II. METHODOLOGY

To evaluate the effectiveness of the gamification approach, an intervention had to be carried out. In the following subsection, we describe the preparation and the process of this evaluation.

In representing the population, 59 respondents of software engineering subject student from computer science background from one public university in Malaysia. Since the case study was not merely surveys or questionnaires but a series of learning activities, a large sample would not be possible. Due to time, money and work-force constraints, only a very small number of respondents were chosen.

Based on the definitions above, we proposed to use gamification mechanism in the Software Engineering class. In this study, we use Kahoot as the platform. Kahoot is known as web game-based learning platform that makes learning fun to learn in any subject, in any language, on any device and for all ages. Figure 1 is the interface of Kahoot for lecturers and student.



Fig 1. Kahoot: Lecturer view



Fig 2. Kahoot: Student view

During the intervention, all students experience gamification in software engineering class. At the end of the study, students answered a set of questionnaires.

III. RESULTS AND FINDINGS

Survey has been conducted through questionnaires to get the students' perspectives on the gamification approach in learning Software Engineering (SE).

For this study we have distributed the questionnaires to 59 students from computer science students who takes Software Engineering subjects. The questionnaire was distributed at the end their semesters and the respondents have experienced both traditional and gamification in learning software engineering subjects.

A. Student demographic data

This demographic data is presented by 3 parts that is gender, age and software engineering ability.

B. Gender

Figure 3 below shows that the number of female student and male student are almost equals. From the total respondents; 53% respondents are female students and 47% is male.

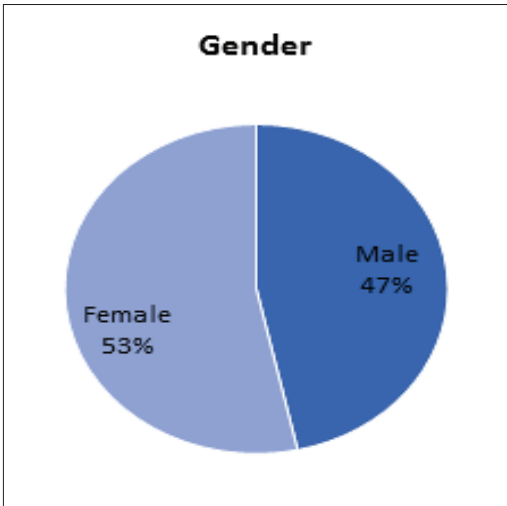


Fig 3. Gender

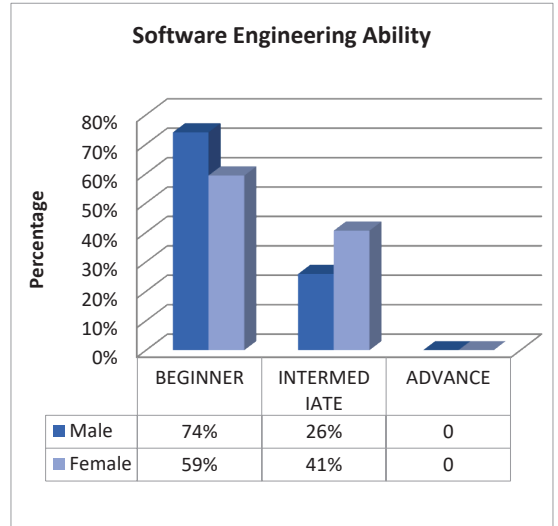


Fig 4. Student Perspectives on Their Ability in SE Subject

C. Age

Table 1 shows the number of respondents by their age's group. From the table it is showed that the respondents at their 20's and most of the respondents age 21 years old, which translated as 58% from the total respondent.

Table 1. Demographic Data - Respondents by Age Group

Age	Frequency	Percentage
20	1	2%
21	34	58%
22	19	32%
23	4	7%
27	1	2%
Total	59	100%

D. Software Engineering Ability

For questions, "How do you evaluate your ability in Software Engineering subject?"

From the results, none of the student rates them as an advance in software engineering subject (refer Figure 4). They are most likely to rate themselves as a beginner translated as 66% and the rest rated themselves as an intermediate, which translated as 34%. The most contributors to the beginner comes from the male student, which is 74%. The results indicate that students have not acquired or maybe not confident about their understanding in learning SE.

E. Student Perspectives on Current Way of Teaching and Learning

In Section B, we asked "Student perspectives on current way of teaching and learning in SE class", 5 Likert scale is used to rate student's perspective. The scale indicator: 1= Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree.

