

Development of An Electronic-Based Parabolic Motion Material Module

Ajeng Aprillia*, Ngadimin, and Agus Wahyuni

Pendidikan Fisika, FKIP Universitas Syiah Kuala, Indonesia

*ajengaprillia292@gmail.com

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Abstract

This study aims to produce an electronic-based parabolic motion material module that is suitable for use as teaching material. The research uses research and development methods (R&D) and 4-D models as development models. This study's subjects are x grade students at SMAN 8 Banda Aceh. The research instruments used are module assessments validated by experts and response questionnaires of teachers and students. Analyze data using a percentage formula. Data analysis of the module assessment sheet by experts involves two validators who conduct assessments in media and materials. The average percentage obtained in the media and material aspects is 74.6% and 89.5%, including decent and very decent. The average percentage obtained from the teacher and student response questionnaires was 83.6% and 85% and was included in the worthy or very good category. The study results can conclude that the electronic-based parabolic motion material module that has been developed is suitable for use as teaching material and is expected to develop the learning media in electronic-based modules further.

Keywords: Electronic Module; Model 4-D; Module; Parabolic Motion

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INTRODUCTION

The Directorate General of Primary and Secondary Education of the Ministry of National Education in 2003 stated that in the teaching materials, there are several characteristics, including self-instructional, self-contained, stand-alone, adaptive, and user-friendly. A teaching material must possess this characteristic to achieve the learning objectives optimally (Khulsum et al., 2019). There is also a major role that technology and communication have in increasing the effectiveness and efficiency of the entire learning process, involving the sophistication of technology to help improve the quality of learning and

shorten the time used to achieve learning goals, and to be able to improve the ability of teachers to supervise each student without reducing the quality of learning (Uno & Lamatenggo, 2022). One form of teaching material that involves technological sophistication is an electronic-based module, also known as an e-module.

Several previous studies have reported that using electronic-based modules makes it easier for students to understand the concept of the material and its application in everyday life, and it can be accessed easily and quickly (Suryani et al., 2020). Student learning outcomes can improve with interactive

electronic modules in the learning process (Sidiq & Najuah, 2020). Recent research (Puspita et al., 2021) states that e-modules are very good for independent learning. Adding videos to modules creates a good learning experience and improves student understanding.

However, electronic-based modules as supporting teaching materials that students can use independently are still rarely available in schools, so they still need to be solved in the learning process. Students still need help understanding the concept of the subject matter, and teachers have difficulty delivering several materials summarized in printed books with limited time, especially physics subjects, which are often seen as difficult and require a detailed discussion of each concept (Indah, 2016).

Based on an interview with a teacher of physics class X MIPA-3 SMAN 8 Banda Aceh, it was obtained that there is no electronic-based module that can be used as supporting teaching material. The declining interest in reading and the unavailability of supporting teaching materials are the reasons for developing modules suitable for use as supporting teaching materials.

Educational technology comes with a strong role, namely increasing the effectiveness and efficiency of the learning process, focused on innovative tools (Sugiarni, 2022). One of the innovative tools resulting from educational technology is the electronic module. Electronic-based modules are interactive learning activities based on Android. Learning using Android can stimulate students to be active in teaching and learning activities while increasing student learning motivation because of interest in using new media (Herawati & Muhtadi, 2018). The electronic module is considered very suitable for physics learning that requires interactive media to present material in an interesting and fun way, especially

parabolic motion material (Sudarsana et al., 2021).

Based on the description above, research was carried out with the title "Development of an Electronic-Based Parabolic Motion Material Module," which aimed to produce a feasible electronic module.

METHOD

The research uses research and development methods (R&D) and 4-D models as development models. (Define, Design, Development, Disseminate) which was adapted by Laili et al., 2019. The resulting development product is an electronic-based module. This study aims to produce an electronic-based parabolic motion material module suitable for use as supporting teaching materials. The population of this study was all students of grade X SMAN 8 Banda Aceh, and the sample of this study was students of grade X MIPA-3 SMAN 8 Banda Aceh, totalling 30 students. The research instrument includes a module assessment sheet to measure the feasibility of the module (Nurhafizah et al., 2015). Then a student response questionnaire will measure the module's practicality and convenience (Oktaviana et al., 2017).

