Design on ‘FunPhy: Fun Physics’ Educational Game Apps using Agile EXtreme Programming

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Abstract. Smartphones and Internet have been growing rapidly along with the modernization of technology. It has impacted almost all walk of human life in the prominent areas, such as business, education, health and social life. Despite of the negative impacts, the use of smartphones should emphasis to enhance the positive impacts so that the users can take advantages. Education through a mobile app or a game is a premium project for the education industry. Therefore, here we designed a mobile game application that supports fun learning for children especially for physics subjects. We called our apps as FunPhy which stands for Fun Physics. It was designed by using Agile method in EXtreme Programming.

1. Introduction

These days, use of smartphones for internet purposes has become a routine. It has impacted almost all walk of human life in the prominent areas, such as business, education, health and social life [1]. Internet addiction was an important issue a few years ago. However, smartphone addiction has become a more serious problem recently. Online game is one technology product which is very popular among teenagers. Despite of the negative impacts, the use of smartphones should emphasis to enhance the positive impacts so that the users can take advantages. In order to prevent the addiction and to provide new educational methods for all stages of education, many researchers have proposed various kinds of research works such as developing mobile learning apps. Education through a mobile app or a game is a premium project for the education industry. The use of games for education can improve the learning process. Gaming, learning, and motivation are three dimensions that based in educational game [2]. Learning in interesting ways can be difficult, but many users believe that presentations and fun elements can keep them playing games [3].

Therefore, here we designed a mobile game application that supports fun learning for students especially for physics subjects. We called our apps as “FunPhy” which stands for Fun Physics. It was designed by using Agile method in EXtreme Programming. This educational game is intended for junior high schools so that it can help students to master physics. An important characteristic in the system development with Agile method is oriented to the completion of the information system and the software application as a product [4]. Compared to processes and tools, Agile method focuses on the interaction between individuals [5]. In addition, a change arose during the development process gives better response than following the set plan from the first step of the project. EXtreme
Programming is one type of Agile method that is popular which has been proved to be suitable for small to medium scale application development [4].

2. Methods
In this work, we used EXtreme Programming system which based on Agile method to develop FunPhy. Since the FunPhy app designed in this work is not too complex and classified as small-scale app, the development time is relatively short. There are several rules in the Agile E Xtreme Programming practice [6]. The developing stages on the Agile EXtreme Programming system are planning, designing, coding, and production as shown in Figure 1.

First step is planning. In this stage, we designed a software refers to the user stories. User stories describe the features and functions needed for the software. When all user stories have been determined, the developer will determine the length of work for each user story. Prospective users are junior high school students. The results of the interview produce user stories. Users want to learn physics to be more fun and challenged by the level of playing.

![Figure 1. Agile EXtreme Programming method](image)

The second step is designing. The design principle in Agile EXtreme Programming is simplicity, feedback, and allows for gradual changes. The simplicity means the designer is expected to use the easiest steps in realizing an application's functionality. The involvement of stakeholders can help find the best solution. Stakeholders in this game application include students, parents, and teachers who use physics subjects for the junior high school.

The next step is coding. This is where the concept of paired programming is applied and used intensively. Application testing is done using data from the programmer or from the user. Users test and provide feedback quickly. The feedback is input for the development team to improve the application. Users must also contribute directly during the coding process.

The final step is production. The entire module developed is comprehensively integrated and tested in this stage. The test intends to ensure that the application developed runs optimally. Unlike other methodologies, documentation is not a top priority. In this paper we limit our work up to the design stage.

3. Results and discussion
In accordance with the stages in Agile EXtreme Programming, designing software refers to the user stories. User stories are obtained by communicating with prospective students and stakeholders such as teachers and parents. Prospective students are junior high school students from grades 1 to 3, with
age 12-15 years old. Users want to learn physics to be more fun and challenged by the level of playing. Parents expect that children avoid addicted games that are not educational. The teacher gives input about questions or content of games. Next is design. This stage determines the use case diagram, such as menu design and display design. The use case diagram show in Figure 2 explains the interactions that occur in the application system. The series of interactions between users and application systems that occur for more details will be described in the use case scenario by user actors. Use case Login functions to log into the FunPhy game application. The use case scenario is the way the user will log in by entering a user name. On the other hand, the admin logged in using the admin username. The actors involved in this use case are the user and admin.

Figure 2. Use case diagram

Figure 2 shows that the user actor can do Choose Level, Input Answer, and View Score. In Choose Level use case, the user selects the level of the game to be played. If the user will choose a higher level first he has completed the previous level. In the Input Answer use case, the user enters the answer to the question in the game. The scenario is that the user answers the question according to the level. We add the backsound "right" if the answer is correct. On the contrary, there will be a backsound "sorry is still wrong" if the answer is wrong. Use case for the next user is the use case View Score. In this use case the user views the game score when it has finished the game. As for the admin, he can manage the system. The management includes Delete Questions, Input Questions, Edit Questions, Input Answer, Setting Level, and Score Settings.

Next is designing the menu. Menu design is used to facilitate searching when running the FunPhy application program. In Figure 3, the menu design consists of Login, View Level, Choose Level, and Start.
Figure 3. Menu design

Figure 4 shows the display design. There is a process which requires contribution from stakeholders, in this case the Junior High School Physics teacher. If according to the teachers, the question at level 1 is not in accordance with the syllabus or the Junior High School curriculum, it must be replaced. Therefore other than the process and tools, the interaction between individuals is very important as the principle of Agile method. The contribution from stakeholders can help to find the best solution.

Figure 4. Display design
4. Conclusion
In this work, we have successfully designed “FunPhy” an education game application based on Agile EXtreme Programming. It is a fun and interactive mobile learning tool for junior high school students who take physics subject. The software design steps consist of planning and designing stages. In each stage, users and stakeholders are contributed greatly in the system development which is in accordance with Agile method.

5. References
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