UNIVERSITI TEKNIKAL MALAYSIA MELAKA

GAMIFICATION FOR IMPROVING STUDENT ENGAGEMENT IN SOFTWARE ENGINEERING SUBJECT: A CASE STUDY IN UTeM

NUR FAIQAH BINTI AB HAMID @ FAUZI

MASTER OF COMPUTER SCIENCE
(SOFTWARE ENGINEERING AND INTELLIGENCE)

2016

© Universiti Teknikal Malaysia Melaka

NUR FAIQAH BINTI AB HAMID @ FAUZI
MSC. (SOFTWARE ENGINEERING AND INTELLIGENCE)
2016

© Universiti Teknikal Malaysia Melaka

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty Information and Communication Technology

GAMIFICATION FOR IMPROVING STUDENT ENGAGEMENT IN SOFTWARE ENGINEERING SUBJECT:A CASE STUDY IN UTeM

Nur Faiqah Binti Ab Hamid @ Fauzi

Master of Computer Science
(Software Engineering and Inteligence)

2016

© Universiti Teknikal Malaysia Melaka

GAMIFICATION FOR IMPROVING STUDENT ENGAGEMENT IN SOFTWARE ENGINEERING SUBJECT: A CASE STUDY IN UTeM

NUR FAIQAH BINTI AB HAMID @ FAUZI

A thesis submitted
in fulfillment of the requirements for the degree of Master of Computer Science
(Software Engineering and Intelligence)

Faculty of Information and Communication Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2016

© Universiti Teknikal Malaysia Melaka

DECLARATION

I declare that this thesis entitled "Gamification to Improve Student Engagements in Software Engineering Class: A Case Study in UTeM" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : ……..

Name : Nur Faiqah Binti Ab Hamid @ Fauzi

Date : ……..……

© Universiti Teknikal Malaysia Melaka

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in term of scope and quality for the award of the degree of Master of Computer Science (Software Engineering and Intelligence).

Signature : ……..

Supervisor Name : Mashanum Osman .

Date : ……..……

© Universiti Teknikal Malaysia Melaka

DEDICATION

My dedication goes to my beloved parents Ab Hamid @ Fauzi bin Ismail and Ramlah Binti Mohd Nor. They give continuous support to complete my master project. I really thank to them and dedicate this project to them as symbol of my love to them. Furthermore, a special thanks to my supervisor Mashanum Osman, and not to forget my loved friends and my entire class mate for supporting me direct and indirect to finish my project successfully. Thank you so much.

© Universiti Teknikal Malaysia Melaka

ABSTRACT

Software engineering Software engineering subject is a very important to every computer science student as it will give an overview about the principles, techniques and process required for development and construction of computer systems now and then. Nowadays the common traditional teaching and learning in software engineering subjects is quite dull and monotonous subject due to the basic studies about 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. Since they are not interesting and attractive, it is difficult to attract the students to focus on the learning process. In order to improve and enhance student engagement in software engineering class, there is an attractive approach suggested in this research is known as gamification approach. Gamification approach can be applied to invent a more qualified student to the community. The proposed approach can encourage students to learn software engineering more effectively and proactively. In this study, we got feedback from 59 respondents of software engineering subject student from computer science background and the data analysis was done using SPSS software. From the result, it shows that the engagement elements of participation, performance and emotional have significant effects on the adoption of gamification in software engineering class.

© Universiti Teknikal Malaysia Melaka

ABSTRAK

Subject kejuruteraan perisian adalah sangat penting kepada setiap pelajar sains komputer kerana ia akan memberi gambaran keseluruhan tentang prinsip-prinsip, teknik dan proses yang diperlukan untuk pembangunan dan pembinaan sistem komputer pada masa kini dan akan datang. Pada masa kini pengajaran tradisional yang sama dan pembelajaran dalam mata pelajaran kejuruteraan perisian adalah agak membosankan kerana kajian asas mengenai kejuruteraan perisian adalah kebanyakannya pada bahagian teori. Kelemahan pendekatan tradisional memberi kesan kepada pelajar kejuruteraan perisian kepada unsur-unsur seperti dalam penyertaan, prestasi dan emosi. Oleh kerana mereka tidak menarik, ia adalah sukar untuk menarik minat pelajar untuk memberi tumpuan kepada proses pembelajaran. Dalam usaha untuk meningkatkan dan meningkatkan penglibatan pelajar di dalam kelas kejuruteraan perisian, terdapat satu pendekatan menarik yang dicadangkan dalam kajian ini dikenali sebagai pendekatan gamification. Pendekatan gamification boleh digunakan untuk mencipta pelajar yang lebih berkelayakan kepada masyarakat. Pendekatan yang dicadangkan boleh menggalakkan pelajar untuk belajar subjek kejuruteraan perisian dengan lebih berkesan dan proaktif. Dalam kajian ini, kami mendapat maklum balas daripada 59 orang pelajar kejuruteraan perisian dari latar belakang sains komputer dan analisis data telah dilakukan dengan menggunakan perisian SPSS. Dari keputusan itu, ia menunjukkan bahawa unsur-unsur penglibatan penyertaan, prestasi dan emosi mempunyai kesan yang besar ke atas penggunaan gamification dalam kelas kejuruteraan perisian.

