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Development of Learning Modules Assisted by *Augmented Reality* (AR) to Improve Learning Outcomes of High School Students on the Concept of the Circulatory System

Qiswatun Mukhoyyaroh [1, *], Latif Sofiana Nugraheni[2], Ripauji[3], Siti Hanna Sumedi[4]

Biology Education, FTTE, Universitas La Tansa Mashiro, Banten-Indonesia
[1] qiswatunm@gmail.com; [2] Latifsofiana@gmail.com ; [3] ripaujiripa@gmail.com; [4]ssitihanna@gmail.com
* Corresponding author: qiswatunm@gmail.com

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ABSTRACT

The learning outcomes of high school students on the circulatory system concept have not reached the expected target. The achievement of basic competencies or learning objectives are not achieved because the learning resources that have been used by teachers and students are not able to strengthen The achievement of basic competencies or learning objectives is not achieved because the learning resources that have been used by teachers and students are not able to strengthen concept abstraction for the topic of the circulatory system.. *Augmented Reality* (AR) technology is a technology that infuses information from the virtual world and displays it in real (3D) with the help of a computer or mobile phone. This study aims to produce *Augmented Reality* (AR) assisted learning modules to improve learning outcomes in circulatory system concept. The type of research used is *Research and Development* (R&D) research with a research design developed by Hanafin and Peck that consists of three phases, that is the needs analysis phase, design phase, and development - implementation phase. Data collection techniques in this study used interviews and questionnaires. The results of this study indicate that Augmented Reality (AR) assisted learning module on circulatory system topic was declared very good (86.6%) by experts with review from media experts (85.3%), material experts (90.2%) and experts language (84.3%). This module has characteristics of a printed learning module which includes 3D images equipped with Augmented Reality (AR) technology.. However, it is not yet known how effective this module in improving learning outcomes because it has not passed the product effectiveness assessment. Therefore, the researcher suggests further research, to test the effectiveness of this learning module on student learning outcomes.

Keywords: Learning Module 1, Augmented Reality 2, Human circulatory system 3, research and development 4.

Introduction

Learning media is an essentialcomponents of learning system. Learning media is anything that can be used to transfer messages that can stimulate student's thoughts, feelings, attention, and abilities to encourage the learning process in students (Hidayatullah, 2014). The use of learning media in learning process is important because it can improve interest in learning, motivate students to learn, avoid or reduce verbalism, generate regular and systematic reasoning, and can develop students' personal values. One example of learning media that can be used in learning process is learning modules. Learning modules are teaching materials where the content is organized in an interesting and systematic way to assist students in learning independently (Prastowo, 2015). The advantages that can be obtained when using learning modules are overcoming the limitations of time, space, and the sensory sensibility , allowing students to measure or evaluate their own learning outcomes, students being more active in learning, the teacher role as a guide, increases self-confidence, relieves the teacher's freedom, learns more effectively, there is a corrective evaluation.

The material of the circulatory system or blood circulation is a concept about the connection between the structure of the tissues that make up organs of the circulatory system, in relation to bioprocesses and functional abnormalities that can occur in the human circulatory system and abnormalities in structure and function of blood, heart, blood vessels that cause disorders in the human circulatory system (Permendikbud, 2018). The results of interviews with Biology teachers revealed that the learning outcomes (cognitive) of a small proportion of high school students on the concept of the circulatory system or blood circulation did not reach the expected target Standard Minimum Completion Criteria (KKM). The learning outcomes (cognitive) is known reached 40%. One of the reasons for low achievement of learning outcomes is because the material used is an abstract concept. Abstract means intangible because this material cannot be observed directly by the eye (Ariwibowo et al., 2015). Nisak (2021) research showed that the circulatory system concept ranks as the fifth most difficult material in class XI with a percentage of 42%. Nisak added that there is a need for biology teaching materials that help solve these difficulties. Ningrum et al. (2022) revealed that the circulatory system is one of the most difficult concepts because learning it requires a high level of understanding. In addition, the concept of the human circulatory system is abstract which makes it difficult for students to understand the content of the material so other media assistance is needed to help deliver the material to be more easily understood and enjoyable for students. Therefore, learning media is needed to help in delivering circulatory system material to make it easier to understand.

The development and use of learning modules on the circulatory system concept have been found, but there are also many weaknesses inherent in them, for example, the material in the module contains a high element of verbalism without being equipped with pictures (Rahmi et al, 2021), the module is equipped with unclear images (Orkha et al, 2020) and the material in learning modules is less contextual (Lasmiyati, 2014). This causes several problems, including using learning modules that tend to be monotonous and boring. Therefore, one solution that can be pursued is to develop an Augmented Reality (AR) assisted learning module to improve student learning outcomes on circulatory system subject.

