

THE DEVELOPMENT OF E-MODULE BASED ON DISCOVERY LEARNING IN THEME 5 AT GRADE IV ELEMENTARY SCHOOL

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Abstract: The research is attracted by students' motivation to participate in learning. They only like using printed book materials and worksheets in schools through reading assignments and doing exercises in the book. It is developed by Discovery Learning-based e-modules in integrated thematic learning. It applies the ADDIE model. Data collection techniques use interview lists, validation sheets, questionnaires, and documentation. Data analysis techniques use descriptive techniques to describe validity, practicality, and effectiveness. The results showed that from the E-module feasibility test, the lecturers were subject matter experts, language expert lecturers, media/design expert lecturers, and one teacher. Based on the validation of material experts, it is obtained an average total score of 97% or classified as very valid. Then, the next validation shows valid criteria with an average score of 100% linguists. Design validation obtained a total average score of 95%, 94%, and an average score of 80%. One teacher tested the practicality of the E-module with a score of 98%. The student response test conducted on 13 grade IV students obtained a value with a proportion of 97%. E-modules in Discovery Learning-based thematic learning include features that are very practical or very feasible to use.

Keywords: E-module, Discovery Learning, Elementary School

INTRODUCTION

In the 21st century, technology is also progressing. Technological developments have penetrated widely to affect various fields and even education. Technology is important in implementing quality learning that solves learning problems to achieve better learning goals (Dinata & Zainul, 2020). A good education will be achieved by optimally connecting all components of education. 21st-century education is knowledge-century education (Rifa, 2021). The century in which information is widely spread, and technology develops. Students must possess competencies in 21st-century education are Critical Thinking and Problem Solving, Creativity, Communication Skills, and the ability to work collaboratively. According to Rahayu et al. (2019), the goal that must be achieved in education 21 is that students can seek knowledge by finding and finding solutions solving problems, and here only as facilitators in learning activities.

Implementing the 2013 curriculum in elementary schools uses integrated thematic learning with a scientific approach (Setyaningsih & S, 2020). Thematic integrated learning combines several subjects connected by a theme (Sari et al., 2018);(Hidayati, 2017). Program components include performance objectives, learning materials, and supplies, tactics and methods, and estimate as an estimate tool (Rohman, 2018). Subjects or teaching materials for the 2013 program follow integrated thematic learning. These teaching materials must be arranged systematically so that teachers and students can apply them in implementing a class while learning (Weriyaniti et al., 2020).

Examining these phenomena, the researcher observed SD Negeri 16 Sitiung on June 1, 2020, and SD Negeri 06 Sitiung on June 2, 2020, during integrated thematic learning in class IV. The researcher used observation sheets and distributed needs analysis questionnaires to teachers and students during the observation. The use of this instrument is intended as a form of preliminary study material for researchers. Another thing that emerged from the interview results was that the teacher struggled to integrate the material. Schools then learn to use textbooks and worksheets simply by reading assignments and doing exercises in print books and worksheets. Therefore, learning in class is often monotonous, resulting in decreased student interest and using teaching materials that are up to date and technology that has never been applied before.

Electronic modules are self-contained learning materials that contain animations, videos, images, and sounds in electronic form and are linked together to make learning more interactive (Kemendikbud, 2017). Electronic modules are based on modules where the advantages compared to printed modules are interactive, easy to navigate, and allow the display of images, video, audio, and animation. They are equipped with formative quizzes/tests enabling immediate feedback (Suarsana & Mahayukti, 2013). Electronic modules are arranged systematically in more learning units to

achieve certain goals presented in an electronic format that includes animation, video, images, audio, and navigation, making them more interactive with the program (Pajr et al., 2017). Using e-modules as teaching materials with concepts in electronic format should replace books or printed materials without reducing their function as a source of information for students (Anggraini et al., 2017);(Ambarita, 2019). The important role of the electronic module in activities is to help the teacher explain the material (Pramana et al., 2020). In addition to making it easier for children to explain the material, electronic modules can influence them so that they are well-planned, independent, thorough, and produce clear results (Rokhmania & Kustijono, 2017).

