
DEVELOPMENT OF EDUCATIONAL GAMES TO IMPROVE LEARNING OUTCOMES BASED ON STUDENTS' MOTIVATION IN MATERIALS OF THE BLOOD CIRCULAR SYSTEM

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ABSTRACT

This study aims to develop educational games and determine the effect of developing educational games to improve learning outcomes based on students' motivation on the circulatory system material. This research was conducted at SMPN 9 Jakarta with a sample of 72 class VIII students. This study used the Borg and Gall Research and Development method, validated by material experts, media experts, and linguists. The results showed: 1) educational game learning media on circulatory system material is valid for students, 2) there is a significant effect of learning using educational games on student motivation on circulatory system material, 3) there is a significant effect on learning using educational games on student learning outcomes on the circulatory system material. Educational game learning media for circulatory system material to help students understand the material that is difficult for students to understand. Using educational game media is assisted by using smartphones independently to make students more focused when learning takes place.

Keywords: circulatory system, educational games, learning motivation, learning outcomes.

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INTRODUCTION

Science and technology are growing, this can provide benefits, one of which is in the field of education. The development of this technology can make it easier for teachers to innovate creative and interesting learning media. This can make teaching and learning activities fun for students, so it is expected to make it easier for students to understand learning material (Muslim & Retno, 2014).

Science and technology are increasingly developing learning methods with media in images, videos, and sound, which can make learning more interactive (Nanda et al., 2019). The development of media integrated with technology has been widely implemented by teachers using PowerPoint, learning videos from YouTube, and the internet to search for learning materials. However, there still needs to be teachers developing educational game-based media. It is known that the data on the number of games found on Google Play are 51,458 casual games, 59,283 puzzle games, 17,853 action games, 47,283 arcade games, and 14,180 educational games (Rahman, 2017).

The game is the game that is most liked by all students. However, many games do not provide education, so this educational game was created to develop education. Many students and teachers use smartphones and personal computers in the current development of science and technology, so developing learning media through educational games is needed. It can be used by students and teachers both inside and outside the school (Rahman, 2017). Educational games are learning media in the form of games, this media is expected to increase students' learning motivation because

learning while playing makes students learn in a pleasant atmosphere, making it easier for students to understand learning material and improve their learning outcomes (Rianingtias, 2019).

Biology is a subject that has complex material. Material on the human circulatory system is a biology material that is difficult for students to understand. It is known that daily tests on the circulatory system material in schools in the Jakarta area, namely, 60% of students, cannot meet the Minimum Completeness Criteria (KKM) (Tambunan et al., 2018). The results of daily tests in schools in Central Java showed that 44% of students still need to reach the KKM (Kusuma, 2017). The low learning outcomes of students can be caused by a lack of innovation in learning methods in the circulatory system material; there are still many teachers who use the lecture method, which does not use media that attract students' attention. It is known that the learning outcomes of students taught through the lecture method only have an average value of 62 (Apriliyanasari, 2011).

Evaluation of student learning outcomes on the circulatory system material, namely the need for media that can visualize various blood types and blood circulation processes, to increase motivation during learning, make it easier for students to understand the material, and have a good psychological effect on students (Nanda et al., 2019). Media can also influence students' learning attitudes. Media can be selected if it has the following characteristics: achieving learning objectives, the content of learning material is clear, teachers and students can easily use it, and displaying attractive media to increase learning motivation (Apriliyanasari, 2011).

Based on this background, it is necessary to increase motivation and learning outcomes in the circulatory system material with current developments in science and technology in the form of educational games, the researchers will create an educational game called Blood Circulatory System Games. Blood Circulatory System Games are educational games that teach about the science of the human circulatory system in a very interesting way, in these games there are four games related to the circulatory system that students must do in the form of quizzes, crosswords, sorting the mechanism of the circulatory system, pairing pictures with appropriate white blood cell description and sequence of blood clotting process. The advantages of Blood Circulatory System Games compared to other games are games that provide education related to the human circulatory system to students and distinguish white blood cells and blood clots, so it is hoped that students can learn with fun media. Blood Circulatory System Games can also be studied using smartphones and personal computers; smartphones can make it easier for students to learn them at and out of school. On personal computers, teachers can use them as interactive learning media in class. Based on this, a study entitled "Development of Educational Games to Improve Learning Outcomes Based on Student Motivation on Circulatory System Materials" will be carried out.

