DEVELOPMENT OF ELECTRONIC MODULES USING PROFESSIONAL PDF FLIP ON MEASUREMENT MATERIALS

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Abstract :
This study aimed to determine the results of the development of electronic modules on measurement material and student's perceptions of the product being developed. The type of research conducted is R&D research with the development model selected, namely the 4-D development model. The research samples used were two expert lecturers as product assessors and 25 students as samples whose perceptions were measured. The sampling technique used was purposive sampling, with the instruments used being a student needs questionnaire, material validation, media validation, and student perceptions. The data analysis for the questionnaire is descriptive statistics, while the instrument data validation uses reliability and validity tests. The results of the data obtained indicate that the product is feasible to use and can be accessed using a mobile phone via the link provided by the author, while the perception of the electronic module obtained shows a very good perception. Thus, this module is considered feasible and ready to be used to assist students in understanding.

Keywords: Electronic Module; Measurement; Perception

INTRODUCTION

In education, the term learning media is commonplace and often heard by teachers and parties related to educational institutions (Ntobuo et al., 2018). It's like a knight carrying a sword and shield, and this learning media can be used as a weapon that can be effective or ineffective in achieving learning goals for the students being taught (Mustadi et al., 2022). By definition, learning media is an intermediary tool between educators and students in learning that can connect, provide information, and channel messages to create an effective and efficient learning process (Zuchdi & Nurhadi, 2019; Safaruddin et al., 2020). Learning media results in communication between educators and students in the learning process. If the learning process does not use media, then the learning process will not occur. One example of instructional media often encountered is an electronic module (e-module).

Electronic modules (e-modules) are the latest technological innovations from traditional printed modules that have existed for a long time (Maison et al., 2022). But along with the development of technology, learning must be flexible and easy to use whenever and wherever. Therefore, it is necessary to streamline the functions of some traditional media, such as print modules,

to adapt to the rapid development of technology (Purushothaman, 2018; Logan et al., 2021). The electronic module has several advantages compared to traditional modules, namely, access is easy to use, inexpensive, and features that print modules cannot. Of course, when using electronic modules, you need software that can configure print modules to become electronic modules, one of which is Flip PDF Professional.

Several types of software can make electronic modules, but for this discussion, the software chosen is Flip PDF Professional (Nora & Sulistyowati, 2022). Besides being able to convert PDF files into ePUb (electronic publications), this software has advantages over similar software, such as; There are quiz features and 3D model backgrounds, and of course, it's free. An online publication for this software can be very easy and interesting because it provides several publication modes such as .exe, HTML, or .apps. Of course, for this research, researchers focused on making electronic modules that can be accessed using smartphones; therefore, researchers published research in HTML format (Tanti et al., 2022). Then the material discussed is the measurement material.

This research is research that is similar to research development. Some research related to research conducted by the author includes research from Nurhidayah et al. (2018), which examines physics courses but focuses on the discussion on the use of learning models. Other research from Dayati & Elisa (2021) has the same topic being studied, but more about the difficulties of learning these subjects in online lectures. While researching, Wilujeng & Permatasari (2019) developed textbooks that are integrated with character values; from this study, the striking difference is the product developed by the author, namely the electronic module. Based on the description that has been explained, the purpose of this research is; (1) to determine the results of the development of electronic measurement modules and (2) to determine students' perceptions of electronic modules that have been developed previously.

RESEARCH METHOD

The type of research used in this research is R&D (research and development) with the development model chosen is the 4-D development model from Thiagarajan. The 4-D development model itself consists of four stages namely; analysis (define), design (design), development (design), and disseminate (dissemination).

The sampling technique used was purposive sampling with the samples used in this study were two lecturers as product assessors and 25 samples of SMA N 1 Banyuasin III as product trials in the study. There are four instruments used themselves, namely the student needs questionnaire, the media and material validation questionnaire, and the student perception questionnaire. Before data collection was carried out, the instrument had been validated and there was one modified instrument, namely the student perception questionnaire. Then for this instrument the categorization range is determined which shows the achievement of the research objectives, while for the range of student needs questionnaires it can be shown in table 1.

Table 1. Range of categories of student needs for electronic modules

Interval	Student need level
25.21 – 30.00	Very needed
20.05 – 25.20	Needed
15.61 – 20.04	Enough
10.81 – 15.60	Not needed
6.00 – 10.80	Really not needed

Then for other instruments, the indicator grid and its category range can be referred to in table 2.

Table 2. Range of data collection instrument categories

Variable	Indicator	Interval	Criteria
Material validation	Material	58.51 – 72.00	Very good
	Learning	45.01 – 58.50	Good
	language	31.51 – 45.00	Not good
		18.00 – 31.50	Not very good
Media validation	Display screen design	58.51 – 72.00	Very good
	Ease of use	45.01 – 58.50	Good
	Benefits	31.51 – 45.00	Not good
	graphics	18.00 – 31.50	Not very good
Student perception	Content eligibility	55. 26 – 68.00	Very good
	Language	42.51 – 55.25	Good
	Benefits	29.76 – 42.50	Not good
	graphics	17.00 – 29.75	Not very good

The main data analysis used in this research is descriptive statistics, while the validation of students' perception instruments uses reliability tests and validity tests. The research procedure carried out begins with problem analysis, design, development, data collection, dissemination, and research conclusions.

RESULTS AND DISCUSSION

The results of this study began with analyzing the needs of the field or sample studied, this analysis was carried out by distributing student needs questionnaires whose results can be seen in table 3.

