Development of an E-Module Based on a Guided Inquiry Learning Model in Natural Science Subjects in Elementary Schools

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Abstract: The research was carried out based on facts found in the field regarding the science and science learning process which still lacks teaching materials. The lack of teaching materials or media used in learning causes learning in class to become less active. Apart from that, teachers also do not use learning models that improve students' ability to think critically, which results in students being less active in class. This research uses the ADDIE Model which consists of five steps, namely analysis, design, development, implementation and evaluation. The results obtained from this research are E-Modules based on the Guided Inquiry Learning Model which are valid, practical and effective. The product validity results obtained from three experts, namely media experts, material experts and language experts respectively were 90.38 %; 91.67%; and 100% with a very valid category. In terms of product practicality, the E-Module is in the very practical category with teacher response practicality results of 88.33 % and student response practicality results of 88.35%. The effectiveness results obtained in this research also show that the product developed is very effective for use in the learning process.

Keywords: Development; E-Module; Guided Inquiry Learning Model; Science.

Introduction

Education is a very important process in the formation of human personality to increase knowledge, skills and strengthen personality as well as foster a spirit of nationalism so that they can develop themselves and assume greater responsibility for the progress of their country (Kurniawan, 2015). The Indonesian government is currently also making improvements in the world of education, one of which is by making changes to the curriculum. The Ministry of Education and Culture is currently planning a curriculum change from the 2013 Curriculum to the Independent Curriculum. The implementation of the Independent Curriculum influences learning materials in schools, especially at the elementary school level. There is a reduction in material as well as several changes to subjects. One of them is in science and social studies subjects, both of which are

combined and known as science (Sugih et al., 2023). To optimize the science and science learning process, teachers need to use an appropriate learning model, tool, media or teaching materials so that they can help the learning process.

The use of teaching materials in the learning process can help students master lessons (Kosasih, 2021). One form of teaching material is E-Module. E-Module is a display of information in book format that is presented electronically using a hard disk, diskette, CD or flash disk and can be read using a computer or electronic book reader (Wijayanto, 2017). Apart from that, another opinion says that E-Modules are educational materials that can be used in the classroom which are provided in digital form and equipped with simulations along with text, images, or both (Herawati & Muhtadi, 2018) .

E-Modules as a teaching material can be combined with the Guided Inquiry learning model, thus forming

an E-Module based on the Guided Inquiry Learning Model. The steps for Guided Inquiry learning (Sanjaya, 2010) are conducting orientation, formulating problems, making hypotheses, collecting data, testing hypotheses and formulating conclusions.

Based on initial observations and interviews with science and science subject teachers in elementary schools, it was discovered that electronic teaching materials had not been used in the learning process, students learned only by reading printed books. This results in students feeling bored and not focused on the material being presented. In the end, it affects the learning outcomes of students who have not achieved the expected learning outcomes.

Due to this problem, the researcher conducted a study entitled Development of an E-Module based on the Guided Inquiry Learning Model in Natural Science Subjects in Elementary Schools. This e-Module was developed using the Flip PDF Professional application as the main application and several other supporting applications. This research is also supported by research conducted by (Safarina & Andromeda, 2022) proving that the use of E-Modules based on the Guided Inquiry Learning Model is effective in the learning process.

Method

The type of research used is development research or known as Research and Development (R&D). Research and development is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2018) . Development research is also referred to as actions taken to produce new products or improve existing products. (Nana Syaodih Sukmadinata, 2015).

The development model used in this development is the ADDIE Model. ADDIE is an abbreviation for Analysis, Design, Development, Implementation, and Evaluations. The stages or steps of ADDIE development research in this research are as follows:
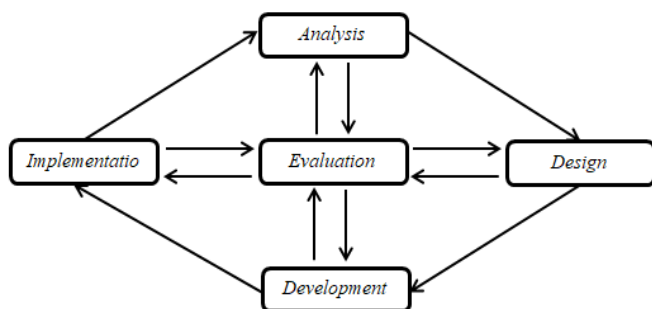

Figure 1: ADDIE Development Model

The ADDIE model consists of 5 stages, namely: (1) Analysis Stage, which is the beginning of creating a program or teaching material which consists of curriculum analysis, teaching material analysis, student analysis and needs analysis. (2) Design Stage, namely to design the E-Module to suit the specified material. This stage begins with creating *a storyboard*, *flowchart*, and compiling the materials needed to create an E-Module. (3) Development Stage, namely all materials and supporting aspects that have been prepared are combined or put together into an E-Module product using the Flip PDF Professional application so that an E-Module is formed. Then the product is validated by an expert validator in the field. (4) Implementation, namely the implementation of the E-Module based on the Guided Inquiry Learning Model in the learning process. Learning uses development findings to assess the impact on the quality of learning. At this implementation stage, the practicality and effectiveness of the product being developed is tested. (5) Evaluation stage, namely to determine the success of product development objectives and obtain data about what can help students achieve good learning outcomes.

