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Submission date: 19-Aug-2020 05:03PM (UTC+0700)
Submission ID: 1371347897
File name: 9 Using Android-based Edu Journal of Physics Q-3.pdf (714.82K)
Word count: 2692
Character count: 14660

Using Android-Based Educational Game for Learning Colloid Material

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Abstract. This research is based on the importance of the development of student's chemical literacy on Colloid material using Android-based educational game media. Educational game products are developed through research and development design. In the analysis phase, material analysis is performed to generate concept maps, determine chemical literacy indicators, game strategies and set game paths. In the design phase, product packaging is carried out, then validation and feasibility test are performed. Research produces educational game based on Android that has the characteristics that is: Colloid material presented in 12 levels of game in the form of questions and challenges, presents visualization of discourse, images and animation contextually to develop the process of thinking and attitude. Based on the analysis of validation and trial results, the product is considered feasible to use.

1. Introduction

Concept of colloids is part of chemistry closely related to everyday life, for example in industrial chemistry, on the manufacture of various products such as cosmetics, food ingredients, and a number of other products [1]. In colloid material usually students are required to memorize it, without applying it in everyday life [2]. With the difficulties of students applying colloid material in everyday life, it demands teachers to be creative and innovative, one of which makes a media of learning [3]. The growing technology demands teachers to be able to use technology to create and develop the learning media in accordance with technological developments. [4]

Implementation of IT in a field of learning is believed to be able to improve student's learning ability [5]. Learning process by implementing IT will provide the learning materials using various media that will affect the student's learning achievement in a positive way [6]. Learning using multimedia has a positive effect on students' learning outcomes [7]. One example of IT implementation in a field of learning is the making of the educational games.

The making of the game is very important; especially apply it in learning because it will improve the learning outcomes and the students' involvement [8]. One of the technological developments that are currently in demand by many people are smartphones based android. Because smartphones are easier to use, have an open operating system that allows smartphone users can add a variety of applications. [9]. This educational game can be very motivating while still maintaining or even

improving the effects of education on the students [10]. Chemical learning on colloid material can be achieved well if the teacher uses the right learning media

Thus, we need efforts to develop the android-based learning media. This paper reports on how to manufacture android-based educational games on a colloidal material to develop students' chemical literacy.

2. Methodology

Methods used in this research were designs based research that will produce the android-based educational game media in the colloidal materials. The subjects of the research were twenty students of Chemistry Education of Faculty of Education and Teacher Training, UIN Sunan Gunung Djati Bandung.

There were six stages in making the android-based educational game media in colloidal materials: (1) analysis of SK and KD of the collodial materials, (2) making process of the android-based educational game media, (3) revision of the android-based educational game media, (4) limited trials, (5) data analysis, and (6) production of the android-based educational game media in the colloidal materials.

3. Result and Discussion

The making process of android-based educational game media in colloidal materials uses research and development. This research method used to produce and examine validity of a particular product [11]. Some phases are conducted in this process. The first stage is analysis of colloidal materials, which aims to plan the sequences of learning process because it plays an important role in learning meaning [12].

In designing stage, the elements needed are integrated in the form of colloidal game by noticing the flowchart and storyboard. Flowchart used to describe the flow from one scene to another which eases the user to operate this colloidal game. The making process of android-based educational game media in colloidal materials is based on the designing stage, such as storyboard and flowchart [13].

The description of scenes, visual and audio design, information, and voice of narration will be made in storyboard stage. Software in this program uses programming language c# c++. After that, the educational game is saved in *.apk format in order to use in android smartphone.

The following is the visualization from android-based educational game media in colloidal materials after finishing some stages.

3.1 Main Scene of Game

In this main scene, there are some buttons of colloidal kinds which displays the menu to enter the game levels according to the colloidal kinds. The characteristic button consists of menu to enter the game levels of colloidal characteristic. Instruction button consists of how the user plays the game. About button consists of application identity. Setting button in the top left consists of sound setting. Exit button used to exit from this application. This can be seen in Figure 2.

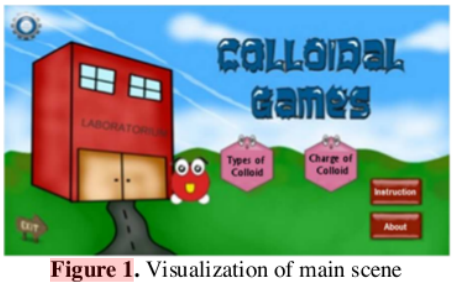

Figure 1. Visualization of main scene

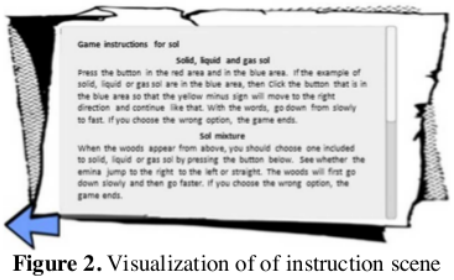

Figure 2. Visualization of of instruction scene

3.2 Setting Scene

This scene is a setting for audio and music in the application. This scene used to turn on or off the audio and the music in the application.

3.3 Instruction Scene

This scene is about the instruction how to play the game in some levels in this application. Visualization of instruction scene can be seen in Figure 2.

3.4 About Scene

This scene displays the information and profile of content and design builder of this application.

3.5 Menu Scene

There are two parts of menu scene. The first part of the menu consists of levels of colloidal materials and kinds. Visualization of the first part of menu scene is in Figure 3. The second part of the menu is about the levels of properties and contents of colloid. Visualization of the second part of menu scene is in Figure 4.

