Edu-Game Media Based on Android to Learn Least Common Multiplication (LCM) and Great Common Divisor (GCD) for the 4th Graders

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Abstract. Learning mathematics for elementary school students is often considered a creepy thing. Some of the tricks that can be used to remove this paradigm is the use of learning media that are attractive to students, one of which is the edu-game media based on android along with current technological developments. This development research developed the edu-game media based on android which aims to: describe the process of developing the edu-game media based on android to learn LCM and GCD for the 4th graders and (2) analyze the feasibility level of the edu-game media based on android to learn LCM and GCD for the 4th graders. The trial subjects of this study were the 4th graders of Laboratory Unesa Elementary School Surabaya and Geluran 1 Elementary School Taman Sidoarjo. The model used in this research is Plomp's development model. From this research, the results obtained from the material expert validator with a percentage of 94.7% (valid), and from the media expert validator with a percentage of 93.75% (valid). Testing the test subjects got an average percentage of the entire program of 93.4% (very feasible).

1. Introduction

Education in the learning process requires 3 important components, namely the presence of students, educators and learning resources. Learning sources are often ignored and do not get the right attention in choosing learning sources, even though learning sources are one of the important points used by educators to help convey learning to students [1]. Learning resources can be obtained from anywhere and in any form, which most importantly, it can be used as a medium to facilitate students in learning and can achieve the desired learning goals [2].

The use of instructional media in the teaching and learning process itself can generate new desires and interests in students, generate motivation and stimulation of learning activities, and even bring psychological influences on students as explained by Rodgers [3] and Puspitarini [4].

The learning media used in the learning process should be interactive media [5,6]. This is because, basically, the media used is effort-oriented in providing real experiences to students [7]. Interactive is a term that refers to learning that is effective and efficient and interactive is a manifestation of learning itself, where learning is a process of interaction carried out by students [8,9].

One of the things that can support interactivity is the use of media [10]. The media we use can be obtained from anywhere, one of which is from technological developments. In the use of media,

technological development is a challenge in itself. In the past, only with the means of handbooks and simple writing tools, it was felt that they had fulfilled the teaching and learning equipment, but now, students can interact with the multimedia world.

Students feel that spending time with computers, cell phones and others feels like it's enough for children today. The closest but most influential realities are gadgets and the internet. It is as if a gadget is a new friend or teacher for a child whose presence is felt to really understand their wishes and conscience [11].

One of the operating systems for gadget devices that are widely used today is Android [12]. Android is a linux-based mobile operating system used for smart phones (smartphones) and tablet computers (PDAs) which includes operating systems, middleware, and applications. With the presentation of information on the content of the subject matter and its use through the Android operating system mobile devices on smartphones and tablet computers, the media presented is not boring, because there are elements of animated multimedia in the form of images, writing, movement, or sound that make students happy in learning and understand the material presented [13].

The media used as a learning resource must be able to make it easier for students to understand a material. However, there is one area that is considered quite difficult to study even with the help of existing media, namely Mathematics [14].

From the results of interviews with several students stated that they did not like learning Mathematics because they thought Mathematics was difficult to understand, and full of formulas. They also often cannot solve problems and always create confusion. In addition, from the results of interviews with teachers, students' enthusiasm will decrease when they get Mathematics material. This is due to the assumption of students from the start that Mathematics is complicated and full of memorizing formulas [15].

In the field, researchers also found that the use of media in the mathematics learning process, especially the LCM and GCD materials, was minimal so that the delivery of learning was not optimal. Lack of innovation and variations of fun learning media are also factors that make students feel uninterested in learning. Therefore, teachers feel the need to present media that is attractive, interactive and has a close presence with children. In addition to increasing the enthusiasm for learning, students are also given knowledge about technology, so that students are open to technological developments and do not become students who are stuttering about the presence of technology.

Researchers made observations about the daily lives of students at school. From the results of these observations, it can be seen that most students bring gadgets to school which are usually operated during rest or empty hours. When researchers conducted interviews, students said that their gadgets were only used for entertainment such as games or accessing social media. In fact, they should be able to use their gadgets as a learning resource by looking for information about subject matter that they feel they don't understand by accessing it on the internet or downloading knowledge applications on the Playstore.