Augmented Reality (AR) can overcome the weaknesses of learning modules that have been used in several ways, such as by providing three-dimensional images (Wardani, 2015). During this time image on the printed learning module is limited to two-dimensional images. *Augmented Reality* (AR) technology is a technology that combines two-dimensional and three-dimensional virtual objects into a three-dimensional real environment and then projects these virtual objects to real environment (Iftene et al., 2018). Augmented Reality (AR) supports interaction between virtual and real, supports learning feedback, helps stimulate interest in

learning and strengthens effects in learning (Wang et al., 2022). In addition, *Augmented Reality* (AR) based learning media can improve student understanding because 3D objects, text, images, video, and audio can be displayed to students in real time (Sejzi, 2015). Lathifah et al. (2021) conducted a research and development on Augmented Reality (AR)-based human digestive system learning modules. The results of the study state that *Augmented Reality* (AR)-based human digestive system learning module can be used as a media of student learning in biology. Mustaqim (2016) revealed that *Augmented Reality* (AR) assisted learning media can visualize abstract concepts for understanding a lesson. However, research that examines the development of Augmented Reality (AR) assisted learning modules on biological materials is still limited. This opens up opportunities for the development of Augmented Reality-assisted modules on biology material, that include human circulatory system material. Thus, purpose of this study is to develop an Augmented Reality (AR) assisted learning module to improve learning outcomes in subject of the human circulatory system. This module is expected to be an alternative learning media that can be used by teachers on abstract biology concepts and improving student learning outcomes.

Methods

The research was conducted in August - October 2022 at Lebak Regency, Banten Province. This type of research uses *Research and Development (R&D)* with the aim of producing *Augmented Reality* (AR) assisted learning modules to improve student learning outcomes on circulatory system concepts. With a research design developed by Hanafin and Peck. The Hannafin and Peck model divided into three phases: Phase I consist of needs analysis of problem, learning system , and learning media. Phase II is the design which consists of making storyboards,interview instruments,material and media expert validation instruments, and student response questionnaires. Phase III is development or implementation which consists of making learning modules, *Augmented Reality* (AR), material expert tests, media expert tests, and product trials. At the end of each phase, an evaluation is conducted. The evaluation aims to review if there are shortcomings in each phase.

This research data consists of qualitative data derived from interviews and quantitative data derived from questionnaires. The instruments used are interview forms, material expert validation forms, media experts, and language experts. Data collection techniques using questionnaires and interviews. After the data is obtained and collected, the data then analyzed. Analyze interview data by considering the model developed by Miles and Huberman (Sugiyono, 2018). This model consists of data reduction, presenting in various models and drawing conclusions. Data analysis of material expert validation instruments, language experts, and media experts using questionnaires, was analyzed by calculating the questionnaire scores quantitatively and then converted qualitatively. The questionnaire uses 4 Likert scales. The Likert scale measurements are translated into variable indicators. The score categories in the Likert scale are described in the following Table:

Table 1. Score Categories on a Likert Scale (Expert Validation)

Score	Answer Options
4	Very good
3	Good enough
2	Not so good
1	Very poor

The expert validity questionnaire test on *Augmented Reality* (AR) assisted learning module can be done by comparing the number of ideal scores that have been given by the validator

(ΣR) with the number of ideal scores that have been set in the learning media validation questionnaire (N). The formula is as follows:

$$P = \frac{\sum R}{N} \times 100\%$$

Description:

P = Percentage of score sought
Σ R = Number of answers given by validators / selected options
N = Number of maximum or ideal scores

The validation criteria or level of achievement used in media development are described in Table 2.

Table 2. Media feasibility criteria

Percentage (%)	Criteria
86 – 100	Very feasible
76 – 85	Worth
56 – 75	Less feasible
<55	Very less feasible

Based on the feasibility table, it shows that the developed product ends when the media reaches the percentage of feasibility in the categories of very feasible, feasible, quite feasible, or less feasible.

