

Development of a Physics Module Based on Augmented Reality Integrated with Al-Quran Verses on Electricity

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Article History

Received: 31 May 2023

Reviewed: 29 June 2023

Accepted: 30 June 2023

Published: 30 June 2023

Key Words

augmented reality; physics
module; electricity

Abstract

Learning resources in the form of teaching materials that are interesting, innovative, communicative, contextual, and technology-based is a demand for public learning now. In line with the West Sumatra Regional Government program in integrating Al-Qur'an education in subjects in Senior High School, especially physics subjects, it is also something that must be included in the teaching materials. Even though there are many teaching materials and technology-based electronics that have been created, printed teaching materials remain the choice for the convenience of students in the study. Therefore, a physics module based on augmented reality integrated verses of the Qur'an on electricity is developed. The purpose of this study is to find out the validity and practicality of the module. This research is development research (R&D) using a 4D model (Define, Design, Develop, and Disseminate). This research is up to develop stage (validity and practicality). The results of the study indicate that the teaching material in the form of integrated augmented reality-based modules of electricity is very valid. This result is according to four experts in terms of the feasibility of content, presentation, language, and graphics. The average score for the module is 90.09%. This module then tested 18 students in grade XII and the physics teacher of Raudatul Jannah Islamic School to gain the practicality aspect. The result was 85.48% (students) and 90.90% (teachers), which are very practical. In conclusion, the module was very valid criteria according to the expert and was very practical based on the questionnaire filled out by students and teachers.

INTRODUCTION

Components that can deliver students to be able to learn and innovate are teaching materials such as modules, worksheets, and so on. The module is written in the form of a book

with the aim that students can learn independently, even without teacher guidance (Sani, 2019). In the module, several components must exist, including instructions for use, competency achievements, subject matter,

supporting information, practice questions, and evaluation. Modules are useful to be able to assist teachers in the learning process and help students learn independently, both to improve the competence of knowledge, attitudes, and student skills. In the module, the material is presented contextually so that it can help students more easily understand learning; with modules, students can also study independently anywhere and anytime; the module is alternative learning if at school the teacher cannot fully discuss the learning material thoroughly. Apart from the components that must be in a module, modules can also increase students' scientific literacy.

Mastering scientific literacy skills in the 21st century has become an obligation for all Indonesian people in the field of education for the success of development in Indonesia (Kemendikbud, 2017). In the development of science and technology, especially in the world of education, the most important point is literacy skills. Scientific literacy gets a lot of attention, especially in the field of education. Scientific literacy directly plays an important role in building a new generation that has scientific attitudes and thoughts. The ability of individual students in skills and knowledge prepares them for the advanced technological era in the future (Fatkhurrohman & Astuti, 2017). One of the things that can increase scientific literacy is teaching materials that include innovative modules. The development and use of sophisticated technology in the present and the future will affect the learning process of students at both the elementary, middle, and high school levels, among the scientific disciplines that are also influenced by technological developments in physics. This is because physics subjects are included in subjects that are difficult for students to understand (Khumaidi & Suahyo, 2018). These difficult-to-understand subjects included material on electricity (Koudelkova & Dvorak, 2015; Maloney et al., 2001; Neset Demirci, 2006). For this physics subject to be easily understood and understood by students, educators, in this case, teachers, must innovate in using learning media and innovate in delivering learning material. Educators must use material delivery methods that greatly influence the process of forming students' concepts of physics subjects through scientific literacy.

Students mastery of low scientific literacy in physics subjects can be overcome with physics learning resources that contain good and appropriate scientific literacy categories.

Interesting, communicative, innovative, contextual, and technology-based teaching materials can be a great source of learning physics. Teaching materials that can be developed can be in the form of print media and virtual media. Print media such as textbooks, modules, worksheets, handouts, and virtual media can be in the form of technology-based teaching materials such as interactive videos, electronic modules, computer-based tutorials, and multimedia (Suryani et al., 2021). In general, printed teaching materials are teaching materials that are widely used in the learning process, but printed teaching materials have the disadvantage of not being able to visualize real concepts, so students will find it difficult to understand abstract material. While teaching materials in electronic form and e-learning in online learning methods are designed to study and deepen material utilizing discussions, assignments, and evaluations online, providing advantages in the learning process because they can visualize real concepts that can attract students' attention. However, students are constrained in the learning process because most students do not have an internet connection, so they cannot use the e-learning modules provided to the fullest (Shofiyah et al., 2020).

