Development of Computer-based Educational Game "BloodCirculation" as Learning Media for Science Biology for Class VIII Junior High School

Wiwiek Okty Herlinda[a*], Muh. Amir Masruhim[b], Sonja V.T Lumowa[c]

[a,c]*Dept. Biology, Mulawarman University, Kalimantan Timur, Indonesia*
[b]*Dept. Chemisttry, Mulawarman University, Kalimantan Timur, Indonesia*
[a]*Email: wiwiekherlinda20@guru.smp.belajar.id,* [b]*Email: nurergaamir@yahoo.com,* [c]*Email:
verasonja@yahoo.com*

Abstract

This study aims to produce a design for developing a computer-based blood circulation educational game as a medium for learning biology in class VIII Junior High School. The research method used is a research and development (R&D) method using a 4-D Thiagarajan development model, namely Define, Design, Development, and Dissemination. The feasibility assessment uses a validation sheet with a Likert scale. Data analysis used descriptive qualitative analysis. This research was conducted in 3 public schools and 2 private schools located in Samarinda. The results of the feasibility of this computer-based educational game were validated by 5 experts, namely 1 game expert, 1 learning media expert, 1 material expert, 1 linguist, and 1 education practitioner. learning is very feasible to use in learning science biology SMP class VIII with a percentage of 94%. Meanwhile, teacher learning outcomes were obtained by 81% in the very appropriate category, and student responses assessing this educational game with a percentage of 91% in the very appropriate category. This computer-based educational game is designed for learning media that can be used by teachers in learning with student-centered learning management.

Keywords: Development; Educational Game; Learning Media; Computer; Feasibility.

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* Corresponding author.

1. Introduction

Computer systems can convey learning directly to students by involving them in the learning process. There are manymethods offered by CAI (Computer Assisted Instruction), one of which is learning games [4]. The purpose of learning games is to control learning experiences that provide learning facilities to increase students' abilities through educational games. According to Rusadi, Game-Based Learning can be used as a way to increase the effectiveness of learning and allow students to be directly involved in teaching materials in a fun and dynamic way. . Educational games are games designed or created to stimulate the mind, including improving concentrate and solve problems. This means that educational games can be intended for students in elementary, middle, or college. This is caused by the tendency of someone who likes games or games [5]. Educational games are games that contain educational content. Education canbe in the form of instilling positive characters in children, learning school materials, learning religious materials, cultural values, introducing technology and culture. Educational games must continue to be developed so that if children only play games that do not contain an educational value, it is feared that it will hurt a negative impact on their future [6]. Therefore, it is mandatory for the community, especially teachers, to innovate in developing media learning that can attract students' interest in the future.

From the above background, a computer-based blood circulation educational game was designed as a learning mediumfor Biology Science for Junior High School Class VIII on the concept of the human circulatory system.

2. Method

This research is a Research and Development (R&D) research to produce a new product, namely a computer-based Blood Circulation Educational Game as a science learning medium for Class VIII SMP. This research procedure uses the Thiagarajan research and development model [3] known as 4D which is an extension from Define, Design,

Development, and Dissemination. In this study, the researchers only carried out the stages to Develop, especially to theproduct validation stage by experts. The steps for using the Thiagarajan model can be seen in the following
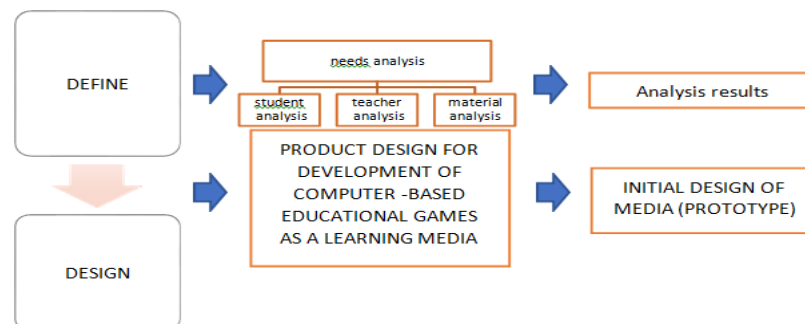
Figure 1: 4D Research and Development Steps Thiagarajan (Sugiono, 2017).