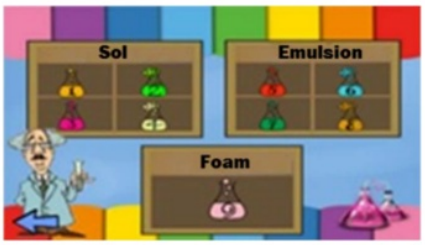

Figure 3. Visualization of colloidal types' menu scene

Figure 4. Visualization of colloidal properties and contents' menu scene

3.6 Levels Scene

This scene displays the game about colloidal kinds, characteristics, and contents. These games provided in text, Figure, and animation which eases the student to learn colloid to develop student's chemical literacy. This game is about the solid soles in which the student can identify the implementation of solid soles in daily life. The game visualization can be seen in Figure 5.

This second level of the game is about liquid soles. Student can identify various things in daily life, thus in the process the student will be able classify colloidal kinds and liquid soles. Visualization of game can be seen in Figure 6.

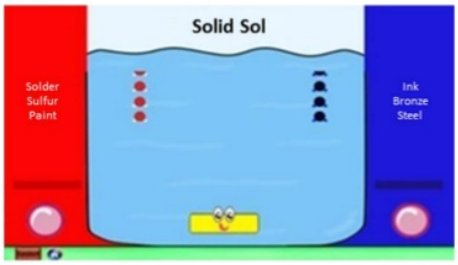

Figure 5. Visualization of level 1 scene

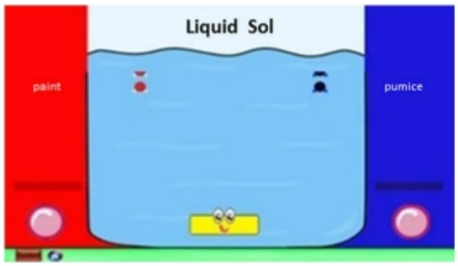

Figure 6. Visualization of Level 2 Scene

This third level of the game is about gas soles. Student can identify various things in daily life, thus in the process the student will be able classify colloidal kinds and gas soles. Visualization of game can be seen in Figure 7.

In the fourth level of the game, student can identify various things in daily life, thus in the process the student will be able classify colloidal kinds, liquid, gas, and solid soles. Visualization of game can be seen in Figure 8.

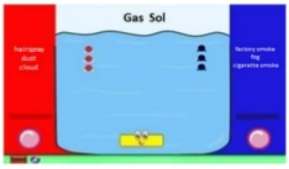

Figure 7. Visualization of Level 3 Scene

Figure 8. Visualization of Level 4 Scene

Figure 9. Visualization of Level 5 Scene

Figure 10. Visualization of Level 6 Scene

Figure 11. Visualization of Level 7 Scene

Figure 12. Visualization of Level 8 Scene

In fifth level about solid emulsion, a student can identify many things in daily life to consider an example of solid emulsion. Student can be able to classify colloidal kinds and can explain about the solid emulsion. Visualization of game can be seen in Figure 9.

In sixth level about liquid emulsion, a student can identify many things in daily life to consider an example of liquid emulsion. Student can be able to classify colloidal kinds and can explain about the liquid emulsion. Visualization of game can be seen in Figure 10.

In seventh level about gas emulsion, a student can identify many things in daily life to consider an example of liquid emulsion. Student can be able to classify colloidal kind-sand can explain about the gas emulsion. Visualization of game can be seen in Figure 11.

In eighth level of this game, a student can identify many things in daily life to consider an example of liquid, solid, and gas emulsion. Student can be able to classify colloidal kinds and can explain about the liquid, solid, and gas emulsion. Visualization of game can be seen in Figure 12.

In ninth level of this game is about foams where a student can identify any kinds of things in daily life to be considered as an example of foam. Student also can be able to classify colloidal kinds, can explain materials about foam.

The tenth level of this game is about Tyndall Effect which is visualized the ray path. Then, the student can be able to visualize the ray path, can be able to cope problems with its content. Consequently, student can be able to explain Tyndall Effect.

The eleventh level of this game is about electrophoresis in which displays the animation of electrophoresis cell. Student can be able to conclude the content in a colloid, to explain the materials of electrophoresis.

The twelfth level of this game is about adsorption in which displays the animation of colloidal adsorption. Student can be able to conclude the content in a colloid, to explain the materials of adsorption.

The content presented in the colloidal game is related to the context in everyday life that aims to direct student to understand chemical literacy. This colloidal game presents content in the form of animation, images along with text simultaneously as well as video. Because some colloidal sub material is quite difficult to visualize. Therefore, with this visualization, someone will more easily understand or easily receive information properly if using animations or images with words.

After completing each level, the student is given a video that contains an explanation of the game being played, so that students can realize and appreciate the power of God in creating everything with various benefits.

The context used in this android-based colloidal game lies in the field of food and the environment as targets, learning resources and tools. This is taken because phenomena related to chemistry occur in everyday life, which usually found in the field of medicine, health, and food. Therefore, based on the statement of this android-based colloidal game is made of the colloidal material context contained in everyday life in the field of food and the environment, in order to explore the ability of student's chemical literacy. In addition, this colloidal game has an evaluation level of the previous level to measure the extent to which student master a material.

The results of data processing on the questionnaire by some validators can be obtained that the validator assessment of the android-based colloidal game can be seen on several aspects. It is obtained that the highest r-value is 0,93, meanwhile the lowest r-value is 0,60 with average r-value is 0,77 for whole aspects assessed. Then it can be concluded that the learning media of this android-based colloid game is declared valid.

4. Conclusion

The development of android-based educational game on chemically oriented colloidal materials through the analysis phase and design phase. In the analytical phase, the result is material relevance between the chemical literacy indicator in the material presentation strategy. The design stage generates android-based educational games that have material characteristics presented through questions visualized with games equipped with images and animations so as to increase student's chemical literacy.

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