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Science Learning E-Module for Fourth Grade Elementary School Students

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ABSTRAK

Latar belakang pengembangan penelitian ini adalah kurangnya pemanfaatan atau penyediaan bahan ajar atau sumber belajar untuk menunjang proses pembelajaran IPA dan meningkatkan hasil belajar siswa. Kurangnya peningkatan hasil belajar siswa disebabkan kurangnya sumber belajar yang digunakan. Oleh karena itu penelitian ini bertujuan untuk mengembangkan e-modul dengan pendekatan kontekstual IPA guna meningkatkan hasil belajar. Jenis penelitian ini menggunakan pengembangan model ADDIE (analisis, desain, pengembangan, implementasi, evaluasi). Metode pengumpulan data yang digunakan adalah angket, pre-test dan post-test. Teknik analisis data menggunakan analisis deskriptif kualitatif, statistik kuantitatif dan inferensial. Hasil penelitian menunjukkan bahwa e-modul yang dikembangkan valid dengan hasil validitas yang diperoleh dari review ahli isi pembelajaran sebesar 97% dengan predikat sangat baik, 90,90% ahli media pembelajaran dengan predikat sangat baik, 91,66% ahli desain pembelajaran dengan predikat sangat baik baik, uji coba perorangan 95,51% dengan predikat sangat baik, uji coba kelompok kecil 96,15% dengan predikat sangat baik, dan uji lapangan 95,74% dengan predikat sangat baik. Kemudian hasil keefektifan pengembangan e-modul dengan pendekatan kontekstual pada mata pelajaran IPA menunjukkan bahwa terdapat perbedaan hasil belajar siswa setelah dan sebelum menggunakan pembelajaran e-modul.

ABSTRACT

The background to this research development is the lack of use or provision of teaching materials or learning resources to support the science learning process and to improve student learning outcomes. Lack of increased student learning outcomes due to the lack of learning resources used. Therefore this study aims to development of e-modules with a natural science contextual approach in order to improve learning outcomes. This type of research uses the ADDIE model development (analyze, design, development, implementation, evaluation). Data collection methods used are questionnaires, pre-test and post-test. Data analysis techniques using descriptive qualitative analysis, quantitative and inferential statistics. The results showed that the developed e-module is valid with the validity results obtained from the review of learning content experts by 97% with very good predicate, 90.90% learning media expert with very good predicate, 91.66% learning design expert with very good predicate good, individual trials 95.51% with very good predicate, small group trials 96.15% with very good predicates and field tests 95.74% with very good predicates. Then the results of the effectiveness of developing e-modules with a contextual approach to science subjects showed that there were differences in student learning outcomes after and before using the learning e-module.

1. INTRODUCTION

In the current era of development of science and technology, science and technology is developing very rapidly. So that automatically requires a teacher or educator to understand technological developments, especially in the learning process. At this time not only students, teachers or educators are also required to have the ability and skills in the field of technology in the teaching and learning process to achieve the expected learning objectives. Technological developments have changed the orientation of learning from conventional learning to digital learning. The current rapid development of information and communication technology must be utilized in the learning process in schools in order to increase the effectiveness of learning outcomes and efficiency in learning so that learning objectives are achieved which are expected to go well (Ahmadi et al., 2017; L. G. R. A. Putri et al., 2021). The success of a learning process is influenced by various learning components, one of which is teaching materials or learning media. Teaching materials are a set of learning materials that are based on curriculum standards that are used to achieve competency standards and basic competencies that have been set (L. G. R. A. Putri et al., 2021; Rahmadhani et al., 2022). There are various forms of teaching materials such as guidebooks, modules, handouts, worksheets, models or mockups, audio teaching materials, and interactive teaching materials.

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In today's era, teaching materials or learning media have been developed, such as modules in the form of electronic modules or e-modules (Elvarita et al., 2020; Wijayanti et al., 2016). E-modules are teaching materials in electronic form which are an alternative for teachers to convey learning to students (Asmiyunda et al., 2018; Wiratama & Margunayasa, 2021). E-modules have advantages so that this development research was carried out that the use of e-modules in the learning process lies in learning patterns that allow students to learn independently so that the teacher is no longer the only source of learning for students. In addition, the teaching period is shorter and the learning process can be carried out at any time and at any time by students independently (Artiniasih et al., 2019; Novrianti et al., 2018). Content in e-modules can attract students' interest in learning because of the combination of various media in it such as text, images, music, animation and video, so that students have perceptions, interests, and motivation so that after introducing e-modules for the learning process (Syahrial et al., 2019; Yayang & Eldarni, 2019). The development of teaching materials in the form of e-modules can make it easier for students to understand learning. It is highly recommended for educators to be able to develop and use e-modules in the learning process, especially in science learning.