Results and Discussion

Augmented Reality (AR) Assisted Learning Module to Improve Student Learning Outcomes on Human Circulatory System Material

The research and development of *Augmented Reality* (AR) assisted learning modules on circulatory system material uses a research design developed by Hanafin and Peck. This research design consists of three steps, there are Needs analysis phase, Design phase, and Development and implementation phase. The details explanations are as follows:

1. Needs Analysis Phase
   The purpose of needs analysis is to identify various needs in researching and developing a learning media product (Suryana, 2014). The needs analysis phase consists of (1) problem analysis. Based on the results of the needs analysis carried out by interviewing biology teachers, information was obtained that the lack of visualization for abstract material in circulatory system topic. The material requires media assistance to support learning in order to see the process directly. This is in accordance with research conducted by Mustaqim (2016) that Augmented Reality (AR) assisted learning media can visualize abstract concepts to understand a lesson. Furthermore, other problems were found,students who passed the KKM of the human circulatory system were still low, with only 40% percentages. These findings are used as the basis for the background of making learning modules using *Augmented Reality* (AR). (2) Analysis of learning objectives. Analysis of learning objectives is cariied out by analyzing lesson plans, basic competency standards, learning indicators, and learning objectives. Analysis of learning objectives is to identify, detail, and arrange systematically the concepts that will be used as material for making learning modules. The results of this analysis are used as guidelines/references in

the content of competencies for the learning module Based on 2013 Curriculum, researchers have basic competencies 3.5 "Analyzing the relationship between the structure of tissues that built the organs in circulatory system correlated to bioprocesses and functional disorders that can occur in the human circulatory system". (3) Analysis of learning media. Learning media analysis in this study was conducted by interviewing biology teachers. The goal is to identify the needs of learning media needed. The results of interviews revealed that there is a need for learning media to support the lesson material on circulatory system topic. Majority, learning activities is dominated by the use of printed books. This is supported by research conducted by Nurhayani (2015) which revealed that animation media has an effect on students' biology learning outcomes regarding concept of the human circulatory system. So, the purpose of this learning media analysis is to find out whether the learning media used by teachers can support students' interest in learning. Furthermore, the results of these findings become the basis for the formulation of the background of making Augmented Reality (AR) assisted learning media.

Based on the results of interviews with teachers, researchers obtained information that the lack of visualization in abstract circulatory system material, low student learning outcomes in circulatory system material, and highly required learning media that supports especially for an abstract topic. Based on these problems, researchers provide new idea , making *Augmented Reality* (AR) assisted learning modules to improve student learning outcomes on circulatory system concepts.

2. Design

The design phase aims to identify and documenting the best rules for achieving the objectives of making learning media. The design phase consists of (1) Making a Storyboard (Figure 1.a). Storyboard describes each display on the *Augmented Reality* (AR) assisted learning module on circulatory system material to be developed. First, collect the materials needed for making *Augmented Reality* (AR) assisted learning modules such as KD (basic competencies), material, images, and references . Then arrange the materials layout for the Augmented Reality (AR) assisted learning module. Furthermore, combining the layout of the materials and making some adjustmen. The storyboard display can be seen in Figure 1. a. (2) Make an interview instrument. Research instruments in the interview method are tools in a form of question lists that are arranged systematically according to the research topic, research subject, and research object with the aim of obtaining data and answers from research informants.. The interview instrument is intended to explore information related to the types of teaching materials that are often used, use of technology in the learning process, teaching and learning activities on circulatory system material.. This interview was conducted with one biology teacher at MAN 1 Lebak. The interview with teachers giving a result that tehre are several types of teaching materials, such as textbooks, learning videos, and LKPD. Furthermore, the school has used technology in learning such as smartphones owned by students,internet, also some kind of learning platforms such as Edmodo, Youtube, and Google Form. In addition, interviews were also conducted with a number of students who have experienced using *Augmented Reality* (AR) assisted learning modules. (3) Making Expert Validation Instruments and studentquestionnaires response. This instrument aims to measure the feasibility of the product by experts (media, material, and language). Before use, this instrument was tested to see the feasibility by the expert validation instrument. The validator on this instrument is one lecturer from Biology Education Study Program, La Tansa Mashiro University. The validator stated that the expert validation instrument needed to be revised because there were statements in the instrument that were complicated. The validator requested that the statements on the instrument have to be more simpler. The same treatment also applied to student response questionnaire.

Apendix 5. *Storyboard*

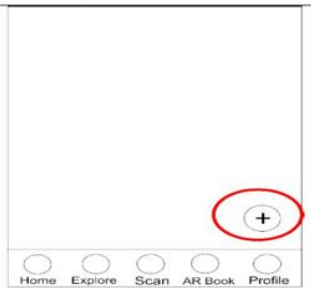
Layout Create AR	Description
	To display AR on the module using the android assemblr application, touch the plus icon (circled in red)
	In the next window there is a choice of simple editor and classic editor. (The researcher chose a simple editor)