The technology that is currently developing is expected to be an attraction and a learning media tool for students/students (Rahman & Dewantara, 2017). Phenomena without visualization in the development of science and technology often cannot help students understand and learn a lesson (Idrus et al., 2021; Wibisono & Wardhani, 2020). The learning system in the 21st century is expected students will have learning skills and be able to innovate, which includes critical thinking and can solve problems and problems creatively and innovatively, as well as being able to communicate and collaborate (Kemendikbud, 2017). With the development of technology, everything that becomes a problem in improving learning media, including the modules in the explanation to students, already has many answers. The learning materials arranged in modules are integrated with the verses of the

Qur'an and then their interpretations are explained. The verses of the Qur'an explain a lot about science and humans are told to think about it. Warriors who fight on the battlefield in Islam are equal in value to fighters who struggle to seek knowledge. As contained in the words of the Prophet Muhammad in a hadith narrated from Anas bin Malik said, Rasulullah saw. Said, "In the hereafter, the ink of the scholars will be weighed against the blood of the martyrs. It turns out that the ink of the clergy is heavier than the blood of the martyrs." (H.R. Ibnu Najar). From the above hadith, it can be understood that there are 3 tasks of Muslims, namely first; studying Isla; second; practicing what is learned and third; conveying what he learned or what he got to other Muslims. This task is the duty of every individual Muslim, as the Prophet Muhammad said: "From 'Abdullah bin Amru, the Prophet saw. Said; "Convey by you (what you have obtained) from me even if only one verse of the Qur'an". (H.R. Bukhari).

One of the technological developments that can improve learning media is augmented reality (AR) technology. Augmented reality is a technology that can connect the real world with the virtual world in two or three dimensions projected in a real environment at the same time (Dunleavy et al., 2009; Mustaqim & Kurniawan, 2017; Peddie, 2017). Even though the internet is closely related to technology, augmented reality can operate even without an internet connection. By presenting video, text, graphics, and audio in student textbooks in real-time, this augmented reality is by the demands of the curriculum (Peddie, 2017). This study will describe the development of a physics module Based on Augmented Reality Integrated with Al-Quran Verses on Electricity Material.

METHOD

This type of research belongs to research and development, which is a research method that aims to develop products used in education and learning and validate them (Sugiyono, 2015). In this case, development research is used to develop augmented reality-based physics modules to increase the scientific literacy of class XII SMA/MA students. This study uses the 4-D learning system development model using

the stages according to Thiagarajan and Semmel (Sugiyono, 2015), which consist of define, design, development, and dissemination. The dissemination stage has not conducted because of some reasons. The type of data in this research consists of quantitative and qualitative data. Data was collected through validation sheets, interview guidelines, and questionnaires.

The first stage is the define stage. There are four steps which are front-end-analysis (to find the student's problem in their studies), learner analysis (to know the characteristic of the students), concept analysis (to analyze the material sources and syllabus), and specifying instructional objectives (to formulate the expected learning objectives). The next stage is the design stage. A prototype of the module based on augmented reality was prepared and design following media design by Susilana & Riyana (2009). The final stage conducted was the development stage. There are three steps in this stage i.e validation, practicality and effectiveness. Because of the limited time, the third step has not done yet.

The validation sheet aims to collect data about the validity of the developed augmented reality-based physics module. This activity is also accompanied by interviews with experts so that the resulting product is valid. Practicality data were obtained through questionnaires on the responses of students and subject teachers. The instrument used in this study was a questionnaire to test the quality of the module from the aspect of validity and practicality. All of these instruments were also validated by the validator before being used. The validators consist of media experts, physics experts, teacher, and experts of interpretation Al-Qur'an. For practicality, it was tested through a questionnaire filled out by one Physics teacher and 18 students in class XII MIA 1 SMA IBS Raudatul Jannah Payakumbuh, as test subjects.

RESULT AND DISCUSSION

This research is started by define stage. In this stage, front-end analysis is done to get the problem of the students of grade XII in their studies. This analysis found that students have difficulties of the electricity concept which is abstract to them. Based on characteristic of the

students, visual learning was easier to understand. Meanwhile, visual learning sources in their school especially electricity was still limited. Concept analysis showed that learning sources for the students only textbooks and did not align the material with several verses of the Qur'an as material integration as demand by local government's policy. Besides, syllabus also demand the students' competency through experiment but they have lack of time in doing experiment, so they need some technology based for doing this.

The design of augmented reality-based physics learning modules integrated with Al-Qur'an verses on direct current (DC) electricity and static electricity is carried out by collecting various materials related to DC electricity and static electricity. In addition to ensuring information about identity regarding a product that is in a class subject, complete with KD, learning objectives, titles, augmented reality applications, related verses of the Qur'an, as well as the process of making physics learning modules based on augmented reality integrated verses Al-Qur'an. After collecting materials related to augmented reality-based physics learning modules integrated with Al-Qur'an verses, making flowcharts on augmented reality-based physics learning modules integrated with Al-Qur'an verses on direct electric current (DC) material and class XII SMA/MA static electricity is a physics module that was developed in the form of a printed module in which there is AR and the integration of verses from the Qur'an. the integrated augmented reality-based physics learning module of Al-Qur'an verses is designed with an application technically making AR-based physics print modules designed with a supporting android application "Electricity AR" which can be downloaded through the play store using internet access. To design the background cover module, the application "Corel Draw X7" is used as an

image editing application. And for typing and merging, the application "Microsoft Word 2016" is used as a commonly used typing application. Final using the QR code to find the application download page and the problem-solving page using the blogger web.