Table 3. Descriptive statistical results for the level of student needs

Interval	Student need level	F	Mean	Med	Max	Min
25.21 – 30.00	Very needed	7	22.4	22.5	30	16
20.05 – 25.20	Needed	13				
15.61 – 20.04	Enough	10				
10.81 – 15.60	Not needed	0				
6.00 – 10.80	Really not needed	0				

The results of the student needs questionnaire show that the average sample really needs the measurement e-module. If the data supports the initial analysis carried out, then the next stage can be continued, namely the selection of research instruments. The media and material validation instruments were adopted, while the student perception questionnaire was modified to the instrument, the Cronbach alpha value was 0.743 by testing the validity of each statement, which can be seen in table 4.

Table 4. Validity test results

Assessment Aspect	Item statement	R_{table}	R_{hitung}	Category
Content eligibility	1	0.321	0.668	Valid
	2	0.321	0.494	Valid
	3	0.321	0.574	Valid
	4	0.321	0.515	Valid
	5	0.321	0.493	Valid
	6	0.321	0.263	Tidak valid
Language	7	0.321	0.576	Valid
	8	0.321	0.291	Valid
	9	0.321	0.398	Valid
	10	0.321	0.291	Tidak valid
Benefits	11	0.321	0.494	Valid

Assessment Aspect	Item statement	R_{table}	R_{hitung}	Category
	12	0.321	0.574	Valid
	13	0.321	0.515	Valid
	14	0.321	0.493	Valid
	15	0.321	0.668	Valid
Graphics	16	0.321	0.576	Valid
	17	0.321	0.398	Valid
	18	0.321	0.665	Valid
	19	0.321	0.665	Valid
	20	0.321	0.494	Valid

Then the product validation results are divided into two aspects, namely material expert validation and media expert validation. The results of the validation can be seen as follows.

Table 5. Electronic module validation results

Variable	Stage 1	Stage 2	Stage 3
Material expert	44 (Not good)	57 (Good)	66 (Very Good)
Media expert	43 (Not good)	56 (Good)	64 (Very Good)

The results of the validation show that the product is feasible in terms of material and media, after the module is suitable for use, the next step is to conduct a product trial to see how the sample or field views it. The results of the field trials can be seen in table 6.

Table 6. Descriptive statistical results of field trials

Interval	Rentang	F	Mean	Median	Modus	Max	Min
55. 26 – 68.00	Sangat baik	23	60.8	60.00	59.00	68	51
42.51 – 55.25	Baik	2					
29.76 – 42.50	Tidak baik	0					
17.00 – 29.75	Sangat tidak baik	0					

From table 6, as many as 25 samples of students on average thought the e-modules used had met their needs and there were positive comments about the electronic modules that were made. In addition, of the 25 samples, 23 students were in the very good category and the remaining 2 students were in the good category.

Discussion The electronic module developed is based on stages that refer to the 4-D development model from Tiagarajan. The initial stages were analyzing the problem with literature analysis and distributing student needs questionnaires. The next stage is to design, where the results of this stage are prototype electronic modules that are ready to be assessed by experts. In the development stage, the electronic module is assessed so that it can be said to be feasible for testing.

Products that are feasible then tested on 25 students. The results show a positive and very good perception of the electronic module being developed, this data is similar to research from Kurniawan & Piyana (2019) but with a different e-module topic. With these positive results, electronic modules can be widely used so that they can be of benefit to students in their lectures.

The developed electronic module can be accessed using a link that has been distributed via social media. Its use is enough to click on the link provided, and users can access all the features and materials that have been made by the author (Yani et al., 2022). The advantages of self-made electronic modules are very suitable for today's generation of students who need something that is easy, instant and flexible to use (Asrial et al., 2022). Apart from that, the advantage that can cover the shortcomings of traditional printing modules is that there is no need for significant maintenance because the products made are not physical but virtual. Access is also free and does not require printing like traditional modules. This of course indirectly supports greening the environment or reducing paper waste in the world.

There are several positive impacts that can be drawn from this research. The short-term impact is that students can be helped in understanding measurement material which is of course in Indonesian which has been explained in detail accompanied by sample questions, quizzes, videos, along with competency tests. The medium-term impact of this research is that it can help accredit study programs by helping students not to repeat courses continuously. Meanwhile, the long-term impact is that it can be used as a research reference for future generations who plan to research similar topics (Asih et al., 2022).

This research is a development of similar research with several additions and modifications in several aspects. Research from Astalini et al., (2021) examines a similar material, namely measurement, but focuses more on implementing the product being developed. Then research from Rohr et al., (2022) also developed an electronic module, but there is a difference, namely the field of scientific study is biology. Meanwhile research from Erna & Anwar (2021) combines electronic modules on misconceptions and relevant learning applications.

No research is perfect, this research itself has several shortcomings compared to previous research that examines similar matters. The weakness of this research is that the modules developed are only seen from the perceptions of the students and do not measure other domains such as critical thinking skills or student attitudes. The sample is also still quite small, namely one class, a larger sample is needed so that differences in perceptions or influences can be seen if other additional variables are added in the future. Therefore, the researcher suggests for further research to add more cognitive or affective variables so that the research data and its analysis can be even more varied.

CONCLUSION

The development results obtained are in the form of links that are distributed via social media to users who want to access, access can be done using a telephone, laptop or computer. Then for student perceptions it shows that there is a very good perception of the electronic module that has been developed, this good perception can be used as a benchmark for how satisfied the sample or field is with the electronic module measuring material.

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