Figure 1.a Desain view storyboard

Apendix 6. Step Create 3D Object

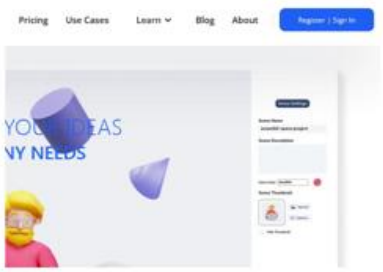
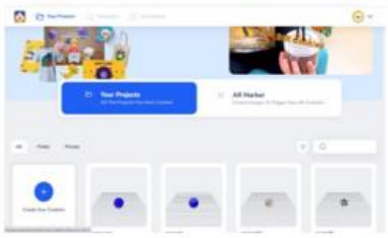
Number	Layout	Step by step
1		(1) Visit the assemblr studio web address https://www.assemblrworld.com (2) Create a web assemblelr studio account (if you don't already have one) by registering)
2		(3) click *create your creation)*

Figure 1.b. Design view 3D object creator in *Augmented Reality* (AR)

3. Development and implementation
   The development and implementation stage aims to develop a product and test it. The development and implementation steps taken are: module creation, Augmented Reality

(AR) media creation, media expert test, material expert test, small-scale and large-scale product trials, and teacher assessment. Module creation is an extension of the Augmented Reality (AR) learning module material layout combining stage. This stage is important because it affects the interface of the pages and the attractiveness of each learning module.. The addition of complementary components, colouring will give an effect to be the main aspect at this stage. The making process of *Augmented Reality* (AR) media is related with creation of 3D objects. First, researchers going to the assembly studio web address, then create a web account, then click register, select create from scratch, select search 3D symbols (heart, red blood cells, white blood cells, platelets), select available 3D objects, click share, click AR graphic marker, click download QR. Finally, researchers inserted the QR png (marker) into the learning module. The creation process of *Augmented Reality* (AR) media or 3D objects is shown in Figure 1. b. Validation test instrument for media experts, language experts, and material experts is an instrument used to measure the feasibility of the product. This instrument is formed as a questionnaire list containing a series of statements about the feasibility aspects of the product. Each statement has 4 scales ranging from very poor to very good. Then, it is analyzed by calculating the questionnaire score quantitatively and then converted qualitatively.

Small-scale product trials were conducted on small groups (5 students of class IX MAN 1 Lebak). During the trial, the researcher explained the learning module contents. Furthermore, students tried to use the learning module themselves and were given the opportunity to provide input, criticism, and suggestions for the product. The results of this small group trial are formed as feedback from a number of students. of the students provided comments related to the difficulty in downloading the *Augmented Reality* (AR) reader application because students' smartphones have little memory and low network bandwidth. After conducting a small-scale trial, the researcher then made some revisions related to feedback that already submitted by students.

Feasibility of *Augmented Reality* (AR) Assisted Learning Modules to Improve Student Learning Outcomes on Circulatory System Material

The products that have been made are then tested for feasibility by experts consisting of a team of material/content experts, language experts, and media experts. using a questionnaire. The results of data analysis showed the product feasibility with an average of 86.6% which is included in very feasible category. It's means that the *Augmented Reality* (AR) assisted learning module to improve learning outcomes for circulatory system topic is very feasible. The feasibility was revealed by a number of experts, that this module displays an interesting 3D objects, and module contains complete, concise, and easy-to-understand material. The experts added that *Augmented Reality* (AR) assisted learning module is relevant for the basic competencies, there are clear instructions on the module for installing the assembler application on a smartphone as a media viewer *Augmented Reality* (AR) and using simple language so that it is easily understood by users. The value of each material and media expert can be seen in Figure 2.

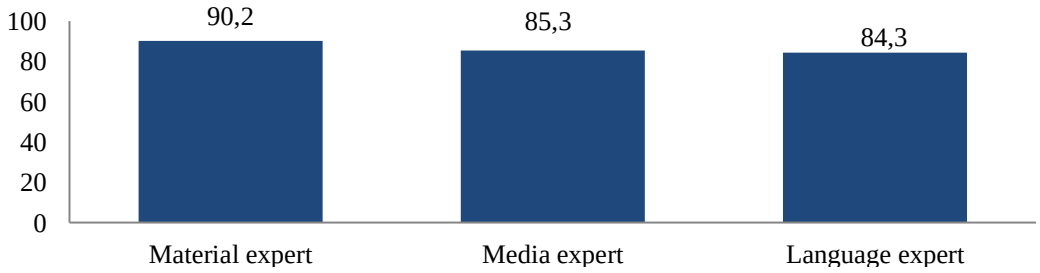


Figure 2. The feasibility value of *Augmented Reality* (AR) assisted learning modules on the material of the circulatory system

Based on Figure 2, the score of product feasibility given by material expert is 90.2%, a very feasible category. The aspects revealed in the material expert validation questionnaire consist of effectiveness and usefulness of the learning module for learning process, aspects curriculum suitability of learning module,material content aspect , andlearning module interaction with users. The percentage value of each aspect of material expert assesment can be seen in Figure 3.