Based on these problems, and the lack of application of learning media that utilizes technology in the realm of education, especially learning in the classroom such as the presence of gadgets, an innovative idea emerged to present media that utilizes technology that is close to children's lives as a learning resource by developing media named SI PONTAR (smart tree). SI PONTAR is an icon or the main character of the media, which was developed in the form of a tree as a characteristic of LCM and GCD materials for the fourth graders.

2. Methods

The type of research used is research and development. In this study, the research procedure used was a research model adapted from Plomp's research and development model. The Plomp model has five phases consisting of 1) the Prelimenary Investigation phase, 2) the Design phase, 3) the Realization / Construction phase, 4) the Test phase, Evaluation and Revision (Test, Evaluation And Revision), and 5) the Implementation phase [16].

In developing this media, researchers only carry out the fourth phase, the Test, Evaluation and Revision phase which is due to the limited time of the research and this research only aims to determine the effectiveness of its use which can already be known in the Revision phase (Test, Evaluation And Revision). The trial subjects in media development were educators and fourth graders of Laboratory Unesa Elementary School Surabaya and Geluran 1 Elementary School Taman Sidoarjo.

In this study, data was divided into 2 types, namely qualitative data and quantitative data. Qualitative data as the main data is obtained from material experts, media experts and users around the media in the form of input, responses, and suggestions which will later be analyzed and the results will be used in the process of improvement both in terms of material and media. The data was collected using data collection instruments in the form of media validation instruments, material validation instruments and questionnaires. The technical analysis of data from the validity results using the Likert scale formula.

3. Results and discussion

3.1. Results

The development of Edu-Game media based on the Android application, the LCM and GCD material prepared for the fourth graders was adapted from Plomp's research and development model. The results of the development and research that has been carried out, based on the phases or stages of the Plomp development model, will be described in detail as follows.

First, the Prelimenary Investigation Phase. In the initial investigation phase, the researcher collected and processed some information regarding the conditions of LCM and GCD learning materials carried out by educators in elementary schools, student activities during mathematics learning and the use of media in LCM and GCD learning activities.

Researchers conducted non-formal interviews with several students at Laboratory Unesa Elementary School and Geluran 1 Elementary School Taman, they said that the material on the LCM and GCD was one of the materials they thought was difficult because before they studied it, they first had to study supporting material or sub material LCM and GCD. Besides that they find it difficult in the calculation part because they have to master multiplication. Only a few students have mastered the material of the LCM and GCD even though it was studied in first semester.

Second, the Design phase. After going through the initial investigation phase and knowing the core problems faced by students in learning LCM and GCD materials, at this stage the researchers began to design learning media that took advantage of the presence of technology as an alternative media needed by students, Edu-Game media based on Android which included material product design activities and media product design activities named SI PONTAR.

The material design begins with determining the sub-material in advance with the aim of facilitating the content of what material is needed in SI PONTAR based on the Android application. Then proceed with determining the content of the material, as well as making practice questions. The design of SI PONTAR products based on Android applications includes making use cases, flowcharts, and storyboards which are in the development process using the Unity software.

The third is the Realization / Construction phase. At this stage the media design that has been designed in the previous stage is then realized by compiling the design into an application system so that SI PONTAR prototype based on Android LCM and GCD materials will be produced. In addition, researchers also developed material validation sheets, media, questions and questionnaire sheets. After SI PONTAR has been produced, the media application of SI PONTAR will be tested for its validity by media experts and material experts.

A brief description of the learning media development process, including: Tools (software) used to process and develop Android-based SI PONTAR, namely Unity 2017.3.1f1 (as the main processor for CAI media), Corel Draw X5 and Adobe Photoshop CS6 (as processors image), Visual Studio 2017 (as a C # file processor for media flow)

The materials needed in SI PONTAR are sound effects, music backsound, background images, images related to LCM and GCD materials, images related to SI PONTAR characters, images related to buttons and an explanation of the material and questions to be presented.