Based on the results of interviews conducted at SDN 1 Banjar Jawa, it was revealed that the science learning objectives had not been fully achieved in terms of student learning outcomes. This is due to factors such as low student engagement, inadequate learning resources, conventional teaching methods, and varying learning styles among students. To overcome this problem, it is necessary to develop attractive and accessible learning materials, especially e-modules, which can suit individual learning styles and encourage independent learning. In general, currently what is happening is that educators at this school in the learning process only use printed modules as the main teaching material. So that students learn science only by listening to material delivered by teachers from books, debriefing between teachers and students, and discussing questions in textbooks. In general, students tend to have difficulty understanding the material in the printed module, especially when students have to study independently. The non-optimality of the learning process is due to the lack of adequate and more interesting teaching materials so that when delivering science material students feel a lack of interest in knowing the new things they are learning, causing learning to become boring.

This development research aims to develop e-module teaching materials with a contextual approach to science lessons, so that they can achieve learning objectives with increased student learning outcomes. With the existence of teaching materials can also help teachers or students to meet the needs in the learning process. Teachers can convey and present interesting learning materials and students can be motivated by the material presented by the teacher. That way the teaching and learning process goes well and achieves the learning objectives that have been set. This e-module was developed to measure the validation and effectiveness of using the product. The effectiveness of this product is seen from the results of student learning.

The existence of limitations on science teaching materials in the form of e-modules used is influenced by the way the teacher presents the material. The method used by the teacher in learning science is the conventional method so that students feel bored when the learning process takes place. In science learning, the teacher only presents material in printed books which are also used by students. This causes students to become more passive so that science learning becomes boring, less meaningful, and has an impact on the learning outcomes obtained by students. In addition, the science learning method that occurs in the teacher's learning process is conventional (lectures) and questions and answers, the teacher dominates the course of learning activities, students become inactive in the learning process, and students feel bored and less meaningful (Prabawa & Restami, 2020; Wedayanti & Wiarta, 2022).

One solution that can be done to overcome problems in the science learning process in elementary schools is that it is necessary to make new breakthroughs by changing the concept of learning, teaching materials that were originally only teacher-centered to become student-centered with the existence of e-modules. Adapted to appropriate learning methods. Several learning methods that can be used in science learning, one of which is the contextual approach. The contextual approach is a learning strategy that emphasizes the full involvement of students to be able to find the material being studied and encourage students to be able to apply it in their lives (Asrizal et al., 2018; Zakiyah et al., 2019). Based on this explanation, the authors are interested in developing a teaching material in the form of a learning e-module that is practical and can be used by students in grade IV Elementary School Science lessons. E-modules with a contextual approach are electronic teaching materials that present contextual examples of science material that are arranged systematically based on the principles of contextual learning (Febriyanti et al., 2017; N. M. C. N. M. Putri et al., 2019).

This research is supported by several relevant previous studies, namely: (1) research which obtains the result that there is an integration of concepts with a contextual approach in teaching materials or learning media that are developed to help teachers to facilitate the presentation and delivery of material to students, so that in this way they can support the creation of a conducive and effective atmosphere during the learning process (Oktafiani et al., 2020); (2) research that obtains results that the use of e-modules with a contextual approach to the learning process is better than conventional learning (Yudiari et al., 2015). Base on the problem state and previous study,

this study aims to develop e-modules with a natural science contextual approach in order to improve learning outcomes.

2. METHOD

Research is a research and development. The procedure for this the model which of is analysis, design development, implementation, evaluation. At this stage, the first analyze (analysis) is carried out by analyzing the needs of students and teachers, the methods used by teachers in the learning process, the facilities used by teachers and students in learning activities. In the second stage of design (design) flowcharts and storyboards are designed, the e-module framework, the preparation of product assessment instruments, and the preparation of the RPP. In the third stage of development (development) the content contained in the e-module is developed. In the fourth stage of implementation (implementation) is carried out to find out the results of the responses from experts and students, and in the fifth stage of evaluation (evaluation) analysis of formative and summative evaluation data is carried out in the form of validation results from experts and students. The result of this research and development project is an e-module designed for fourth-grade students at SD Negeri 1 Banjar Jawa, focusing on the subject of Natural Sciences with a contextual approach. The development process involved the participation of subject content experts, instructional media experts, and instructional design experts. The e-module was tested through individual trials, small group tests, and a field test conducted with 38 fourth-grade students. The effectiveness of the e-module was evaluated using pretest and posttest assessments administered to all the students at SDN 1 Banjar Jawa. The instrument grids of experts and students are presented in Table 1, Table 2, Table 3, and Table 4.