The data collection methods in this research are: (1) Documentation, namely in the form of writing, drawings or someone's monumental works. (2) Questionnaire sheet or questionnaire, namely a number of written questions used to obtain information from respondents (Arikunto, 2014) . (3) Interview, namely the process of obtaining information directly to describe and explain a particular situation and condition.

The data obtained during the research was analyzed. Validation test analysis uses a 1-4 Likert scale arranged in positive categories. Then the validity value is categorized on a scale of 0%-100%. The same thing is also done at the practicality stage. Analysis of effectiveness tests is carried out by looking at student learning outcomes and student learning activities in class. All observation points include indicators regarding students' affective and psychomotor competencies. After analysis, assessment criteria will be obtained according to the percentage obtained.

Results and Discussion

This research produces a product in the form of an E-Module based on the Guided Inquiry Development Learning Model. This e-Module can be accessed using a laptop, computer or *smartphone*. E-Module is a technology-based module which has the advantage of being interactive, making navigation easier, allowing the display of images, audio, video and animation as well as interactive quizzes (Putra & Musril, 2022) .

The development of this E-Module went through a development process using the ADDIE Model which started with the analysis stage. The analysis stage consists of curriculum analysis, teaching material

analysis, student analysis and needs analysis. This analysis stage was carried out with the aim that the product developed in this research was appropriate and on target and could be used well.

The second ADDIE Model stage is the design *stage*. The steps taken are to determine the design of the content or material where the material presented in this E-Module is about Changing Forms of Energy. The selection of this material is based on a needs analysis that has been carried out previously. After that is determining the display design. The E-Module display was created using several applications such as the *Flip PDF Professional application*, *Microsoft Office Word*, *Canva* , *Capcut* and *Sparkol Videoscribe* . In this design stage, *a flowchart* and *storyboard are also created* for the E-Module being developed.

The next stage is the development stage. At this stage, all the materials that have been designed are combined into an E-Module using the *Flip PDF Professional application*. After the product becomes an E-Module, validation is then carried out. (Akker, 1999) explains that validity is related to two main things, namely: (1) Validity is measured by how well the resulting design is supported by strong theoretical rationale (content validity) and (2) How well the various components are related to each other (construct validity). Validation is carried out by involving expert lecturers in their fields. The validation of the E-Module was assessed by three experts, namely media experts, material experts and language experts. The assessment of the E-Module is carried out by expert lecturers who have competence in their field (Purwanto et al., 2020) . Validators assess the validity of the media, material and language aspects of the E-Module being developed. From the media aspect, E-Modul gets a very valid category. This can be seen in terms of the use of clear and attractive elements of text, color, images, video, animation and musical instruments. (Lastri, 2023) said that with the E-Module students will understand the material better because the learning process is not just about reading, but using several methods supported by the E-Module. In line with previous research conducted by (Nurmilah et al., 2023) which stated that the E-Module developed received a very valid category because the E-Module has an attractive appearance and is easy to use in the learning process. Validation was carried out using a validation questionnaire which had also previously been validated by instrument experts.

Validation Test Results

The product validation results in this research were obtained from 3 validators, namely media validator, material validator and language validator. The recapitulation of the E-Module validation based on the

Guided Inquiry Learning Model can be seen in the Table 1.

Table 1. Recapitulation of E-Module Validation Results

Validation Type	Number of Indicators	Number of Values	Percentage	Category
Media	13	47	93.38	Very Valid
Material	12	44	91.67	Very Valid
Language	8	32	100	Very Valid

Referring to the validity category of a product, the E-Module validation results are included in the "Very Valid" category. The results of the media, material and language validation analysis of this E-Module can be seen in the Figure 2.
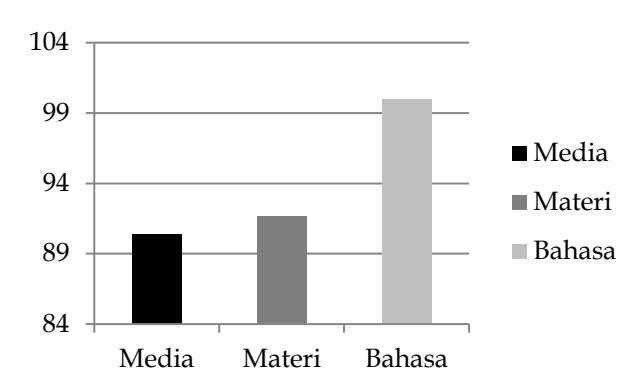