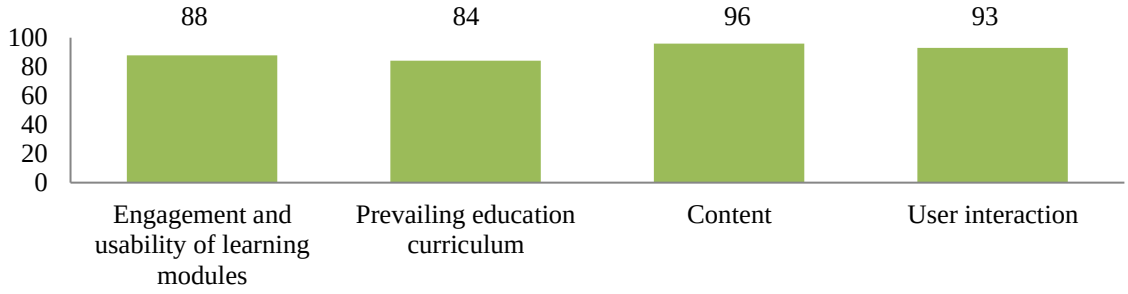


Figure 3. The feasibility value of Augmented Reality (AR) assisted learning modules on the topic of circulatory system in review from material experts.

The feasibility value of the material expert on the product in terms of the effectivity and usability for the learning module is 88%,very feasible category. Students interview result stated that*Augmented Reality* (AR) assisted learning module can attract student attention and help learning process because they can see directly the organs of the circulatory system in 3D (looks real) (Figure 4). Based on Figure 4. a, it shows the AR display of heart function, while Figure 4. b shows parts of the human heart. This advantage makes *Augmented Reality* (AR) assisted learning module very feasible. This is in accordance with research conducted by Saputri (2018) which stated that science learning media using *Augmented Reality* (AR) based on Android can be used as a learning media for students. Mustaqim (2016) reveals *Augmented Reality* (AR) based learning media makes learning atmosphere more active and looks real.

Review from material expert's feasibility value of the product in the aspect of the suitability of learning module with the applicable education curriculum is 84% with a very feasible category. Indicators in curriculum aspect consist of media related to the content, the material presented is in accordance with the existing curriculum, and the learning objectives and benefits are clearly presented. The advantages of this module are the material that matches the basic competencies. Mantasia et al. (2016) revealed that Augmented Reality (AR) is one way of learning practicum that is practicable, effective, and efficient which its implemented supports the 2013 curriculum program.

The material expert's feasibility value of the product in the aspect of material content is 96% with a very feasible category. Indicators in material consist content of the material in accordance with the Basic Competencies (KD) and the language indicators used are in line with student understanding. According to Laili (2020), a good textbook covers all Competency Standards (SK) and Basic Competencies (KD) in accordance with content standards, including the feasibility of content, language, presentation, and textbook graphics. So that teaching and learning process carried out by teachers and students can achieve the Graduate Competency Standards (SKL). Input and suggestions on aspects of the content of the material submitted by the material expert, such as exercise questions contained in learning activities that are not in accordance with the material being learned, in the material there is a paragraph or prologue before entering the core of the lesson. . The content aspect of the material gets the highest score compared to other aspects. This is due to the Augmented Reality (AR) assisted learning

module has advantages such as the content of the material is adjusted to the basic competencies, the explanation in this learning module is equipped with 3D images, there are learning evaluation questions that are adjusted to students' abilities.

The material expert's feasibility value of the product in the aspect of learning module interaction with users is 93% with a very feasible category. The indicator in this aspect is that the media is easy to operate/use. The material expert revealed that there were obstacles when scanning 3D objects. This is in accordance with the research of Harahap et al. (2018) who said that the *Augmented Reality* (AR) media developed has issues such as cameras and lighting. The camera type used must have adequate qualifications. In addition, lighting also has an effect. This is supported by research proposed by Muntahanah et al. (2017) which states that light is needed in the *tracking* process.