This study aims to: (1) develop smartphone and personal computer-based educational games to increase student motivation, and learning outcomes in the circulatory system material, (2) analyze the effect of learning using smartphone and personal computer-based educational games on student motivation in the material circulatory system, (3) analyzing the effect of learning using smartphone and personal computer-based educational games on student learning outcomes in the circulatory system material.

METHODS

The research was conducted at SMPN 9 Jakarta. The research was carried out in September-January of the 2022 school year. The population in this study were all class VIII students at SMPN 9 Jakarta. Sampling and population selection was carried out by simple random sampling technique. The population in this study was 72 students from 2 classes VIII.

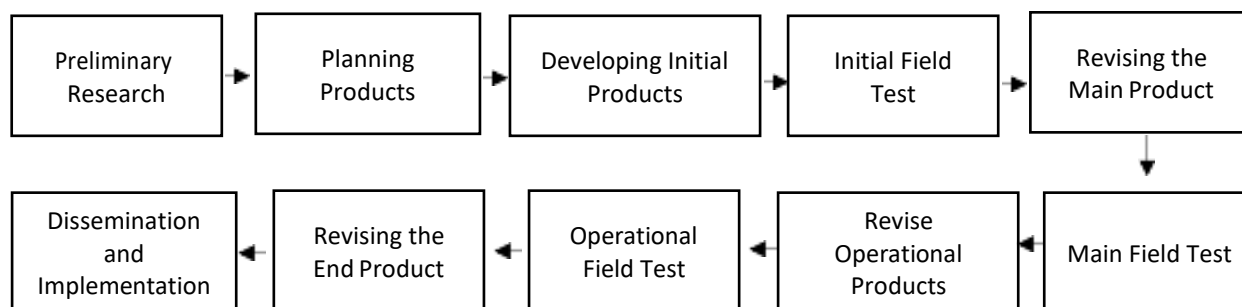


Figure 1. Research and Development Steps with the Borg and Gall model

This learning media development research uses the Research and Development method with the Borg and Gall model.

1. Preliminary research

After the potentials and problems can be shown factually, it is necessary to collect various information that can be used to plan certain products that are expected to overcome these problems.

2. Product planning

Complete product design with specifications. Product design is realized in the form of drawings or charts to be used as a guide for assessing and making it. The results of this product design are still hypothetical because their effectiveness has yet to be proven and will be known after going through several tests on material experts, media experts, linguists, and small group trials of students.

3. Develop initial product

The results of the product planning then made a prototype. This prototype will then be tested on material experts, media experts, language experts, and small groups of students.

4. Initial field trials

Trials at this stage can be carried out in small groups. Testing is carried out with the aim of obtaining information that the product is more effective and efficient than the previous product or other products.

5. Revise the main product.

At this stage, product revisions were carried out based on the results of initial field tests through discussions with media and material experts. This revision was made to improve the learning media that is being developed.

6. Main field test

After the revision, the next main product will be tested on 108 class VIII students at SMPN 9 Jakarta. Furthermore, students can provide suggestions on products that are being developed.

7. Revise operational products

The next stage is revising through discussions with media and material experts to improve the learning media being developed.

8. Operational field test

Operational products will be tested on 76 class VII students at SMPN 9 Jakarta. Furthermore, students can provide suggestions on products that are being developed.

9. Revise the final product.

At this stage, the final revision is carried out through discussions with media experts and material experts, it is hoped that the product being developed is better, easier for students to understand, and can increase student motivation and learning outcomes.

10. Dissemination and implementation

Dissemination, namely product distribution, and implementation, namely carrying out the learning process through learning media through smartphones and personal computer-based educational games to increase student motivation and learning outcomes on the circulatory system material.

RESULTS AND DISCUSSION

The implementation of the research carried out was R&D research with the Borg and Gall model by producing products. Development research produces products in the form of educational game learning media to increase student motivation and learning outcomes on circulatory system material.

Educational Game Product Development on circulatory system material

The development of this research produced Educational Game learning media on circulatory system material which contains pictures of the circulatory system and questions to increase student motivation and learning outcomes. Educational game media products have several games that students can access directly. Display menus contained in educational game products such as the learning objectives menu, the user manual menu, the educational game menu, the evaluation question menu, and the product developer profile. Before being used by students, educational game learning media must be validated by an expert validator. Media, material, and language validation results. All validators recommend that a revision be made because the item is invalid. However, after revising the results of the overall validation of experts, biology teachers, and students produce valid conclusions to be used by students.