Table 1. The Lattice of Learning Content Expert Instruments

No.	Aspect	Component	Item No	Number of Items
1	Curriculum	Clarity of e-module identity Suitability of e-module with learning objectives	1,2,3,4,5	5
2	Material	The suitability of the material with the learning objectives	1,2,3,4,5,6,7	7
3	Evaluation	Compatibility of the image with the material The suitability of the questions with the learning material	1,2	2
		Amount		**14**

Table 2. The Lattice of Learning Design Expert Instruments

No.	Aspect	Component	Item No	Number of Items
1	Curriculum	Clarity of goals and objectives of the e-module Suitability of learning objectives	1,2,3,4	4
2	Matode	The accuracy of the presentation of the material The suitability of the presentation of the material with the characteristics target e-module	1,2,3,4,5,6	6
3	Evaluation	Clarity of question work The suitability of the questions with the material	1,2	2
		Amount		**14**

Table 3. The Lattice of Learning Media Expert Instruments

No.	Aspect	Component	Item No	Number of Items
1	Message design	Text Picture Videos	1,2,3,4,5,6,7,8	8
2	Organizing	Ease of use in access products	1,2,3	3
		Amount		**11**

Table 4. Individual, Small Group and Field Tests

No.	Aspect	Component	Item No	Number of Items
1	Media Learning	Ease of use of the product	1,2,3	3
2	Material	Appropriateness of the content of the material, the contents of the evaluation questions, the appropriate language used with products Availability of individual student evaluations and assignments	1,2,3,4, 5,6,7	7
3	Benefit	The use and presentation of the material in accordance with learning objectives	1,2,3	3
		Amount		**13**

The data obtained in this study were then analyzed using qualitative descriptive data analysis techniques, quantitative and inferential statistics. Qualitative descriptive data analysis was used to process data based on suggestions and input from the validity test results. Descriptive data analysis is used to process data which is carried out in a regular arrangement in the form of percentages or questionnaires presented in Table 5.

Table 5. Achievement Level Conversion Table with a Scale of 5

Chievement Level	Qualification	Information
90-100	Very good	No need to revise
75-89	Good	Slightly revised
65-79	Enough	Revised to taste
55-64	Not enough	Many things were revised
0-54	Very less	Repeated product creation

3. RESULT AND DISCUSSION

Result

This research on e-module development follows the ADDIE model, which comprises five stages: analysis, design, development, implementation, and evaluation. The analysis stage involves assessing learning needs, material analysis, media requirements, competency analysis, and infrastructure evaluation. The analysis revealed that students and teachers preferred using guidebooks as a learning resource, leading to monotony, particularly in science lessons. To address this, teaching materials needed to be developed to support the science learning process and engage both teachers and students. In the design stage, flowcharts, storyboards, e-module frameworks, product assessment tools, and lesson plans were created. The subsequent development stage focused on refining e-module content and its actual development. The content was aligned with the specific needs of teachers and students while adhering to the competency standards set at SDN 1 Banjar Jawa. The material was presented in an appealing manner to facilitate learning for students and teachers alike. The results of e-module development are presented in Figure 1.

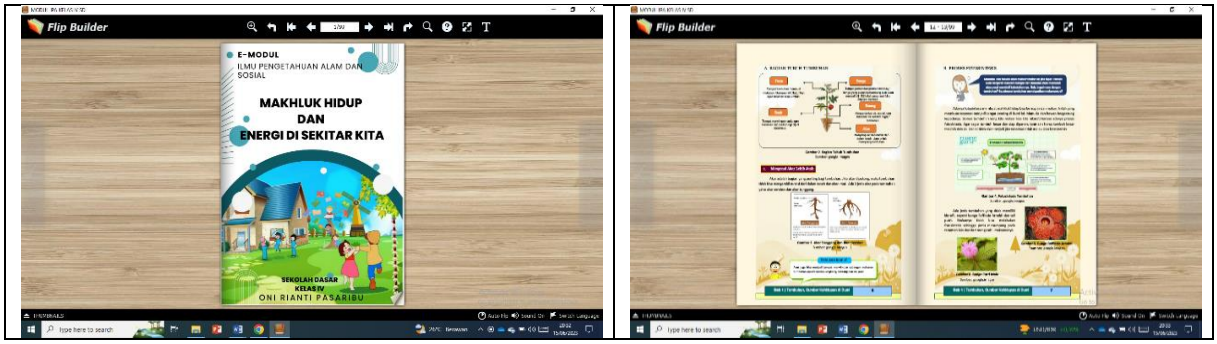

Figure 1. The Results of The E-Module Development Process

The implementation stage at this stage is carried out to find out the responses of experts including (subject content experts, learning design experts, and learning media experts) and students in terms of attractiveness and feasibility. From the results of product implementation in the form of (1) validation from experts (subject content experts, learning design experts, and learning media experts), (2) product trials namely, 3 individual student trials,