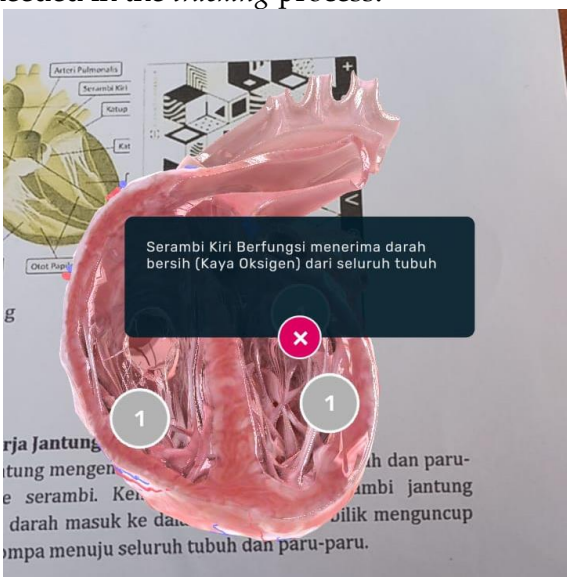


Figure 4. a

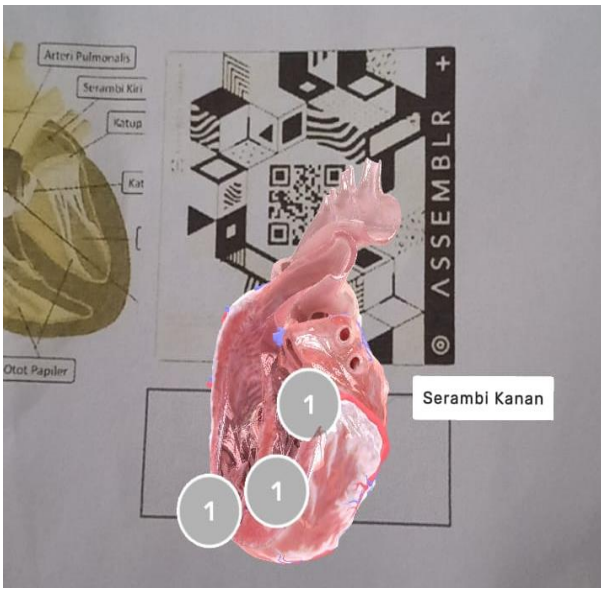


Figure 4.b

Figure 4. Display of the *Augmented Reality* (AR) (a) heart function; (b) heart parts

Based on Figure 2, the product feasibility value seen by media experts is 85.3% with a very feasible category. The aspects measured include the appearance of learning module, media in learning module, and student involvement in the use of learning media. The following percentage of each aspect of the media expert questionnaire can be seen in Figure 5.

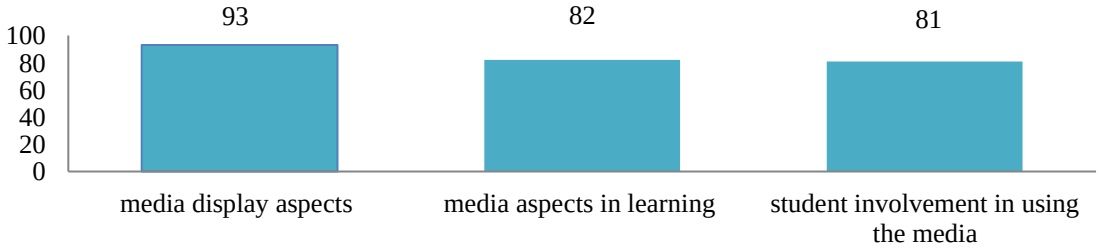


Figure 5. The feasibility value of Augmented Reality (AR) assisted learning modules on circulatory system material in the review of learning media experts.

The product feasibility value of learning media experts in terms of media display aspects is 93% with a very feasible category. Media experts say that the display of modules and *Augmented Reality* (AR) learning media is generally attractive to users. *Augmented Reality* (AR) that is reflected looks clear and similar to the original image. However, there is a weakness of the module display and learning media,the process of scanning (3D object display) sometimes the 3D objects do not appear. The obstacles that arose during the operation of the media were

caused by influential factors, such as the lack of light during the marker scanning process.. This is in accordance with research conducted that light is needed in the tracking process and only smartphones that have certain specifications to display 3D objects (Muntahanah, 2017). In addition, media experts also argue that the size of the module does not match the existing standards.