Analysis of the Effect of Learning Using Educational Games on Student Motivation in the Material of the Circulatory System

Motivation is a process related to one's strength (intensity), direction (direction), and persistence (persistence) in achieving goals. Strength (intensity) describes the ability of a person's efforts to achieve their goals. This business will be successful with the support of directions that can be profitable, and maintaining this business requires persistence (Siregar & Hadiyani, 2019). The function of motivation is to support someone in determining actions to achieve goals and to increase achievement (Sardiman, 2020). Efforts to increase learning motivation can be made by clarifying the goals to be achieved, arousing student interest, creating a pleasant learning atmosphere, and

creating competition and cooperation (Sanjaya, 2008). Learning media can also influence students' attitudes to have a strong motivation in learning (Sadi & Cakiroglu, 2014).

Based on the analysis using Wilcoxon, it is known that learning using educational games has a significant effect on students' motivation in the circulatory system material. The average score in the post-test is higher than the pretest, indicating that the provision of learning using educational games is proven to increase student motivation in the circulatory system material.

Learning media is a support and link in the learning process and a communication component to convey information (Susilawati et al., 2018). The function of learning media is to increase students' attention and motivation, increase the effectiveness of delivering material, increase innovation in presenting material, make it easier for students to understand the material, and improve student responses to the material. Interesting media can increase motivation to learn and the stronger motivation to learn. Students with strong motivation will get maximum learning outcomes, and those with weak motivation will get minimum learning outcomes. Educational games will attract the attention of students because they make students happy and have challenges when learning them, so they are motivated to have high curiosity about the material and the enthusiasm to continue practicing so that it can improve memory and stimulate inspiration.

The results of this research align with the theory of (Sele, 2019), which reveals that teachers who always innovate learning media can motivate students to learn. Students with strong motivation will have much energy to learn to play an active role in learning and get maximum learning outcomes. In line with the expression (Mukti & Nurcahyo, 2017) that the use of learning media can increase learning motivation during teaching and learning activities. In addition, the results of this research align with the results of research (Astuti et al., 2018), which concluded that learning through mobile can increase learning motivation in circulatory system material.

Analysis of the Effect of Learning Using Educational Games on Student Learning Outcomes in the Material of the Circulatory System

Learning outcomes are student achievements at the end of learning activities. Students are expected to understand a material after following the learning process. These results include knowledge, skills, and attitudes (Kennedy, 2007). Learning outcomes also change in students after the learning process is carried out on affective, psychomotor, and cognitive aspects (Prasetya, 2012). The selection of appropriate learning media can affect the success of the learning process. The more effective the learning media, the more effective the learning process will be in achieving its learning objectives. Learning media is tool students, and teachers use in teaching and learning activities that can facilitate learning in class to increase effectiveness during teaching and learning activities (Akbar et al., 2015).

Based on the analysis using Wilcoxon, it is known that learning using educational games has a significant effect on student outcomes in the circulatory system material. The average score in the post-test is higher than the pretest, indicating that the provision of learning using educational games improves student outcomes in the circulatory system material.

Learning media is used as a means for teachers to achieve learning objectives for their students. The benefits of learning media are that learning materials become more interesting, the learning process becomes more interactive, positive attitudes, and student learning outcomes can

increase (Maulana, 2017). Educational games are learning media that can improve student learning outcomes because the media is fun and attracts students' attention with the appearance of educational games that provide challenges so that students continue to learn. The current digital era has made many students use smartphones and personal computers as tools for learning media. Educational games on smartphones and personal computers make students more enthusiastic about learning because they can be learned inside and outside school. Fun learning media and learning materials that continue to be studied can make it easier for students to achieve learning goals.

The results of this study align with the theory of (Lin & Chen, 2017), which states that learning media can also make it easier for students to get good learning outcomes. The results in this study align with the results of research from (Latif et al., 2017), which revealed that strengthening motivation has learning outcomes with an average value of 75.17.

CONCLUSION

Educational game learning media on circulatory system material are valid for use by students at SMPN 9 Jakarta. There is a significant effect of learning using educational games on students' motivation in the circulatory system material. The average score in the post-test is higher than the pretest, indicating that the provision of learning using educational games is proven to increase student motivation in the circulatory system material. There is a significant effect of learning using educational games on student learning outcomes in the circulatory system material. The average score in the post-test is higher than the pretest, indicating that the provision of learning using educational games improves student learning outcomes in the circulatory system material. Educational game learning media for circulatory system material to help students understand the material that is difficult for students to understand. Using educational game media is assisted by using smartphones independently to make students more focused when learning takes place. The use of educational game media is an innovation for teachers in the limitations of using learning media and makes it easier for teachers in the learning process.

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