Most of the student strongly agreed that they had never miss Software Engineering class for this semester but most of them rate neutrally to the question ask if software engineering subject is their favourite subject and it seem that they act neutrally about taking part in question and answer or the discussion the class.

We also can see that they still can accept the traditional way of teaching and learning of software engineering subject as 49% of the respondent agree that the current way of lectures help them to understand the topic better but somehow 34% agree that they always have some difficulty in memorizing the notes from the lecturer. More over 46% of the respondent agree that software engineering subject is too much theoretically and somewhat 29% of the respondent even agree that software engineering subjects is a monotonous subject.

To conclude, the students need an alternative, which is more interesting and attractive to help them to be more engaged in studying software engineering so that they attracted, able to understand easier and increase motivation in learning the software engineering subjects.

F. Student Perspectives on Games in General

In this section, we want to gauge the information about student perspectives on games in general. From the questionnaire, 80% of the students, play games while the others did not play games. To learn more, how long the period for students spend time on playing the games, we asked them the duration. It showed that most of the students spend about 1 hour playing games (39%).

Most of the students play games because games are interesting and enjoyable which worth 25%. They also play games to get satisfactions when they successfully accomplish the mission and the goals of the games by 21% which is fewer 3% to the factors that they actually play games for games is challenging and its challenge them to do better.

G. Engagements Factors in Gamification on SE Subject

As for the question how gamification approach can help them to improve their engagement, we have divided the elements into three parts that is in term of participation, performance and emotional engagement. For this, questions we sure that all of the students have already experience gamification in software engineering class as we have already done the experiment before we distributed this questionnaire. As stated previously, we use Kahoot as the gamifications tools to gauge student's perspectives on their engagements in software engineering subjects.

a) Participation

For the participation engagements, students love to be ranked. Ranking engaged them to participate in all of the quiz and it even challenge them to beat their friend's score in order to be the best out of the best ranking in their class.

46% of the respondents agree that gamifications help them to evaluate their learning achievement in understanding software engineering subjects. 41% of the students agree that gamification also help their lecturers to evaluate whether the lesson was clear or not.

b) Performance

In term of performance, 47% of the respondents agree that Kahoot help them in their study and 39% of the respondent agree that Kahoot help them to get better understanding on the topic discussed in class and it is even more that 42% of the respondent agree Kahoot help them to understand the topic covered in class much easier after using Kahoot. About 44% of the respondents agree that Kahoot help them to identify which topic should they focus more. So we can see that gamification helps student to improve their understanding of software engineering subjects and gamification also helps students to identify their strength and weakness in the topic learned in the class which will end up they will know which one should they focuses more and less.

c) Emotional Motivations

The third element of engagements in gamification that we have tested though the questionnaire is the emotional elements. 51% of the respondents agree that Kahoot makes SE class more interesting and engaging and 34% of the students agree that Kahoot challenges them to always be a better student. Overall 51% of the students agree that Kahoot gives them a positive experience for them to learn software engineering subject in a fun interesting and attractive ways. 36% of the students even agree to apply Kahoot in other lessons too and they are mostly preferred Kahoots compare to face to face teaching and learning in nowadays education systems. From this emotional engagement we can conclude that students have given us a very positive feedback about accepting and applying gamification in this software engineering subjects and even more they like to

in nowadays education systems. From this emotional engagement we can conclude that students have given us a very positive feedback about accepting and applying gamification in this software engineering subjects and even more they like to apply gamification in other subjects too which we should take this into serious action in the future research.

H. The Student Suggestion and Opinion toward Gamifications

The last section is an open ended and close ended questions for suggestion and opinion towards gamification. 98% students agree that gamifications help students to be more proactive in SE class. There is only one person who does not agree that gamification can helps student to be more proactive because the respondent believes that gamification is just a gameful thing that they are playing for fun but not to get knowledge.

92% students agree that gamification helps students to improve students' productivity and get a better. In other open ended questions, we have note that most of the student agree that gamification can improve their pro-activeness in the class and increase their productivity to get a better result, this is due to that they love play games and gamifications is one kind of games that gives them fun and enjoyments together with improving knowledge and skills.

IV. CONCLUSION

From the results of the study, it can be concluded that Kahoot is user friendly and benefits both instructors and students. The initial study proved that Kahoot can engage and motivate students in learning particularly in subjects that involve lots of theoretical terms and need to do lots of reading. Accurate findings however will need larger sample and a longer period of intervention. Future work can also be expanded in terms of statistical analysis to validate the reliability of the results.

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