The researchers can analyze whether the electronic modules can be used as teaching materials for comprehensive subject learning in primary schools. This is also supported by the statement by Syahrial et al. (2019). It has been verified that this particular electronic module can significantly enhance students' perception, interest, and motivation during the education process. Numerous previous studies and research analyses have supported this conclusion. First, the research output includes the study conducted by Nopiani et al. (2021) Entitled Electronics Module Interactive Topic Learning Topic 6 Subtopic 2 My Big Dreams. This study was a research and development study conducted in Class IV SD, and the product developed was an E-modulus. The results of this study show that the developed Young's modulus is valid and practical for use in Topic 6 Subtopic 2. My lofty ideal is the second grade of elementary school.

In addition, a study conducted by Violadini & Mustika (2021) found that the e-module as a product being developed has a level of validity categorized as very valid. Based on this information, it can be concluded that the developed e-module is feasible and can be used during integrated thematic learning in elementary schools. One of the things that can improve learning to improve student learning outcomes is the use of learning models (Muhlis, 2018). The use of learning models whose implementation is adapted to the circumstances of this class can further encourage students to feel interested in participating in the process (Nurhadiyati et al., 2021). In addition, learning will be more effective and efficient if the teacher uses a learning model whose implementation is adjusted to the characteristics/qualifications of the subject matter, situation, and student learning environment (Desvianti et al., 2020).

Then, some studies support using the Discovery Learning Model in elementary schools. Among them, research conducted by Setianingrum & Wardani (2018) with the results of this research stating that the application of the Discovery Learning model can improve integrated thematic learning outcomes of students with themes of natural events in grade I at SD Negeri Blotongan 01 Salatiga. This can be seen in the contrast of the learning outcomes for the Natural Events theme in the

completion percentages (i.e., 40.90%: 81.82%) for the first and second cycles. Furthermore, in research that has been tested by Watipah (2019), the results of parsing the data using t obtained tcount => ttable at the level of 0.05. It means tcount > ttable, so it is accepted. Thus, the discovery model significantly influences student learning outcomes in integrated topic learning for grade IV elementary schools.

Based on the meaning of the problem and the information above, the researcher hopes that an effort can be made to find a solution to overcome the problems identified in the field. This effort also follows the challenges and demands of learning in the 21st century. Therefore, the researcher wishes to conduct research titled "Development of Discovery Learning-Based E-Modules in Integrated Thematic Learning in Grade IV SD."

METHODS

This study used the Research and Development (R&D) method. This method intends to create a product, which will later be tested to determine its effectiveness (Sugiyono, 2020). The purpose of R&D research is to create products and conduct tests on the products' effectiveness. The output of product development can be in the form of software or hardware (Richey, 2014). In this study, the product developed was an e-module based on the Discovery Learning model in integrated thematic learning in grade IV SD.

Development Research Model

In this study, the development model used is the ADDIE model. ADDIE stands for five process stages: Analyze, Design, Develop, Implement, and Evaluate. The ADDIE model can be used in various forms of product development, one of which is learning tools. This ADDIE design development model can be illustrated in the following diagram:

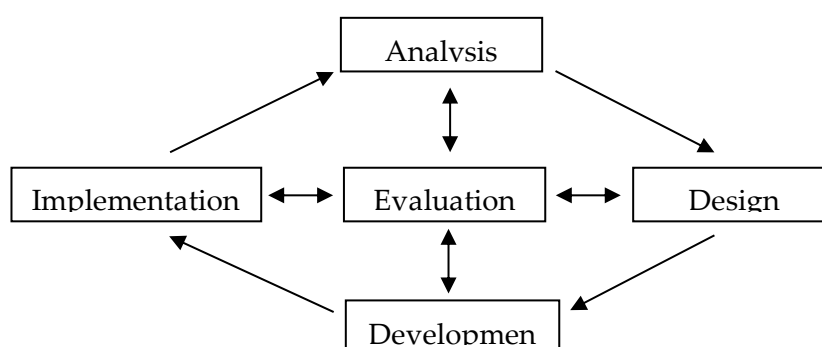


Figure 1. Stages of the ADDIE design development model

Research Subjects

The test subjects in the study were conducted on fourth-grade students at SD Negeri 16 Sitiung and SD Negeri 06 Sitiung. At SD Negeri 16 Sitiung, it consisted of 13 students, while at SD Negeri 06 Sitiung, it consisted of 15 students. So the total number of test subjects is 28 students.