© Universiti Teknikal Malaysia Melaka

ACKNOWLEDGEMENTS

All praise and thanks to ALLAH, the lord of the Alamin. I would like to express my deep appreciation and sincere gratitude to Mashanum Osman, my supervisor, for her patience, wisdom, invaluable guidance, advice and motivational thoughts from the beginning to the end of this project. Mashanum Osman has been an excellent mentor and has provided unfailing support throughout my research of the GAMIFICATION TO IMPROVE STUDENT ENGAGEMENTS IN SOFTWARE ENGINEERING CLASS: A CASE STUDY IN UTeM.

I am thankful to my beloved parent Ab Hamid @ Fauzi Bin Ismail and Ramlah Binti Mohd Nor who taught me the value of education, and also many thanks to my siblings without your love, doa and endless support, I am sure that I would not have been able to achieve so much. Special thanks to the UTeM lecturers that teach me skills that helps me to reach at this level.

My gratitude also goes to lecturers, friends, and to all might have involved directly or indirectly in doing this research and in giving me some ideas, information and also for spending their valuable time and effort.

© Universiti Teknikal Malaysia Melaka

TABLE OF CONTENTS

		PAGE
DECLARATION		
APPROVAL		
DEDICATION		
ABSTRACT		**i**
ABSTRAK		**ii**
ACKNOWLEDGEMENTS		**iii**
TABLE OF CONTENTS		**iv**
LIST OF TABLES		**vii**
LIST OF FIGURES		**viii**
LIST OF APPENDICES		**ix**
CHAPTER		
1.	**INTRODUCTION**	**1**
1.1	Introduction	1
1.2	Background Of The Study	5
1.3	Problem Statement	6
1.4	Research Question	7
1.5	Research Objective	8
1.6	Research Scope and Limitation	8
1.7	Project Methodology	9
1.8	Significant And Research Contribution	11
1.9	Expected Output	11
2.	**LITERATURE REVIEW**	**12**
2.1	Introduction	12
2.2	Traditional Software Engineering Subject Teaching Approach	12
2.3	Gamification	13
2.3.1	The Motivation Of Games In Gamification Approaches	14
2.3.2	Gamification Practice In Education	15
2.3.3	Challenge/Limitation Of Gamifications	20
2.3.4	Advantages Of Gamification	20
2.4	Conclusion	22
3.	**METHODOLOGY**	**23**
3.1	Introduction	23
3.2	Research Methodology Process	25
3.2.1	Literature Review	26
3.2.2	Experiment	26
3.2.3	Questionnaire	28
3.2.4	Data Analysis	30
3.3	Conclusion	30
4.	**RESULT ANALYSIS AND DISCUSSIONS**	**31**
4.1	Introduction	31
4.2	Survey	31
4.2.1	Student Demographic Data	32

© Universiti Teknikal Malaysia Melaka

4.2.2 Student Perspectives on Current Way of Teaching and Learning 34
4.2.3 Student Perspectives On Games As In Generally 36
4.2.4 Awareness on gamification in software engineering subject 39
4.2.5 Engagements Factors in Gamification on SE Subject 40
4.2.6 Application of Gamification in Software Engineering Sub Topic 44
4.2.7 The Student Suggestion and Opinion toward Gamifications 46
4.3 Data Analysis 48
4.3.1 Reliability Analysis 48
4.3.2 Hypotheses Analysis 49
4.3.3 Correlations Coefficient 54
4.4 Recommendation 55
4.5 Conclusion 56

5. CONCLUSION, CONTRIBUTIONS AND FUTURE WORK 57
5.1 Introduction 57
5.2 Conclusion 57
5.3 Research Findings 57
5.4 Contribution Of The Research 59
5.5 Background And Context Limitation Of The Study 62
5.6 Future Work 63