The type of data obtained is qualitative data obtained from the needs analysis instrument and the feasibility instrument. The instrument used is a needs analysis instrument, a product feasibility instrument. The data analysis technique used in this development research is a quantitative technique. Data obtained from the validator and analyzed descriptively qualitatively and used as a reference to revise the product made, to produce a decent product. The product design developed was assessed by 5 validators using a validation sheet. The results of the assessment of all aspects of the validation are measured using a Likert Scale In this research and development, the answers to the instrument items are classified into five choices or indicators. Each choice or indicator that is measured is given a score on a scale of 1-5, namely 5 (very feasible), 4 (adequate), 3 (less feasible), 2 (not feasible), 1 (very inappropriate). Then the next step is to assess the feasibility of a learning media to be implemented in science subjects Biology the concept of the circulatory system in humans in class VIII junior high school . After the data is obtained, to see the weight of each response and calculate the average score with the following formula: [1]

$$\overline{X} = \frac{\sum X}{n}$$

Description :

$\overline{X}$: average score

n   : number of appraisers

x : total score of each

Then the formula for the percentage of results can be calculated by the following formula: Result = <u>total score</u>
<u>Earned</u>   X   100 %

Maximum score

The results of the calculation of the feasibility of computer-based educational games as learning media are then categorized based on the qualitative criteria of the feasibility test [2]

Table 1: Feasibility Criteria.

No	score in percent (%)	eligibility category
1.	< 21 %	very unworthy
2.	21 – 40 %	not worthy
3.	41 – 60 %	quite worthy
4.	61 – 80 %	worthy
5.	81 – 100 %	very worthy

Source **:** Arikunto (2009)RESULTS AND DISCUSSION

A. Definition stage At this stage

what is done is a needs analysis, namely student analysis, teacher analysis, and analysis of learning materials. From the needs analysis obtained in the field, students' opinions about learning media using computer-based educational games, only about 30% of students have ever seen biology subject matter taught using games, while 69% of students have never seen biology subject matter taught using games, 1% have not. answered About 87% of students thought that learning to use educational games could increase their interest or interest in learning, 43% of teachers stated that the material on the circulatory system is quite difficult to teach students. In addition, the learning media that is often used by teachers is 57% using a torso/model/lab material tool. / props, while for computer-based educational game media it has never been used. Based on the definition stage, it is concluded that the learning media created is the development of computer-based educational games and the material to be delivered is the human circulatory system. This educational game is named "Blood Circulation"

B. Design Stage At this stage

the design of a computer-based "blood circulation" educational game is carried out. This is the front page of a computer-based blood circulation educational game.

Figure 2: Main Page.

This educational plan consists of :

1) KD contains basic competencies, core competencies, and learning objectives

Figure 3: KD Content View.

2) The material contains blood, heart and blood vessels and spleen, circulatory disorders, and diseases

Figure 4: Front View of Material Selection.

3) The play, contains games about the function of blood cells and how they circulate

Figure 5: One of the Gameplay Views in the menu MAIN MAIN.

4) Quiz, contains questions related to the material of the circulatory system.

Figure 6: QUIZ Content.