Data Collection Technique

The data collection technical instruments that researchers use include:

1. Interview and observation

Interviews and observations were conducted with teachers and in elementary schools as a place of research for researchers. This is a reference for consideration when improving the product the researcher is developing.

2. Validation sheet

The validation sheet will be given to the expert validator, and the product to be validated to obtain data and input/suggestions from the expert validator. The results of the expert validator's assessment will be tested for validity.

3. Questionnaire

This questionnaire consists of a needs analysis questionnaire for teachers and students, a practicality questionnaire, and a product evaluation questionnaire for teachers and students. The results of data analysis from the questionnaire will determine the needs analysis during the preliminary study and the practicality and effectiveness of the product being developed.

4. Test

The results of this test will be used to analyze students' integrated thematic learning outcomes before and after using the products developed by researchers. The results of data analysis from these tests will determine the effectiveness of the product being developed.

5. Documentation

Documentation in this study to collect qualitative data. This research documentation was taken to strengthen the research results.

RESULTS AND DISCUSSIONS

Analysis

The activity that the researchers carried out at this stage was to conduct a preliminary study on two elementary schools that the researchers used as research sites, namely SD Negeri 16 Sitiung and SD Negeri 06 Sitiung. This preliminary study was carried out using observation, interviews, and distribution of needs analysis questionnaires for teachers and students. The results of the preliminary study found that the two elementary schools minimally used teaching materials following the demands of the development of the 21st century or the era of the industrial revolution 4.0, namely the use of technology during the learning process in class. Based on the results of this preliminary study, the researchers developed a product that meets the needs of the 21st century, using technology in the form of electronic modules based on the Discovery Learning learning model applied to learning comprehensive themes in grade IV of primary schools.

The curriculum analysis stage is carried out by analyzing KD to formulate indicators. Based on the indicators, the learning objectives to be achieved by students are formulated. Furthermore, indicators are formulated to develop e-modules for integrated thematic learning in grade IV, which is under the content standards for integrated thematic learning at the 2013 Curriculum Elementary School level. After analyzing KD, the researcher formulated indicators for KD in class IV thematic learning. The teaching materials educators use need to be developed because they do not yet contain KD achievement indicators, and the goals to be achieved are not yet specific. The indicator analysis carried out by the researcher was adjusted to the needs of the designed e-module development. After analyzing KD and indicators, the researcher determined the material to be developed in Theme 5, sub-theme 1, learning 1, sub-theme 2, learning 1, and Sub-theme 3, learning 1.

Design

The following is a plan for developing comprehensive thematic learning media in e-modules based on discovery learning. The electronic module works based on discovery learning. The images and backgrounds used to create the covers for the electronics modules were created using the PageFlip Pro 3D test application. The cover includes pictures, material titles, electronic module objectives, and lessons. The images used on the cover are taken from internet sources related to the study material. Discovery Learning-based e-module covers are shown in the image below:

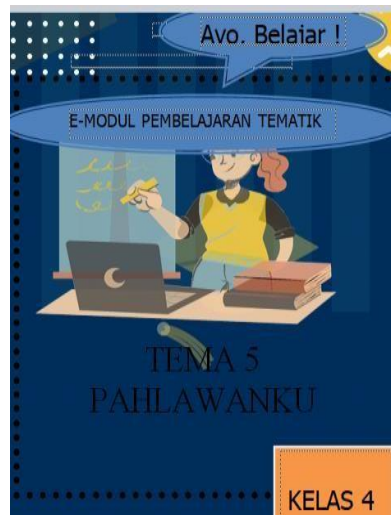


Figure 2. The front cover view of the e-module

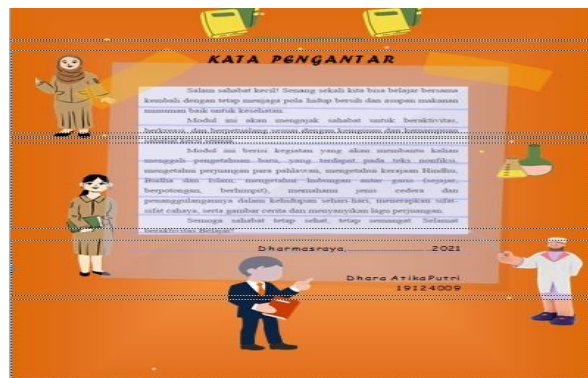


Figure 3. Display of e-module introduction

DAFTAR ISI	
Kata Pengantar.....	
Daftar Isi.....	
Petunjuk Penggunaan.....	
KD/Indikator.....	
Tujuan Pembelajaran.....	
TEMA 5	
Pahlawanku.....	
SUBTEMA 1	
Perjuangan Para Pahlawan.....	
SUBTEMA 2	
Pahlawanku Kebanganku.....	
SUBTEMA 3	
Sikap Kepahlawanan.....	
DAFTAR PUSTAKA.....	

Figure 4. Display the e-module table of contents

Development

The validators are divided into material, media, and language, and each uses a separate validation questionnaire instrument. The material validator consists of three validators, while the

media and language validators each consist of one validator. At this stage, the validator is asked to provide an assessment and suggestions for improvement. In the following, the researcher describes the results of the Discovery Learning-based e-module validation test that the researcher has done, namely:

Material Expert Validation

Material expert validation aims to test the completeness of the material, the correctness of the material, and the systematics of the material. Material expert validity test data were obtained from two PGSD material expert lecturers and one from an elementary school. The results of the Discovery Learning-based e-module assessment based on material aspects can be seen in the following table:

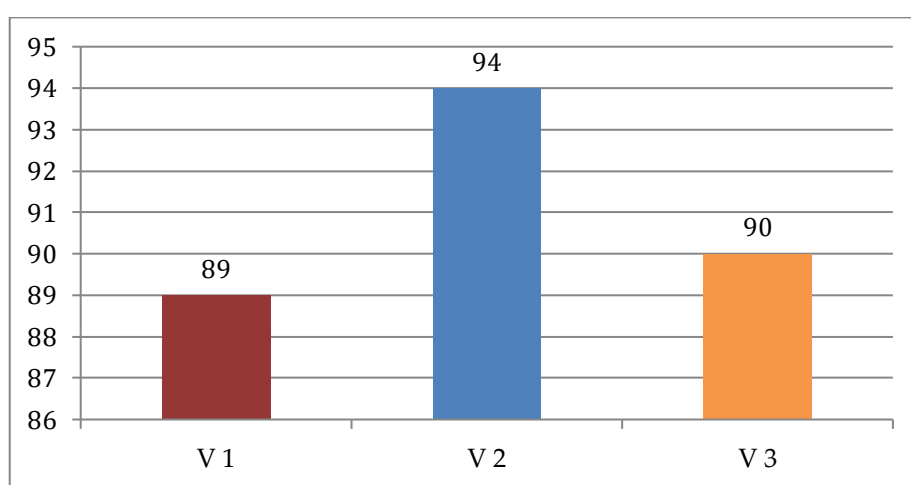


Figure 5. Results of Validity

Media Expert Validation

The results of the Discovery Learning-based e-module assessment based on media aspects can be seen in the following table:

Table 1. Validity Test Results on the Media Aspect

Field of Expertise Validator	%	Category
Media	88	Very Valid

Linguist Validation

Language validation aims to see the usage used in the product used. Aspects of use to evaluate the vocabulary used, punctuation symbols, or terms used. The results of language and design validation data can be seen in Table 3:

Table 2. Validity Test Results on Language Aspects

Validator's Area of Expertise	%	Category
Language	92	Very Valid

The following is a recapitulation table, and the results of material, language, and media validation of Discovery Learning-based e-modules can be seen in the following graph:

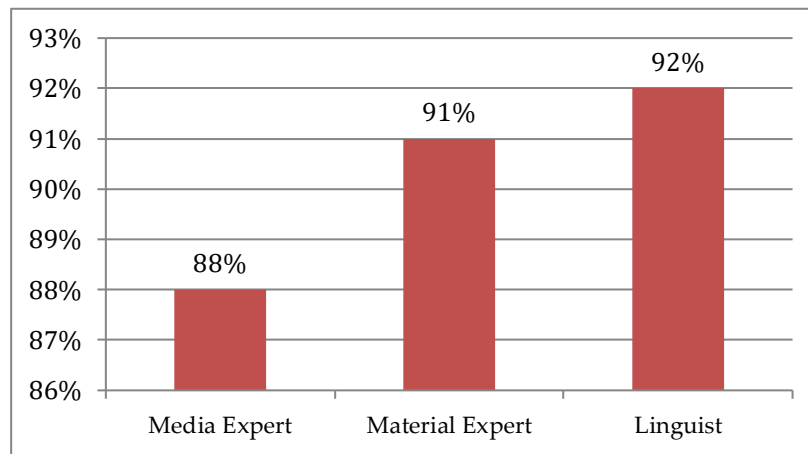


Figure 6. Graph of Media, Material, and Language Validity Test Results

The validation process of the Discovery Learning-based e-module involved expert validators, such as material experts, media experts, and linguists. The results of this assessment indicate that the e-module has been deemed highly valid and feasible in terms of material, media, and linguistic aspects. As a result of the validator's evaluation, the e-module is now ready to be tested in the field.

Implementation Stage

The implementation phase is a wider product trial stage. At this stage, it was carried out at SD Negeri 16 Sitiung and SD Negeri 06 Sitiung to determine the product's practicality and effectiveness in the field. At this stage, the researchers tested the e-module based on Discovery Learning in small/limited groups and large/wide groups from November 15, 2021, to December 11, 2021. Researchers conducted group tests during the trials at SD Negeri 16 Sitiung, an elementary school, in small clusters. As for the larger group trials, they were conducted at SD Negeri 06 Sitiung.

Product trials in small and large groups are carried out during integrated thematic learning. Before and after testing the product, the researchers conducted tests on students. Then, proceed with distributing the practicality instruments of teachers and students through questionnaires. Next, the researcher conducted a data analysis of the test instruments given to students. This test instrument demonstrates the effectiveness of the Discovery Learning-based e-module researchers have developed. The following is a further explanation regarding the implementation phase that the researcher has carried out.

Practicality Test

Practicality testing is carried out after the product is developed in small or large groups. The instrument that the researcher used was a practicality questionnaire for teachers and students. The practicality of the developed Discovery Learning-based e-module can be seen from the results of the practicality analysis by teachers and students.

Teacher Practicality Test

Data for the feasibility trial of e-modules based on Discovery Learning were collected from two fourth-grade educators who had previously completed a practicality questionnaire. Primary data were directly obtained from them. The practicality of the e-module was evaluated based on the teacher's use of the e-module, observation of the learning process, and completion of the practicality questionnaire provided by the researcher. The trial's practicality assessment outcomes are outlined in the subsequent table, with one teacher from SDN 16 Sitiung and another from SDN 06 Sitiung providing their input:

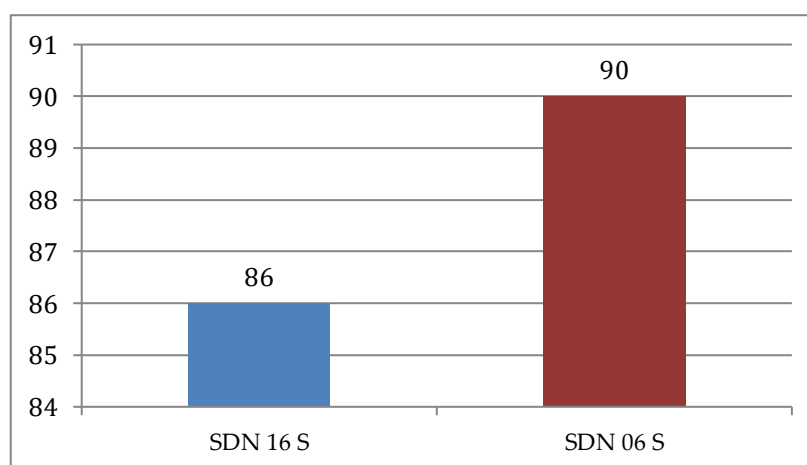


Figure 7. Recapitulation

Student Practicality Test

Discovery Learning-based e-module practical trial data is primary data obtained directly from students using a student practicality questionnaire instrument. The small group trial's subject is the fourth-grade students of SD Negeri 16 Sitiung. Then, as the subject of the large group trial, namely class IV students at SD Negeri 06 Sitiung. This practicality test was carried out at the end of the trial meeting. After using the product during the trial, students provide an assessment of the Discovery Learning-based e-module by filling out a practicality questionnaire that the researcher has provided. The recapitulation of the results of the practicality test assessment of students can be seen in the following table:

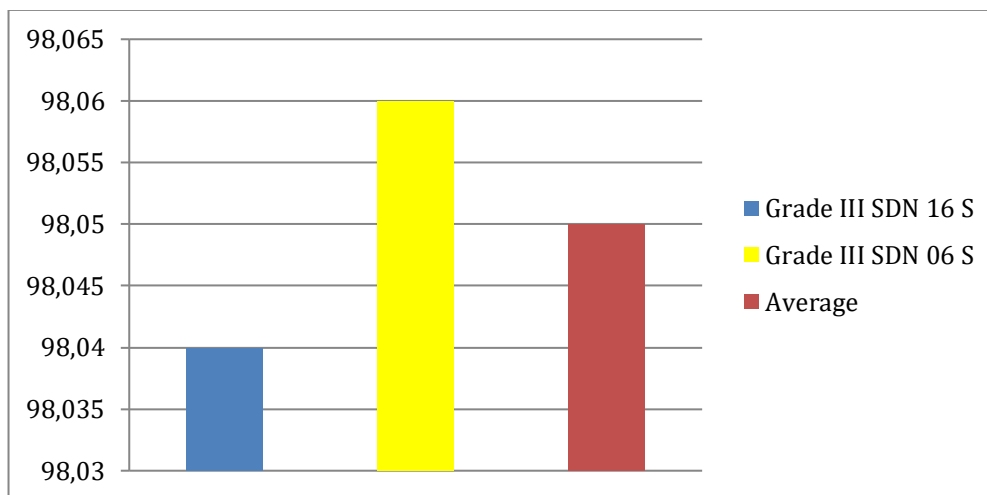


Figure 8. Recapitulation of Student Practicality Test Results

Effectiveness Test

After carrying out the practicality test is followed by an effectiveness test in which the data source is obtained from students' learning outcomes. The learning evaluation path was carried out by using the Pre-test and Post-test instruments to test the researchers' effectiveness. In addition, researchers also tested effectiveness using product evaluation channels, namely by using an open evaluation questionnaire instrument for teachers and students. For the learning evaluation path, data on the value of student learning outcomes is taken, namely before and after participating in the learning process using this Discovery Learning-based e-module, namely through the results of the Pre-test and Post-test. The product developed is effective if assessing student learning outcomes obtains 85% mastery or above the KKB (Learning Mastery Criteria). To determine whether this Discovery Learning-based e-module affects learning outcomes, the researcher conducted the Pre-test and Post-test at SD Negeri 16 Sitiung as the subject of the small group trial. The following is the Pre-test and Post-test data of SD Negeri 16 Sitiung along with the results of the N-Gain Score analysis which can be seen in the table below:

Table 3. List of Pre-test and Post-test Scores at SD Negeri 16 Sitiung

No	Students	Pre-test	Post-test	Post test - pre test	Ideal Score (100) - Pre test	N- Gain Score	N-Gain Score Percentage
1	AM	35	70	35	65	0.54	53.85
2	AB	70	95	25	30	0.83	83.33
3	DA	45	75	30	55	0.55	54.55
4	FR	70	100	30	30	1	100