REFERENCES 65
APPENDICES 69

© Universiti Teknikal Malaysia Melaka

LIST OF TABLES

TABLE	TITLE	PAGE
1.1	Definition of Engagement Factors That Affected Student Concentration Software Engineering Class	4
2.1	Gamification Definition	13
2.2	Gamification Practice In Education	16
2.3	Relevant Elements in Gamification in Education Adoptions	19
2.4	Traditional approach vs Gamification approach	21
3.1	The Relationship Between The Objectives And Methods	23
4.1	Demographic Data - Respondents by Age Group	33
4.2	Frequency of Student Awareness in Gamification and Student Perspectives on Applying Gamification in SE Class	45
4.3	Cronbach's Alpha for Engagement	49
4.4	Mean and Weight for The Compared Variables	49
4.5	Paired Samples Test	51
4.6	Paired Samples Test: Participation	52
4.7	Paired Samples Test: Performance	53
4.8	Paired Samples Test: Emotional	54
4.9	The Correlation Values	55
5.1	Summary of Hypothesis Testing	58

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

LIST OF FIGURES

FIGURE	TITLE	PAGE
1.1	Elements of Engagements	4
3.1	Four stages of Research Methodology Process	25
3.2	Kahoot Interface for Lecturer and Student	27
4.1	Gender	33
4.2	Student Perspectives on Their Ability in SE Subject	34
4.3	Frequency of Student Perspectives on The Current SE Class	35
4.4	Frequency of Student Play Games	36
4.5	Frequency of Student Play Games	37
4.6	Frequency of Hours Spend Every Day To Play Games	37
4.7	Frequency of The Reason Why Student Play Games	38
4.8	Frequency of Student Awareness in Gamification and Student Perspectives on Applying Gamification in SE Class	39
4.9	Frequency of Student Perspectives on The Gamifications: Participation Elements	41
4.10	Frequency of Student Perspectives on The Gamifications: Performance Elements	42
4.11	Frequency of Student Perspectives on The Gamifications: Emotional Elements	43

© Universiti Teknikal Malaysia Melaka

4.12 Frequency of Student Awareness in Gamification and Student Perspectives on Applying Gamification in SE Class 44

4.13 Frequency of Student Perspectives on Gamification Helps Students To Be More Proactive in SE Class 46

4.14 Frequency of Student Perspectives on Gamifications in SE Class Improve Students Productivity/Get a Better Result 47

5.1 Correlation Coefficient 58

© Universiti Teknikal Malaysia Melaka

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Questionnaire	69
B	SPSS Data Analysis	73
C	Student Opinion and Suggestion	80
D	Kahoot	86

© Universiti Teknikal Malaysia Melaka

CHAPTER 1

INTRODUCTION

1.1 Introduction

Student engagement in software engineering subject in class is very important to make sure an effective teaching and learning process in education field. A successful teaching and learning will produce a proactive, creative and innovative student in the future. In term of software engineering education, the successfulness of teaching and learning will produce many proactive, creative and innovative fresh graduates and to be software engineer who worth working in the world wide industry market in the software engineering field.

Since there are some problem and issues in the industry have been wrote regarding the software engineering fresh graduates namely have poor communication skills, leadership style, ego, gender issue, poor documentation skills, misinterpretation of requirements, incorrect requirements and etc. (Hayat et al., 2010; Kumari & Pillai, 2013)

These issues will not be an issue and will no longer become a mess to the educators in the educational field if we can consider applying and adopting a new approach which is more engaging and entertaining in the learning and teaching in the software engineering field.

The approach that we are proposing is the Gamification approach. Gamification refers to service design aimed at providing game-like experiences to users, commonly with the end-goal of affecting user behaviour by providing gameful experiences (Huotari and

© Universiti Teknikal Malaysia Melaka

Hamari, 2012). Persuasive technologies, on the other hand, refer to interactive computer systems designed to change the attitude and/or behaviour of the user (Fogg, 2003).

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. Although these studies indicate that gamification can lead to increased user activity, a detailed analysis of users

The perception of gamification principles has hardly been studied. We are all individuals and are driven by different input factors such as our personality, as well as social or cultural differences. Especially in an education scenario, it is of uttermost importance to measure challenges and risks that occur due to these differences before introducing gamification methods though. On the one hand, we expect gamification to increase student participation.

Why do we want to apply gamifications. As an emerging industry, the game industry develops rapidly in recent years, directly promoted the current popular online games. While the network game brings people entertainment, it also brings about many negative effects at the same time. Some students are addicted to online games, not interested in learning, studies abandoned. In fact, "Playing" is the person's nature, many students have dreams: they can play games, but also can learn professional knowledge well.

In this situation, many educators have done a lot of interactive teaching reform, and actively exploring the teaching mode of gaming and studying. Teaching-and-gaming is an effective teaching method to enhance the interaction between teachers and students. Students like vivid and interesting game teaching form. The teaching activities mode - playing in study, learning in games - may create a relaxed and rich learning scene, helps

© Universiti Teknikal Malaysia Melaka

students to understand, master the related knowledge. The mode also makes the teaching a new life

In this project, 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. More specifically, we aim to answer the following research questions:

1. What is the current existing problem of student engagement in software engineering subjects?
2. How gamification approaches improves the student engagement especially in participation in software engineering class?
3. Is there any significant different between gamification and face-to-face approach in improving the student engagement in software engineering class?
4. Which element of the student engagement has more significant for student engagements in SE.