5) The profile, contains the name of the developer of the educational game idea and the name of the mentor
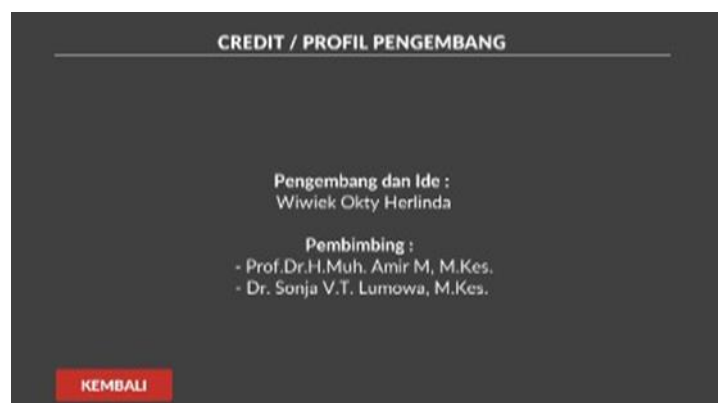

Figure 7: Profile Content.

6) Exit, which is the menu to end the educational game.

To make it easier and more interesting, this Blood Circulation educational game is equipped with a Manual

Book as auser manual so that it can be used for teachers and students, and packaged to make it more interesting.

As for the appearance of the packaging and contents of the Educational Game product in the packaging box

Figure 8: Manual/Instruction Book and Packaging.

C. Development Stage

In the development stage the product validation stage, teacher review assessments, and student responses to thedevelopment of this computer-based Blood Circulation Educational Game were carried out. The product validation

consists of 5 validators, namely 1 Game Expert Validation, 1 Learning Media Expert Validation, 1 Material Expert Validation, 1 Language Expert Validation, and 1 Education Practitioner Validation. Product Validation Results in Initial research in the form of

Table 2: Preliminary Results of Expert Team Validators.

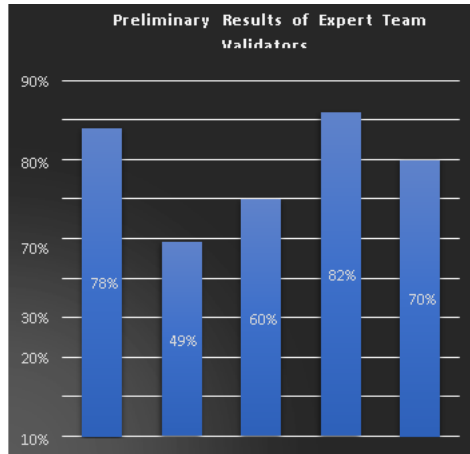| No	Validation	score in percent (%)	Qualitative Criteria
1.	Game Quality	78 %	worthy
2.	Quality of Learning Media	49 %	quite worthy
3.	Material Quality	60 %	quite worthy
4.	Language Quality	82 %	very worthy
5.	Education quality	70 %	worthy

Source: Research Result 2019

Figure 9: Graph of Validator Team's Overall Initial Validation Result.

the development of this computer-based educational game is presented in the following table

Table 3: Final Result of Expert Team Validator.

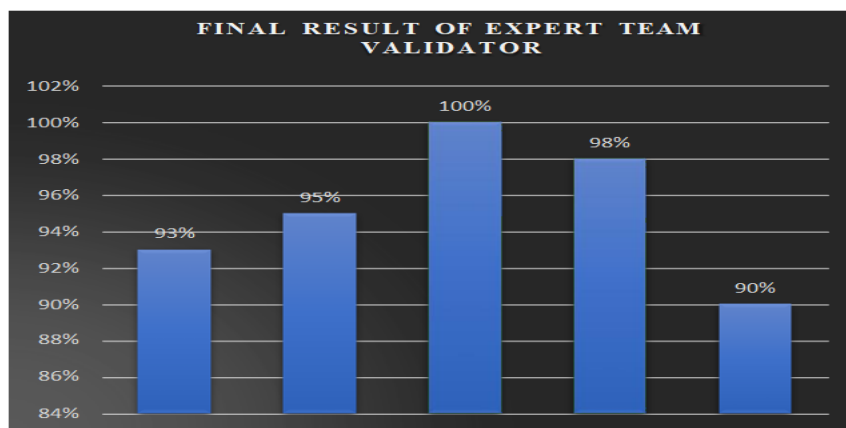| No	Validation	score in percent (%)	Qualitative Criteria
1.	Game Quality	93 %	very worthy
2.	Quality of Learning Media	95 %	very worthy
3.	Material Quality	100 %	very worthy
4.	Language Quality	98 %	very worthy
5.	Education quality	90 %	very worthy

Source: Research Result 2019

Figure 10: Graph of Validator Team's Overall Final Validation Result.