Figure 2. Graph of summary of validity results

The next stage is the implementation stage. At this implementation stage, the product that has been developed is tested on elementary school students. The learning process using the E-Module based on the Guided Inquiry Learning Model was attended by 20 elementary school students. After students carry out the learning process using an E-Module based on the Guided Inquiry Learning Model, students take a final test on the material presented to be able to see the level of students' understanding. The final test is carried out in writing by answering the questions provided and then from the results the results will be obtained for processing the data.

The final stage is the evaluation stage, namely evaluating the results of product practicality and effectiveness tests. Practicality is the usability of learning media or teaching materials that have been developed (Yanto, 2019) . The practicality test was carried out with two respondents, namely teachers and students. Respondents consisted of one teacher and 18 students who took part in science learning using the E-Module based on the Guided Inquiry Learning Model.

Practicality Test Results

Table 2. Recapitulation of E-Module Practicality Results

Respondent	Percentage	Category
Teacher	88.33%	Very Practical
Student	88.35%	Very Practical

Based on the results of practicality tests carried out by teachers and students on the E-Module based on the Guided Inquiry Learning Model in the Social Sciences subject, it was found that the E-Module was very practical to use in the learning process. The results of the practicality analysis can be seen in Figure 3.
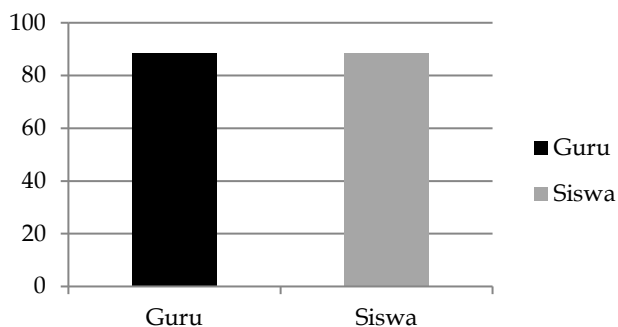

Figure 3. Graph of recapitulation of practical results

Based on the results of the E-Module practicality test based on the Guided Inquiry Learning Model, the E-Module is in the very practical category. The author also strengthens the research results with research conducted by (Damayanti & Perdana, 2023) where based on the results of teacher and student response questionnaires, the E-Module learning teaching materials are stated to be very interesting because of their attractive appearance, providing images, video, audio to clarify material or assignment, attracts students' attention, and makes it easier to understand the material

Effectiveness Test Results
The results of the effectiveness test were obtained from learning outcomes and observations of student activities. The existence of the E-Module is effective in supporting the teacher's role as a source of information for students and increasing students' interest in learning (Karnando et al., 2021).

a. Learning outcomes
Student learning outcomes are obtained through knowledge test results by conducting tests on students. The average learning outcomes of students after using the E-Module based on the Guided Inquiry Learning Model in Science Subjects is 90.61 in the very good category. The data obtained also calculated the gain score by comparing the students' pre-test and post-test scores. The results obtained were 0.81 in the "High" category (N-gain ≥ 0.7). The increase in the average post-test score shows that in general the E-Module based on the Guided Inquiry Learning Model is effective in improving the learning outcomes of students in science and science subjects after being used in the learning process.

b. Student Learning Activities
Student learning activities observed in this research included four activities, namely visual activities, motor activities, listening activities, and emotional activities. The recapitulation of student activity results is as Tabel 3.

Table 3. Recapitulation of Student Learning Activity Results

Aspect	Results	Category
Visual Activities	93.75	Very good
Listening Activities	91.67	Very good
Motor Activities	100	Very good
Emotional Activities	93.75	Very good

The results of this research are in line with research conducted by (Asda & Andromeda, 2021) which states that the use of E-Modules in the learning process can improve learning outcomes and student learning activities. Other research also states that the use of E-Modules in learning is effective as seen from the significant differences in learning outcomes after students use E-Modules in learning (Mutmainnah et al., 2021) . So it can be concluded that the use of E-Modules based on the Guided Inquiry Learning Model has a positive effect on learning activities and is able to improve student learning outcomes.

Conclusion

This development research was carried out to produce an E-Module based on the Guided Inquiry Learning Model which can be used in the learning process. The E-Module development process based on the Guided Inquiry Learning Model uses the ADDIE Development Model. The results of the validity, practicality and effectiveness of the E-Module developed are very valid, very practical and very effective for use in the learning process.

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