The data used in this study is the feasibility of the module by experts, student responses, and teacher responses. Data analysis using qualitative descriptive analysis. The feasibility of the developed module is determined from the validation results using the percentage formula. The validation results are processed based on the equation using the module eligibility criteria (Mahyuddin et al., 2017).

Data was collected by distributing response questionnaires. Questionnaires are given after students study and learn to use electronic-based modules (Fitrianna et al., 2021). The purpose of giving response questionnaires to students and teachers is to gauge students' interest in the module after learning to use an

electronic-based module (Safitri et al., 2019). Using the questionnaire assessment criteria, the test results were then analyzed based on the percentage equation (Imanda et al., 2018).

RESULT AND DISCUSSION

The development of electronic modules is carried out based on four stages of development, namely, define, design, develop, and disseminate. In the definition stage, the researcher analyzes the needs of students and teachers and learning materials. The analysis is carried out by direct observation and researchers' interviews with teachers and students.

Based on the analysis of the needs of students and teachers, it was determined that students still needed help understanding the subject matter, and teachers had difficulties conveying several materials summarized in printed books with limited time. Supporting students and teachers need teaching materials to be an alternative to maximizing the learning process (Laili & Ganefri, 2019). Developing electronic-based modules is deemed necessary given the unavailability of electronic modules that help teachers teach physics lessons.

The material used in this study is parabolic motion material with KD 3.5, namely analyzing parabolic motion using vectors, their physical meanings and their applications in everyday life. Interactive electronic modules can make it easier for students to understand the concept of parabolic motion material both with text and audiovisual (Septora, 2017).

At the design stage, the module is developed to be more interactive, where researchers develop changes in the background, writing, and additional features to support the learning process using electronic-based modules. The designs used by the researchers include background design, colour selection, writing, illustrations/pictures, learning

videos, and using Google forms in collecting evaluation questions.

In the development stage, the electronic module is developed according to the design design. The development of the preparation of the module is carried out starting from the cover, background, colour selection, writing, illustrations, pictures, and the addition of learning videos, as well as the use of Google forms in collecting evaluation questions. Furthermore, the modules are arranged in a format designed on each sheet (Indah, 2016). The development of module preparation is carried out using the Book creator application website as a forum for producing interactive teaching materials or modules (Zulhijjah, 2021).

The modules that have been developed are then tested for feasibility by experts in their fields (Hendri et al., 2021). The module feasibility test is divided into two aspects of the assessment: the media and material aspects. The media feasibility aspect consists of six assessment aspects: self-instructional, self-contained, stand-alone, adaptive, user-friendly, and display. The media feasibility aspect obtained a score of 86 from a maximum score of 110 with an average percentage of 74.6% and was categorized as feasible; with details of self-instruction, namely the module developed was able to make students learn themselves, obtained a percentage of 80% with the assessment category of decent, on the characteristics of self-contained, namely the module contains all competencies and sub-competencies, obtained a percentage of 90% with the assessment category of very feasible, on stand alone characteristics, namely the module developed does not depend on other teaching materials, obtained a percentage of 60% with the assessment category of fairly decent, on the adaptive characteristics of the module. It has a high adaptive power to the development

of science and technology, obtained a percentage of 60% with the assessment category of fairly decent, on user-friendly characteristics, namely the instructions used are helpful, getting a percentage of 80% with a decent category, and on display characteristics, namely module design and ease of use. Concerning module usage, image and video quality obtained a percentage of 78% with a decent category.

The feasibility aspect of the material consists of 2 assessments, namely, the feasibility of the content and the feasibility of the presentation. The feasibility aspect of the material obtained a score of 98 out of a maximum score of 110, with an average percentage of 89.5%. It was categorized as very feasible, while the details on the feasibility of the content with indicators of material suitability with basic competence (KD) specifications and up-to-date material obtained a percentage of 88% with the assessment category of very feasible. On the feasibility of presentation with presentation technique indicators and presentation support, it gets a percentage of 91% with a very decent assessment category.