No	Students	Pre-test	Post-test	Post test - pre test	Ideal Score (100) - Pre test	N- Gain Score	N-Gain Score Percentage
5	GA	50	85	35	50	0.70	70
6	KN	80	100	20	20	1	100
7	MS	55	80	25	45	0.56	55.56
8	MHR	50	80	30	50	0.60	60
9	NC	65	90	25	35	0.71	71.43
10	NG	60	95	35	40	0.88	87.50
11	NA	60	85	25	40	0.63	62.50
12	RS	35	75	40	65	0.62	61.54
13	RR	50	85	35	50	0.70	70
	Total	725	1115	390	575	9.30	930.25
	Average	55.77	85.77	30.00	44.23	0.72	71.56
	Category					High	Effective Enough

Upon examination of the two data sets, it becomes apparent that there has been a significant rise in the post-test outcomes compared to the pre-test results. The average score for the pre-test was marked at 55.77. However, there was a remarkable increase in the post-test scores, with an average of 85.77 points. This improvement can be attributed to the implementation of the researchers' product. Furthermore, the results indicate that the Discovery Learning-based e-module has increased student learning achievements, exceeding the *Kriteria Ketuntasan Belajar* (KKB). The researcher conducted pre-test and post-test assessments on a large group of test subjects, namely SD Negeri 16 Sitiung. The effectiveness of the product's integration into thematic learning was also evaluated using N-Gain Score analysis to determine its impact on student learning outcomes. Furthermore, the following are the results of the pre-test and post-test recapitulation, along with the results of the N-Gain Score analysis for both small and large groups, which can be seen in the image below:

Furthermore, to see the difference between the Pre-test and Post-test scores in both the small group and the large group can be seen in the following diagram.

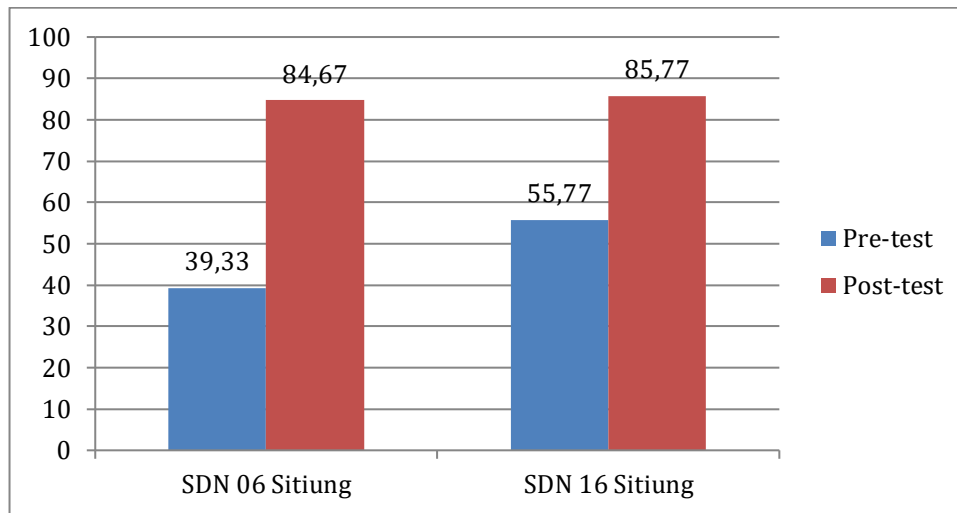


Figure 9. Graph of Differences in Pre-test and Post-test Scores

Based on the comparison of the values above, the average value of the Pre-test results obtained by both the small and large groups has an average value of 47.55. Then, during the Post-test it increased to 85.22 after using the product the researcher developed. The results of the Post-test also show an increase in student learning outcomes after using this Discovery Learning-based e-module. This can be seen from the achievement of these values above the KKB.

Discussion

Discovery Learning-Based E-Module Development Procedure

The ADDIE model was chosen because it is simpler, more organized, and widely used to develop programs and learning offerings effectively. The model is designed programmatically with a systematic sequence of activities aimed at solving learning problems related to learning resources tailored to students' needs and characteristics. In addition, the ADDIE model is conceptually clear and easy to apply, and the model is in line with the development of Discovery Learning-based electronic modules in learning subjects revised at each stage to produce good products suitable for use.