The feasibility value of educational games as learning media for the initial product from the entire expert team is 66% in the appropriate category and after revisions, the final product feasibility value from the entire expert team increasesto 94% in the very feasible category. This can be seen in the following graph
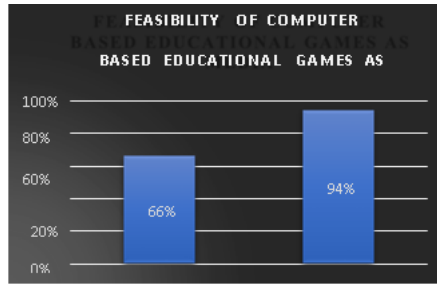
Figure 11: Educational Game Feasibility Result.

For teachers, specifically for science teachers, 7 teachers who filled out the teacher review questionnaire, after observing and trying the educational game product... and the results of the teacher's study got 81% very good category. The student response was done by directly trying the educational game on a laptop or computer and being given a student response questionnaire, 12 students tried and filled out the educational game questionnaire, and the results got 91% very feasible category. The results of the teacher's assessment and student responses can be seen in the graph below
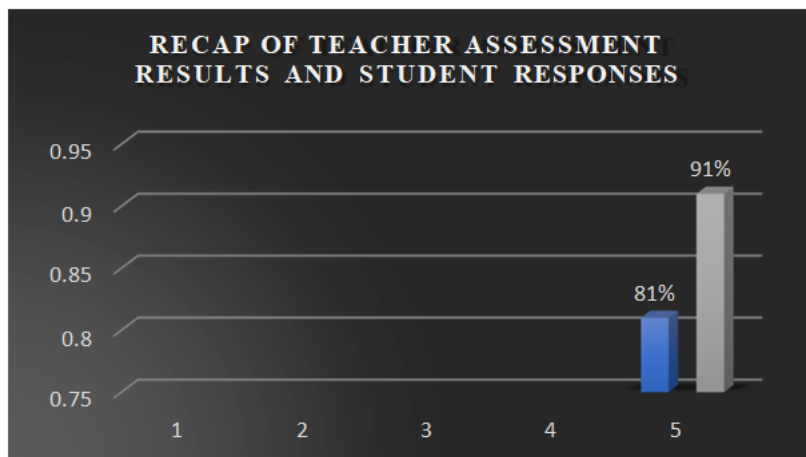

Figure 12: Result Recapitulation Graph of Teacher Assessment and Student Response.

The existence of technology is very useful in supporting the learning process and for child development has a positive impact, but currently when compared to existing games, games that contain school education are very few [7]. Educational games are one type of learning media that are used to provide teaching, increase the knowledge of users through unique and interesting media [5]. Games have a positive effect on learning because games provide direct experience from the users involved and based on McLaren Research (2017) it is explained that learning is more fun and students have a better understanding, so they can solve problems better after using educational games [8] This blood circulation educational game was created with a specific purpose as an educational tool to get to know more closely how the function of blood cells and the course of blood circulation in the human body. This educational game can be used as a computer-based educational learning media to add

learning media for teachers in providing learning.

3. Conclusion

The development of this computer-based Blood Circulation Educational Game is designed to increase students' learning motivation and learning outcomes, as well as improve their higher-order thinking skills and their insights to develop and help students acquire the skills to find answers/solutions in understanding the concept of blood circulation. The results of the feasibility assessment which were validated by 5 expert validators, as well as the teacher's review and student responses were very feasible.

4. Suggestion

This computer-based educational game can be further developed with other learning materials, and can be developed into an Android-based game

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