The product feasibility value from media experts in terms of media aspects in learning is 82% with a very feasible category. Media experts said that the 3D images displayed were clear and easy to understand. The product feasibility value of media experts in terms of student involvement in using the media is 81% with a very feasible category. Media experts revealed that the *Augmented Reality* (AR) assisted learning module involves teachers and students in the learning process. In accordance with research conducted by Hidayat et al. (2019) stated that *Augmented Reality* (AR) can be used by teachers to explain the material in more detail and well visualized to increase students' understanding of the material presented. *Augmented Reality* (AR) assisted learning modules can also be utilized by students, this is in accordance with research conducted by Aripin et al. (2019) revealed that *Augmented Reality* (AR) media can help students understand the concept of the nervous system. According to students' perceptions, one of the factors that make students interested in learning the nervous system using AR is the 3D animation, making it easier for students to visually represent the complex structure of the nervous system to be more easily described visually. Media experts giving some feedback such as adding a statement of the minimum smartphone specifications that can run the application to scan 3D objects in the module, also adding more 3D objects. Figure 6.a explains the incompatibility of the assembly with smartphone specifications, then the researcher tries to use an assembly that is more compatible with smartphone devices. The smartphone device used is at least iOS 12 (Apple), OS 7.0 Lollipop (Nught), a minimum RAM load of 2 GB and an MP camera (Android) (Figure 6.b). The advantages of Augmented Reality (AR) assisted learning modules in their learning media are the displays of media and Augmented Reality (AR) learning modules attract user attention so that they can be utilized by users in learning processes, Augmented Reality (AR) which is reflected looks clear and similar to the original image.

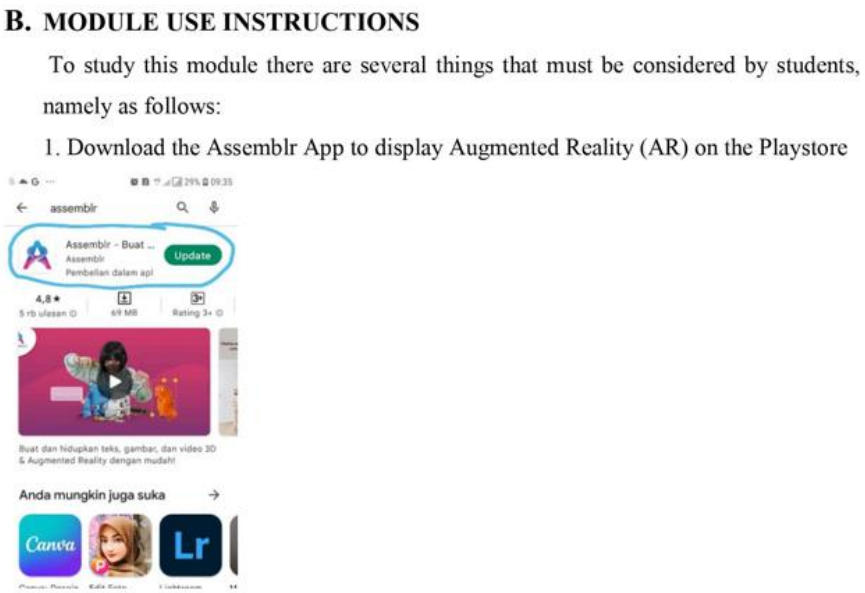


Figure 6. (a) Asemblr is not compatible with *Augmented Reality* (AR)

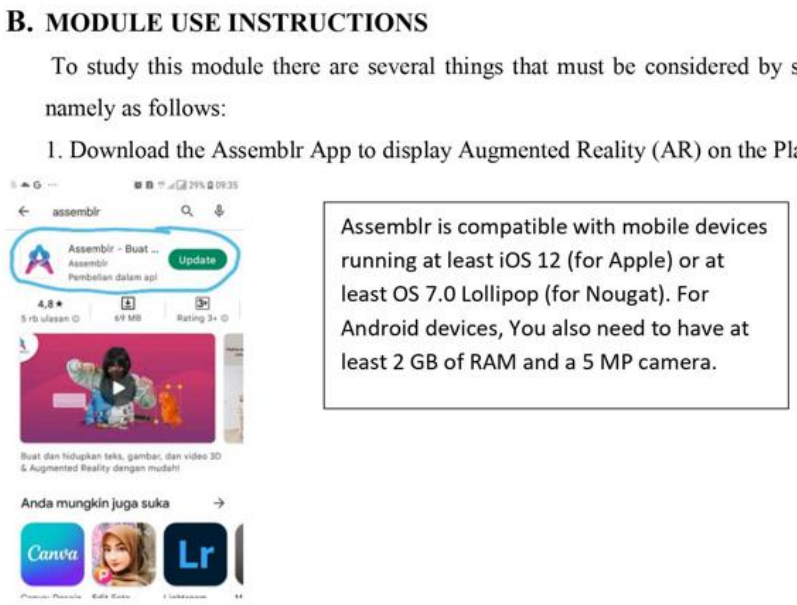


Figure 6. (b) Assemblr is compatible with mobile devices running at least iOS 12 (apple) or at least OS 7.0 lollipop (Nought). Android devices must have at least 2 GB RAM and 5 MP camera

Based on Figure 2, the product feasibility value given by language experts is 84.3% with a feasible category. The aspects revealed in the language expert validation questionnaire consist of grammar on the cover of the module, typography of the module content, and language use. The percentage of each aspect in the linguist questionnaire can be seen in Figure 7.