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 (Deterding et al., 2011).

Gamification approach can give software engineering subject more cheerful and colourful for student to be attracted and study. Student engagement is classified into four elements that are skills, participation, performance and emotional (Dixson, nd). The definition of engagement factors that affected student concentration software engineering class can be referred to the Table 2.1 below.

© Universiti Teknikal Malaysia Melaka

Figure 1.1: Elements of Engagements

They found four elements illustrating how students devote time and energy in the classroom:

1. skills engagement (keeping up with readings, putting forth effort);
2. emotional engagement (making the course interesting, applying it to their own lives);
3. participation/interaction engagement (having fun, participating actively in small group discussions); and
4. performance engagement (doing well on tests, getting a good grade)

Table 1.1 Definitions of Engagement Factors That Affected Student Concentration Software Engineering Class

Skills	Emotional	Participation	Performance
• Study regularly. • Stay up on reading. • Look over class notes. • Be organized. • Listen/read carefully.	• Put forth effort. • Find ways to make materials relevant. • Apply to my life • Find ways to make material interesting. • Really desire to learn.	• Have fun, engage and participate actively in all activities. • Help fellow students. • Get to know other students.	• Do well on tests. • Get good grades

© Universiti Teknikal Malaysia Melaka

1.2 Background of the Study

Software engineering subject is the crucial subject for all software engineering students in most universities in Malaysia. The subject provides an overview of software engineering as a discipline; the subject introduces students to the fundamental principles and methodologies of software engineering. It covers basic knowledge about software development process, software requirements, software design, software testing software quality management and etc. It provides minimum prerequisite knowledge for more detailed and specialized study of software engineering. Students gain experience, via a team project, about life-cycle development of software systems.

Upon completion of this software engineering subject, students should be able to: identify and discuss the technical and engineering activities of producing a software product, describe issues, principles, methods and technology associated with software engineering theory and practices (e.g., planning, requirements engineering, design, coding, testing, quality assurance, and configuration management).

The software engineering subject will include the following topics: introduction to software engineering, models of the software development process, project planning and organization, software requirements and specifications, software design techniques, software quality assurance, software testing, software tools and environments, team project activities and software project management

Software engineering subjects is the subject teaches in the second year students. It suppose to be a warm, entertaining, educating introductory in teaching and learning process to all software engineering students and educators. Usually in a university, a semester got 14 weeks of study weeks before the exam weeks, for a subject such as software engineering subject they provide 2 hours per week for lectures and 2 hours per weeks for lab sessions. So student have to take that 4 hours per weeks to learnt and

© Universiti Teknikal Malaysia Melaka

understand the subject deeply. For the lecture session usually lectures will give lectures on the topic that I have describe above while in the lab session they will implement them in many ways on study.

When student are more engaging into the technology world, they loves entertainments more than the monotonous, facts and their psychological motivation, behavior and the way of thinking is the things that educators need to take into concern especially in the contact of educations disciplines. Teaching excellent and meets students satisfactions.

So this gamification approach is proposed to increase student interest and level of engagement in this subject. This new approach will help the student in understanding the subject deeply and improve their awareness of how important software engineering subject to their studies and their future. Thus, this also can reduce the huge gap between software industry organization field and education field later as we can produce more qualified fresh graduates to the industry

1.3 Problem Statement

Software engineering subject is a very important to every computer science student as it will give an overview about the principles, techniques and process required for development and construction of computer systems now and then.

Nowadays the common traditional teaching and learning in software engineering subjects is quite dull and monotonous subject due to the basic studies about software engineering is mostly on the theoretical part. It covers basic knowledge about software development process, software requirements, software design, software testing software quality management and etc.

© Universiti Teknikal Malaysia Melaka

These drawbacks of the traditional approach affect the software engineering student engagements elements such as in participation, performance and emotional. Since they are not interesting and attractive, it is difficult to attract the students to focus on the learning process.

In order to improve and enhance student engagement in software engineering class, there is an attractive approach suggested in this research. We recommended this gamification approach to invent a more qualified student to the community. The proposed approach can encourage students to learn software engineering more effectively and proactively.

1.4 Research Question

Based on the problem statements as stated in an earlier section, the research question of this study are as follows:

1. What is the current existing problem of student engagement in software engineering subjects?
2. Does gamification approaches improves the student engagement especially in participation in software engineering class?
3. Is there any significant different between gamification and face-to-face approach in improving the student engagement in software engineering class?
4. Which element of the student engagement has more significant for student engagements in SE.

© Universiti Teknikal Malaysia Melaka