The fourth phase is the Test, Evaluation and Revision (Test, Evaluation And Revision). In this phase, information is collected, processed and analyzed through validation of media experts, material experts including evaluation questions and questionnaires as well as product trials in the field, whether the feasibility of the media has been fulfilled or not. Media experts gave a score of 93.75%. From the results of the percentage value, it shows that SI PONTAR is declared valid without revision (there are several suggestions from the validator) by media experts.material experts gave a score of 94.7%. From the results of the percentage value, it shows that the material presented on SI PONTAR is declared valid without revision (there are several suggestions from the validator) by material experts.
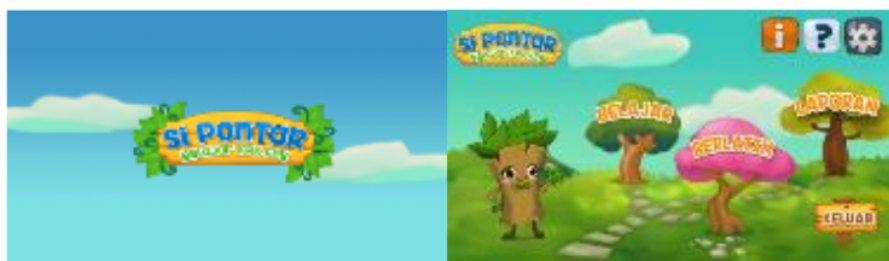
Figure 1. SI PONTAR display.

Next is the trial process, during the trial process, students are asked to operate SI PONTAR individually through the phones they carry. Students are given the freedom to operate SI PONTAR for approximately 1 hour. The freedom given aims to find out whether students can understand and operate SI PONTAR easily and with high enthusiasm as if they are installing new applications that they want.

After the SI PONTAR product trial process was carried out, the trial subjects were given a questionnaire sheet regarding the use of SI PONTAR. Giving the questionnaire aims to determine the response and level of user satisfaction to all components of the SI PONTAR program, so that the feasibility of SI PONTAR media can be found. Based on the results of the questionnaire after carrying out field trials, the percentage value was 93.4%. So that SI PONTAR the Edu-Game Media based on Android to Learn Least Common Multiplication (LCM) and Great Common Divisor (GCD) For the 4th Graders can be said to be very feasible to use.

3.2. Discussion

Based on the results of media trials that have been carried out, SI PONTAR is said to be feasible as a learning medium for LCM and GCD and can be used to help students learn LCM and GCD materials. SI PONTAR can also provide motivation and increase the enthusiasm of students in the learning process of LCM and GCD, because the experience during learning the material without media makes it difficult for them to understand LCM and GCD material and makes them lose enthusiasm, so that their learning becomes less lively [17].

The use of media in learning activities will greatly assist in the effectiveness of the learning process and in the delivery of learning content at that time. In addition to generating motivation and interest in students, learning media can also help students improve understanding, which agrees with Puspitarini [4] and Chuang [18] that the use of learning media in the teaching and learning process itself can generate new desires and interests in students, generate motivation and stimulation of learning activities, and even bring psychological influences on students.

In line with Shabiralyani [19], the presence of media in the learning process of students will create the impression of attracting the attention of students so that it can foster motivation to learn in

students. The learning material provided will be clearer in meaning, so that it can be more easily understood by students and allows students to more easily master and achieve learning goals.

The props or media that are presented in learning do not have to be the real form of the object but can also be manipulated with something that resembles the original object such as pictures, both those in the delivery of material concepts or the SI PONTAR display that are presented clearly resembling the original objects. This is in line with Piaget's explanation, Bruner [20] that the age of elementary school students also enters an iconic stage where in the delivery of each concept in mathematics learning can be represented by manipulating concrete objects.

SI PONTAR is packaged as an interactive learning media, where the media is developed so that students participate actively during the learning process. In summary, with this media an interactive teaching environment is created that responds to the learning needs of students, which means that SI PONTAR can provide an active response to users because users must actively participate in solving the practice questions presented in SI PONTAR. In addition, the animation that accompanies examples of everyday problems that are presented in the SI PONTAR learning menu makes users observant to see and understand the explanations conveyed through these animations and it makes users feel learning LCM and GCD easier and more fun. The statement points are supported by the opinion of Neo [21] which explains that interactive is a teaching delivery system where the material presented can not only be heard and seen, but can also provide active responses.

4. Conclusion

The development of Edu-Game Media based on Android to Learn Least Common Multiplication (LCM) and Great Common Divisor (GCD) For the 4th Graders SI PONTAR in this study was adapted from Plomp's research and development model so that it has four phases, namely, the Prelimenary Investigation Phase, the Design Phase, the Realization / Construction Phase, the Test Phase, Evaluation And Revision (Test, Evaluation And Revision). Based on the quantitative data on the SI PONTAR product trials, it can be concluded that from all aspects of the results of the field trials, the percentage value of 93.4% is obtained.

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