6 students small group trials. These students came from high, low and medium learning outcomes, and field trials were conducted on 38 grade IV students at SDN 1 Banjar Jawa and had high, low and medium academics. The evaluation phase was carried out to obtain data analysis using formative and summative evaluations. The formative evaluation process involved expert validation, individual trials, small group trials, and field trials to gather feedback and improve the product. In contrast, the summative evaluation focused on assessing the effectiveness of the learning e-module by administering pretests before implementation and posttests after using the e-module with fourth-grade students. The results of the reviews from expert tests and product trials are presented in Table 6.

Table 6. Product Trial Results

No.	Product Trial Subjects	Result Validity (%)	Information
1	Subject content expert test	97.05%	Very good
2	Learning design expert test	91.66%	Very good
3	Learning media expert test	90.90%	Very good
4	Individual trials	95.51%	Very good
5	Small group trial	96.15%	Very good
6	Field trials	95.74%	Very good

Based on Table 6 the results of the product trials, it can be seen that the development of e-modules with a contextual approach to science subjects in class IV obtained validity test results and student trials obtained very good qualifications, so that the e-module was feasible to be given to students or teachers. The suggestions and input obtained from the test experts are used as a reference for the perfection of the e-module being developed.

Discussion

Based on the research results from the analysis above, the e-module with a contextual approach has very decent quality as a learning resource for students in grade IV SD in science. Evidenced by the validation results of subject content experts, learning media experts, learning design experts, individual trials, small group trials and field trials stated that in terms of the feasibility of e-modules with a contextual approach, they met the very feasible criteria. Very decent qualifications can be achieved with several criteria, namely (1) clarity of subject identity and suitability of indicators with basic competencies; (2) completeness of learning media and study guides; (3) the availability and suitability of the evaluation presented in the e-module with the contents of the learning material. The validation results obtained are in line with research which states that the modules developed are feasible to use based on the results of the validity of subject content experts, learning media experts, learning design experts, with material, presentation, language and contextual aspects (Ibrahim & Yusuf, 2019; Manuaba, 2017). Likewise, based on the results of experts and student trials on the use of e-modules with a contextual approach, in general, e-modules are very feasible and interesting for students to use in the science learning process. This is in line with several previous studies which stated that the developed e-module received a positive response from students and teachers with teacher response scores as subject experts and students as individual trials, small group trials and field tests namely 97.05%, 95, 51%, 96.15% and 95.74% in the very good category (Sitorus et al., 2019). Other research also stated that the responses from students were in a very good category so that the e-module with a contextual approach to science that was produced was suitable for use in the learning process (Safitri et al., 2018).

In terms of design, the advantages of e-modules with a contextual approach are that they can provide an attractive appearance because they are equipped with learning media in the form of images, text and learning videos that are in accordance with the material presented so that students can more easily understand the contents of the material in the e-module, by the content in this e-module can help students to be more active and motivated to learn so that this e-module with a contextual approach will be interesting if applied in the next learning process. Utilizing learning media in increasing desire, increasing motivation, increasing interest in learning activities has a psychological effect on students (Nuryani & Abadi, 2021; Saputra & Musafanah, 2017). Students have good perceptions, interests and motivation after being introduced to e-modules in the learning process. Modules can be used anytime and anywhere according to student needs (Hamid et al., 2017; Rahmatsyah & Dwiningsih, 2021).

This module is also equipped with instructions for use. There is clarity of user goals, clarity of learning steps, strategy accuracy, and suitability of questions with the learning objectives to be achieved. Presentation of material in this e-module is also able to motivate students because it is equipped with interesting learning pictures and videos. Thus the content of the material can be conveyed properly. Material that has a long and abstract description will be easier to understand because it is visualized with pictures. Images are included in the material in the e-module to encourage learning motivation, clarify and simplify complex and abstract concepts into simpler, concrete, and easy to understand (Aryawan et al., 2018; Fearnley & Amora, 2020). In addition, with the use of e-modules teachers can include videos, animations, text and images supporting content through distance learning. This e-module has clear instructions for use so students can learn with the help of a teacher or without the help of

a teacher. The components of the developed e-module are in accordance with the indicators specified in the validation instrument.