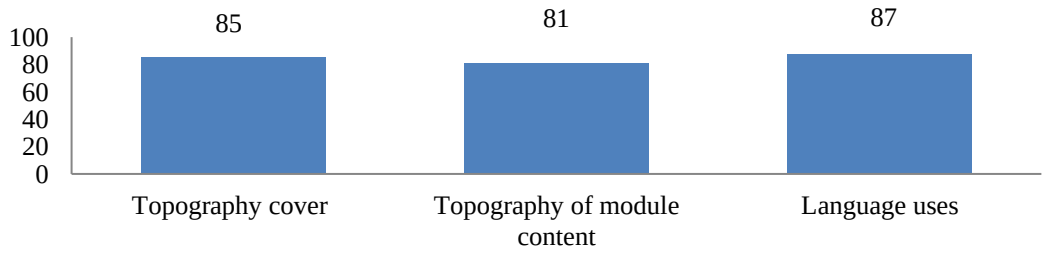


Figure 7. The feasibility value of Augmented Reality (AR) assisted learning modules on circulatory system material in review by language experts..

The feasibility value of the language expert on the product in terms of the topography aspect of the module cover is 85% with a very feasible category. The language expert revealed that this learning module has strengths in composition and size on the cover of the module (title, instructions, logo, image) looks proportional, balanced, and in harmony with the layout.. The size of the title letter is more dominant and clearly visible with attractive colors to attract users attention. The title color on learning modules appears to contrast with the background color of the module cover so that it is clearly visible.. Language experts suggest that the font used is more attractive, there needs to be additional sentences for the cover page and book cover to make it attractive. This is in accordance with research conducted by Agustina (2015) revealed that there is a significant influence between book cover design and student reading interest so the book cover design needs to be maintained and creative so that students are more enthusiastic to read.

The language expert's feasibility value of the product in terms of the typography aspect of the module content is 81% with a decent category. Media experts revealed the strengths of

the learning module, such as the placement of chapter titles and the equivalent (preface, table of contents, etc.) is uniform/consistent, placement of titles, subtitles, illustrations, and image captions does not interfere with comprehension, does not use too many types of fonts, the use of letter variations (bold, italic, capitalized) is not excessive, the space between lines of the text structure is normal, the level/hierarchy of the title is clear, consistent, and proportional, it is easy to understand the sentences used in the learning module, the word beheading is clear, consistent, and proportional.. Language experts reveal that the typographic hierarchy is less consistent, paragraphs are still inconsistent and must be considered in writing sentences. This is in accordance with research conducted by Rohmah (2020) which revealed that mastering of writing skills and error analysis in words, clauses, sentences, and paragraphs are important skills that must be considered.

The feasibility value of language experts on the product from the point of language use is 87% with a very feasible category. The language expert explained the strengths of this module, that the vocabulary used was in accordance with the spelling of the Indonesian dictionary, and the sentences used were in accordance with the students' abilities. This is in accordance with research conducted by Rohmah (2020) which reveals that the use of spelling in writing sentences must be properly understood so that there is a balance between writing skills and spelling control.

After students finished using the learning module, students were asked to give a response in the questionnaire form to the Augmented Reality (AR) assisted learning module. Results of data analysis of student response questionnaires to the product showed that this product received a positive response from students. This is proven by the average value of the student response questionnaire of 75.8% with a very feasible category.

Research and development of Augmented Reality (AR) learning modules to improve learning outcomes of high school students on circulatory system topics is done through three stages, such as needs analysis stage, design stage, and development and implementation stage.

However, the product of this research and development has not been tested for product efficacy. Therefore, it is expected that in the future there will be further research to test the effectiveness of Augmented Reality (AR) learning modules to improve the learning outcomes of high school students on circulatory system topics.

Conclusion

This research produces *Augmented Reality* (AR) assisted learning module to improve student learning outcomes on the material of the circulatory system. This module has characteristics of a printed learning module which include 3D images equipped with *Augmented Reality* (AR) technology. *Augmented Reality* (AR) assisted learning modules to improve student learning outcomes on circulatory system topic has high feasibility from learning materials aspects. However, the effectivity of this module in improving learning outcomes is not yet known because it has not passed the product efficacy assessment. For that reason, the researcher suggests for further research, to test the effectiveness of this learning module on student learning outcomes.

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