These results show that the electronic-based parabolic motion material module is feasible and can be distributed. This follows relevant research (Pratiwi, 2017) statement that the module can be feasible if it obtains a percentage of 61%. The results of this study are also supported by research that developed an Android-Based Interactive E-Module, stating that the developed e-module is feasible and meets the criteria for learning media (Sidiq & Najuah, 2020).

Furthermore, a module revision is carried out based on suggestions and input by the validator; the reference source must contain all sources, including videos and format corrections, that follow the electronic module directions and are tested.

In the dissemination stage, the electronic-based module developed and revised by the researcher is given to class X MIPA-3 students and teachers at SMAN 8 Banda Aceh. The initial step taken was to introduce and approach students. Then, by sending the module link to student representatives and distributing it in the class WhatsApp group, the researcher gave directions covering the module's content, how to use the module, and how to take advantage of the features presented in the module. Electronic based. Student response questionnaires were collected after students studied and studied using electronic-based modules.

The teacher's response questionnaire consists of aspects of a material assessment, media, and module learning. The teacher's response questionnaire gets a 90 out of a maximum score of 110 with an average percentage of 83.6% and is categorized as very good. As for the details of the material aspects with indicators of learning material in the module, the use of language and practice questions in the module received a very good rating category with a percentage of 83.6%; on the media aspect with module page design indicators, text on the module, the use of images and videos, and the ease of operation of the module received a very decent rating category with a percentage of 83.6%. In the learning aspect of the module, with indicators of the teacher's expectations and the module's usefulness in learning, the assessment category is feasible with a percentage of 84%. This is in line with relevant research (Hadijah, 2018) that the teacher's positive response is obtained from the assessment of each media and material indicator with a relatively high percentage.

Student response questionnaires consist of an assessment of the material, media, and learning modules. The recapitulation of student response questionnaire results is shown in Table 1.

Tabel 1 Recapitulation of Student Response Questionnaire Results

Aspect evaluation	Level of Assessment Validity (%)	Criteria
Theory	85	Very well
Media	84	Very well
Module learning	85	Very well
Average percentage	84.6 %	
Criteria	Very well	

Student response questionnaires consist of aspects of a material assessment, media, and module learning. The student response questionnaire obtained an average percentage of 84.6% with very good criteria. As for the details on the aspect of a material assessment, there are three indicators: learning material in the module, use of language, and practice questions in the module. The assessment of these three indicators obtains a percentage of 85% with excellent criteria. From this data, it can be interpreted that students are enthusiastic and enthusiastic about using electronic-based modules in teaching and learning activities because the material is explained in simple and easy-to-understand language. This is in line with Puspita's opinion (2019) that a module is the result of development and must be easily understood by the user.

In the media assessment aspect, there are five indicators, namely the module page design, the text on the module, the use of images on the module, the use of video on the module, and the ease of operation. The assessment of these five indicators obtained a percentage of 84% with excellent criteria. From this data, it can be interpreted that students are enthusiastic and enthusiastic about using media in electronic-based modules that are easy to access. This is in line with Ramadhan and Murtinugraha (2020) opinion that a module must pay attention

to the ease of access or use (Murtinugraha & Ramadhan, 2020).

In the assessment aspect of module learning, there are two indicators: the suitability of the medium with student expectations and the usefulness of the module in learning. The assessment of these two indicators obtained a percentage of 85% with very good criteria. From this data, it can be interpreted that students are enthusiastic and enthusiastic about using electronic-based modules in teaching and learning activities because they provide new learning experiences. This is in line with relevant research (Hasanah & Rodi'ah, 2021) that teaching materials developed using technology can provide new learning experiences for students.

In line with the relevant research (Simanjuntak & Imelda, 2018), the positive response of students and teachers, along with the validation of the appropriate development results module, states that the module is feasible to be used as teaching material.

CONCLUSION

Based on the results of this study, an electronic-based module has been produced, which is designed using a website book creator application. The results of expert validation and user responses indicate that the electronic-based parabolic motion material module produced is feasible to be used as teaching material for teachers, students, and other users.

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