In terms of the content of the material, the advantages of e-modules with a contextual approach that have been developed are in accordance with the implementation of the independent curriculum book guide which is adjusted to the provisions in the class. This can be seen from the selection of material, the breadth of material content, and the learning steps that have been prepared referring to KI and KD in the independent curriculum following the suitability of indicators and learning objectives with basic competencies (Asmiyunda et al., 2018; Swiyadnya et al., 2021). The presentation of the content of the material in the e-module has been adjusted to the formulation of indicators and the appropriate and complete order of presentation so that it can make students more familiar with the learning concept being studied. The content of the material presented in the e-module has also been adapted to the characteristics of the contextual approach by presenting contexts that are significantly related to the daily lives of students so that students can more easily understand and be able to relate the content of the material in real or everyday life. day. The material presented is also adjusted to the level of development of students so that the developed e-module can be a learning resource that can be used in the learning process.

In addition, seen from the integration of teaching materials, in this case e-modules with a contextual approach can make it easier for teachers to present and deliver material by linking it to the real world of students, so as to encourage students' interest in making connections between the knowledge they have to apply it in everyday life. The benefits of learning with a contextual approach, namely: (1) motivating students and engagement as a result of understanding relevant learning processes that are obtained from phenomena or new things they get in everyday life; and (2) the development of critical thinking and skills for problem solving with questions that are focused on familiar contexts so that they are more effective in the learning process (Suasaningdyah, 2018; Zakiyah et al., 2019).

Previous study suggests that learning must be contextualized to real life situations (Asrizal et al., 2018; Zakiyah et al., 2019). In accordance with the relevant research above, the development of e-modules with a contextual approach in this study can be an alternative to increase the effectiveness of student learning outcomes. This e-module with a contextual approach is a digital-based teaching material designed to be studied by students or anyone who can access it easily and can use it via computers, laptops, tablets, even smartphones, which can be done through distance learning. That way the use of this e-module allows students to learn independently and the teacher is no longer the only source of learning for students during the learning process. With the renewal of learning media for the e-module learning process with a contextual approach with deficiencies and limitations it can make it easier for teachers to present and deliver material that can be directly related to the real world of students, so students are able to encourage making connections between the knowledge obtained and the results observations in everyday life. Thus, the teaching materials developed are valid and appropriate for the learning process. This finding is reinforced by previous findings which state that interactive teaching materials make it easier for students to absorb information (Fearnley & Amora, 2020; Siti et al., 2021).

The effectiveness of the e-module with a contextual approach in this study was measured in terms of the quality of the effectiveness of the product produced using the pretest and posttest on 38 fourth grade students at SDN 1 Banjar Jawa. The results of the pretest and posttest that were obtained after being done manually with the t-test showed that 17.112 > 1.665. So that there is a significant difference in the learning outcomes of science content students before and after using e-modules with a contextual approach. Based on the t-test analysis obtained from the pretest and posttest data, it proves that using e-modules with a contextual approach can improve student learning outcomes (Devi & Bayu, 2020; Oktafiani et al., 2020). In line with some of the relevant previous studies: (1) research which obtained the result that there is an integration of concepts with a contextual approach in the teaching materials or learning media developed can help teachers to facilitate the presentation and delivery of material to students, so that in this way it can support creating a conducive and effective atmosphere during the learning process (Rosyida et al., 2018): (2) research that obtains results that the use of e-modules with a contextual approach to the learning process is better than conventional learning (Zakiyah et al., 2019). So it can be concluded that based on the results of previous research, it can be seen that e-modules can build student enthusiasm, increase student curiosity, motivate students so as to continue to try and hone student abilities through exercises on evaluation questions to develop student interest, so as to improve results. learn students.

The implications of this research can help students to understand the content of learning materials, so that learning objectives can be achieved. The developed e-module can be one of the learning resources or teaching materials used during the learning process because with this contextual approach e-module is presented as attractively as possible to attract attention and increase students' interest in the learning process. In accordance with the findings of other researchers that implementing e-modules can increase student independence and learning outcomes.

4. CONCLUSION

The analysis and discussion of the data indicate that the developed e-module meets the criteria for excellent quality and is highly suitable for development and utilization by students. E-modules support student enthusiasm, increase student curiosity, motivate students in learning process especially in science learning. Therefore, the e-module with a contextual approach to science subjects can be presented as a suitable learning medium that effectively improves student learning outcomes.

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