Article 9

Proposed Framework for Combining Gamification Elements with Open Learner Model in a Collaborative e-Learning System for Programming Course

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Abstract
The main objective of the proposed framework that combines gamification and open learner model is to increase students' engagement in learning programming via virtual computer environment, thus enabling them to learn cooperatively and helps them to increase awareness of their own performance. The framework proposed the development of an e-Learning system that includes gamification elements such as the users' level and leaderboard to display users' achievements and rewards. Meanwhile, in order to increase students' awareness of their own milestone in the programming course, the framework also included the Open Learnel Model, which shows the students' milestones via the skills meters. This project also proposed the use of Web 2.0 elements such as chat rooms to allow collaboration and group discussions over the Internet.

Keywords: *gamification, e-Learning, Open Learner Model, Web-based application*

Introduction
Swacha (2013) has defined in his study that gamification is the gaming metaphors that improve motivation, influence behavior and engagement in the real life task. Whenever elements of game mechanics and game dynamics are applied in a non-game environment, it will consider as gamification (Fox, Kim, Kirk &Zinchermann, 2010). Urh (2015) has explained that in the education field, gamification has been seen as a potential alternative to teaching and learning methods that promote students' engagement and motivation.

Ideally, open learner models are learner models that can be viewed or accessed in some way by the learner, or by other users (Bull, 2012). The learner model contents can also be of direct use to the user. This is to enable adaptation to the individual according to their current learning need and in addition to the standard purpose of the learner model of maintaining data. According to Kay (2012), if viewing the information in their learner model may be benefits to the user, a learner model that is inferred using any learner modeling techniques could potentially be opened to the learner. Generally, opening the learner model is more than simply showing the learner the representations from the underlying system's model of their knowledge. To create an effective interface to represent the model and support interaction with it is the key challenge in opening a model.

Gamification is one of the popular choices on web-based activities in motivating user participation. It does help aligning the students' interest with the intrinsic motivation when done well as stated by Zichermann (2011) in his study. This kind of concept also can be adapted into the learner. Based on Monterrat, Lavoue, and George (2014), there are two needs to be fulfilled in order to produce or adopt gamification in learning. Moreover, it is a complex process for turning a game from an actual learning environment.

The idea of combining gamification elements in open learner models is not a new thing. Even so, there is still a lack of research regarding this field of study. If these gamification elements are adapted to the open learner model like e-learning system, there are many positive impacts that might be seen in the students' achievement.

Therefore, this study is conducted to implement selected gamification elements for collaborative e-learning. These included small tasks, rewards for accomplishing the tasks and measurable progressive challenge. Other than that, selected game mechanics such as points, levels, challenges, progress bar and leaderboard will also be implemented. Achievements, competition, and rewards are an example of the selected game dynamics that might be implemented in the open learner model. With all those elements, the students will be more encouraged in having active participations.

Related Works

i. Motivation for Learning: Adaptive Gamification for Web-based Learning Environment

This paper has proposed the architecture of a system to motivate learners by integrating game elements in the existing web-based learning environment. It is not the ultimate goal of this system to turn every learning activity into a game. This is because games need to be played voluntary and in some context, people are already motivated to learn.

Even so, there are still drawbacks exist in this system. One of the drawbacks is it proposed the adaptation of multiplayer features, where existing environments have already proposed the same game elements for all users. Other than that, it also deals with the adaptation of gamification, where the literature deals more with an adaptation of the game. It also proposed the adaptation of game dynamics where existing system adapts the learning path and difficulty level (Khan Academy, 2006).

ii. Play As You Learn: Gamification as Techniques for Motivating Learners

This research discussed core game concepts that usually used in implementing gamification elements, which are goal-focused activity, reward mechanisms and progress tracking. It also explained that by adding all these gamification elements in the e-learning platform might increase the engagement of unmotivated learners in the learning process and interaction with other learners. The researchers of this study also discussed and came out with things that need to be questioned before implementing gamification in a learning environment.

It is also highlighted in this study that gamification actually have been adapted into some applications like FourSquare and Crowdrise. For both applications, the users will be given badges and earning some points after they have completed their activities or tasks. To be concluded, it does give positive impact in their engagement for the users of the applications that implement gamification elements.

iii. Quick Quiz: A Gamified Approach for Enhancing Learning

Quick Quiz is a gamified quiz software tools that developed as a mobile web application. The main aim of this developed tool is to motivate students in revising all the course materials throughout the semester. This tool is embedded with several features to make students more enjoyable while doing all the tasks. The features are included providing multiple choice questions so that students did not need too much thinking, limits the time for students in answering questions to put some pressure and the participation is voluntary.

Students will be rewarded with a point for each question they answered correctly within the time limit given. This is an example of the game mechanics that have been applied in this Quick Quiz tool. After completing answered all the questions, students are allowed to see their own individual performance against the other class members' performance as a holistic feedback.

Based on the data collection, students' engagement, enjoyment, learning and experiences are being evaluated. The students are engaged enough to complete the task with this gamified approach tool. This study also recommends that implementing gamification element in the education system, like e-learning should be investigated more.