E-module based on Discovery Learning in thematic learning is a tool used to collect data or see the level of mastery of students' material. Discovery Learning-based e-modules in thematic learning can be good if they follow learning needs. Competency analysis aims to identify competencies that apply to class IV in elementary schools. The needs analysis found no e-modules based on Discovery Learning in thematic learning in the learning process, making students less interested in participating in learning. In the analysis of student characteristics, it turns out that elementary school children the same age like objects and experience what they learn first and like to learn by using various pictures.

This development resulted in a discovery-based learning e-module created and revised with expert input. Experienced verifiers conduct the material, language, and material verification stages to determine the language used and the feasibility of the design. After three verification teams have verified the discovery-based electronic modules, group tests are performed to determine the strengths and weaknesses of the product to be developed, and then full-scale testing begins.

Validity of E-module Development Concerning Discovery Learning

This product is designed to be used as an aid to assist teachers and students in learning topics that are integrated to increase learning capacity. To offer a well-product, it is necessary to do testing. The first must be done is validity, practicality, and effectiveness. The researchers created discovery-based learning electronic modules to demonstrate their effectiveness and tested them with language, media, and knowledge experts. Reviewers put pressure on, debate, and provide advice and material on research conducted by researchers.

The results obtained from this validation showed that the product developed by the researchers was effective regarding materials, with a validation score of 91%, classified as very effective, and in media, with a validation score of 91%. 88% Received, Fulfillment Classified as Very Efficient, and Linguistically Verified 92% As Very Efficient.

The Practicality of Discovery Learning-Based E-module Products

The product's practicality can be seen after the e-module based on Discovery Learning is considered valid. Based on the training results by two teachers, the teacher gets the following percentage percentages: teacher 86% and teacher 2 90%, so the average score is 88%. Based on the product assessment classification guidelines that have been developed, the results of aspects of the teacher's response to the electronic-based discovery learning module are in the very category.

Student responses to the learning tools used showed an average score of 98.05. Based on the assessment classification guidelines developed, the practicum results of student responses to modules based on electronic learning are obtained in the very practical category.

The Effectiveness of Learning Outcomes Using Discovery Learning-Based E-modules

Based on the data above, it can be concluded that the e-module created by researchers based on Discovery Learning principles can potentially improve student academic achievement. This is mainly due to the many benefits of the e-module, including its ability to facilitate the learning process, encourage student independence, optimize the use of technological resources, encourage creativity and productive thinking, and foster active, effective, innovative, and environmental attitudes and fun learning, improve student skill development, motivate students to improve the quality of their learning

outcomes, reduce boredom during the learning process, and assist teachers in switching from a teacher-centered approach to a student-centered approach (Kholidah & Savitri, 2022; Syahrial et al., 2019; Kuncahyono, 2018). The researchers have specifically developed an e-module based on Discovery Learning to assist and facilitate teachers and students during the teaching and learning process. When the actual learning process occurs, the instructional material delivered by the teacher will be augmented by including visual representations, animations, audio elements, and video content embedded in the e-module. This serves the dual purpose of explaining complex concepts to students, making learning experiences more interesting, and ultimately leading to improved student learning outcomes compared to previous achievements.

CONCLUSION

This developmental research is expected to result in a product in the form of an electronic module based on discovery learning, designed according to the needs and requirements of the 21st century and implemented according to the 2013 curriculum. Three experts tested young's modulus validity results: a material expert lecturer, a media/design expert lecturer, and a language expert lecturer. Media Expert Validator scored an average of 88%, putting it in the Very Effective category. The Materials Expert Validator scored an average of 91%, putting it in the Very Valid category. Linguist validators scored an average of 92% in the "Very Effective" category. The usability results for the Discovery-Based Learning e-Module show a very practical standard after the usability assessment, with an average student score of 98.05 and a teacher average score of 88 in the "Very Practical" category. The validity test was carried out on the students' pre-test and post-test data, and the results showed that after using discovery-based learning, the scores before and after the test were both 47.55. They added 85.22 - Modular products in integrated subject learning. This shows students' learning outcomes improved after using the electronic modules developed based on discovery learning.

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