The next stage is making a story board. Making a story board is done by grouping the materials that have been collected which contains descriptions containing writing and pictures explaining each plot in the flowchart. After that, collection of design objects or collection of charts such as in the form of material text, questions and answers according to the module design, making backgrounds and images. Then the programming part which consists of combining the module material with the AR application. This integration consists of a QR code that directs the user to the application download page and an AR marker that functions as a trigger for the AR model to appear. The finishing part is in the form of the process of trying to read the program on printed modules and the process of printing modules for later research. The appearance of the module shows in Figure 1.

After the integrated augmented reality-based physics learning module of Al-Qur'an verses is completed, validation and practicality is carried out on the module to determine the validity and practicality of the module. The following are the results and discussion obtained from the validity and practicality of the augmented reality-based physics module integrated with the verses of the Qur'an to increase the scientific literacy of class XII SMA/MA students on the subject matter of direct current (DC) electricity and static electricity that have been developed. Table 1. Shows the validation result of the module.



Figure 1. Product of the module in Augmented Reality

Table 1. The Results of the Validation of a Physics Module Based on Augmented Reality Integrated with Al-Quran Verses on Electricity

Validator	Aspect				Total
	Content	Presentation	Language	Graphics	
1	31	47	24	25	127
2	36	52	25	28	141
3	39	59	32	32	162
4	37	60	32	32	161
Amount	143	218	113	117	591
Maximum score	160	240	128	128	656
%	89.37	90.83	88.28	91.41	90.09
Description	very valid	very valid	very valid	very valid	very valid

Table 2. The Practicality Results of a Physics Module Based on Augmented Reality Integrated with Al-Quran Verses on Electricity

Aspect	Percentage (%)		Description
	Students	Teacher	
Ease of use	86.46	93.75	Very practical
Attractiveness	84.03	87.50	Very practical
Efficiency	86.11	91.67	Very practical

Validation is carried out using an assessment carried out by four validators who are experienced in their fields. The validation sheet used so that the AR-based physics module is integrated with verses from the Al Quran is assessed and given suggestions by the validator. The suggestions given by the validator are used for AR-based physics modules integrated with Al-Qur'an verses to be more valid. The validators consisted of three lecturers and one physics teacher. Module validation is seen from several aspects, namely module content, format, and language. The AR-based physics module integrated with verses of the Al Quran was made by the opinions of experts so that the physics module made is more valid. The validation sheet is adjusted according to the aspects of the opinion of the experts. The validation sheet is also adapted to the AR-based physics module integrated with Al-Qur'an verses (Chandra & Lizelwati, 2022; Muzakki et al., 2021). It contains module content, presentation, language, and graphics. the content aspect of the module has a validation value of 89.37% so in this aspect the module is very valid to use. In the presentation aspect, it has a value of 90.83% in this aspect the module is also very valid to use. And for language quality, it has a value of 88.28% in this aspect which is very valid to use. Finally, in the graphical aspect of the module, it also gets a value of 91.41 which is also very valid to use. The graph also shows that the graphical aspect is the aspect that gets the highest percentage, this indicates that the graphics in the module are very good. Overall the module has a value of 90.09% which means that the module is very valid to use in the learning process. The results obtained were the same as previous research by (Permana et al. (2019).

The next step was practicality step. Practicality is all the convenience that exists in evaluation instruments both in preparing, using,

obtaining results, and the ease of storing them (Sugiyono, 2015). Practicality refers to the attractiveness and ease of use during the learning process for teachers and students (Hanum et al., 2019). The instrument used in this step was a questionnaire that was given to a teacher and students. There are three aspects assessed in this questionnaire i.e ease of use, attractiveness and efficiency. These three aspects show the practicality of the module. The questionnaire was done to 18 students and a teacher. The result shows in Table 2. The table shows that all aspects get percentage of 80%. The highest percentage is from ease of use aspect (86.46% students, and 93.75% teacher). From this research we can conclude that the module was very practical

CONCLUSION

A physics module that integrates augmented reality and Quranic verses on electricity has been developed. The module was validated by experts in four areas, and the average score was 90.09%. This indicates that the module is very valid. The module was also evaluated by students and teachers, who gave it scores of 85.48% and 90.90%, respectively. This suggests that the module is very practical. In conclusion, the augmented reality module is very valid and practical. Further research is needed to determine its effectiveness for teaching electricity, and to develop similar modules for other subjects.

ACKNOWLEDGEMENT

We like to acknowledge the funding of umbrella research of Faculty Tarbiyah and Teacher Training and Leading Research Competitive Research the Institute for Research and Community Service (LPPM) UIN Mahmud Yunus Batusangkar.

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