Proposed Framework of Combining Gamification Elements and Open Learner Model in e-Learning Environment

Figure 1 shows all the elements included in combining the gamification elements with the open learner model. This proposed project will be done using the web application development tools such as PHP and MySQL database that mimics the traditional e-learning system. The enhanced factors of e-learning system proposed in this framework is collaboration and gamification, where the pair programming technique was chosen to represent the collaborative concept. For the purpose to encourage collaboration over the Internet, the Web 2.0 tools will be used to support the online chatting, upload or download electronic materials as well as online discussions to answer the quizzes, whether in groups or individually. In order to provide gamification elements in this system, we have identified gamification elements that represent the game mechanics and game dynamics. The elements proposed are the use of levels of difficulty, progress bar and leaderboard. These game mechanics are used to encourage achievements or accomplishments, provides competition among groups and giving out rewards.

Meanwhile, open learner model proposed in this system, will provide users with their individual skill meters and groups' skill meters. This was to encourage students' engagement and monitoring their own milestones in learning introductory programming. The skill meters are the visual representation of the students' achievements each time they or their team members solve particular online quizzes provided in each chapter. The skill meters, like a progress bar will depict the milestones of the students starting from the least difficult questions until the hardest ones. This way, the students will be able to be part of their own progress and becoming increasingly aware of their performance in programming.

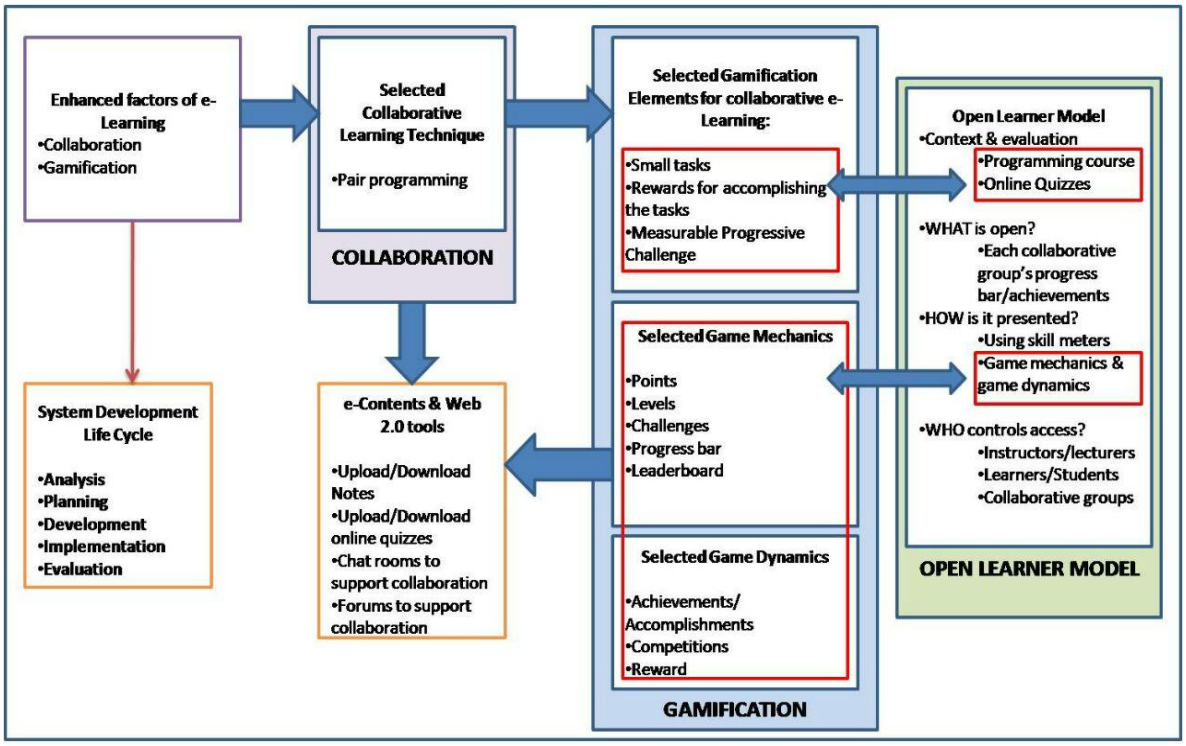

Figure 1: Research Model of Gamification with Open Learner Model in a Collaborative e-Learning System

In this proposed framework, lecturers were given the access to the online course and were able to track students' progress, submissions or achievement in the account management section. Lecturers can upload online materials, construct online quizzes that meant to be answered whether individually or by each group of students registered in the system. Furthermore, online discussions can also be done among the students and the lecturers in order to support distance learning.

Conclusion

Combining gamification elements with open learner model in a web based system environment can be seen as a good initiative to encourage student participation in learning process. In this paper, a framework of an enhanced e-learning system for learning programming was proposed to combine gamification elements such as leaderboard and levels of difficulty with the concept of open learner model. Both technologies that include elements of visual representations will be embedded in the e-learning environment to encourage students' engagements and awareness of their own progress. Besides that, the framework also proposed to include collaborative elements to encourage online discussions and collaborations among students. Through this, students will be able to stay connected and discuss via the Internet from dispersed locations. Lecturers can also participate in the discussions to increase online engagements and provide channel for better online teaching and learning.

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