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Development of Plant Reproduction E-Module with Sets (Science, Environment, Technology, and Society) Insight to Improve Learning Outcomes of Students of Grade IV of Wonorejo 04 Elementary School, Semarang Regency

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ABSTRACT

This research was conducted based on the results of observations and interviews with teachers in the teaching and learning process, and many teachers have yet to use teaching materials in the form of E-modules. This study aims to develop teaching materials for E-modules for SETS-based plant development for grade IV of Elementary Schools to improve the learning outcomes of elementary school students. The research method used is the research and development (R&D) method with the Borg & Gall development model with ten stages. This research was conducted with small-scale testing in grade IV of SDN Wonorejo 0 with 30 students and large-scale testing in grade V of SDN Wonorejo 04, Semarang Regency, with 30 students. Data and collection techniques in this study include interviews, questionnaires, document data, and test questions for validity, reliability, difficulty level, and discrimination. The study results show that the feasibility of developing an E-module for SETS-based plant development is developed according to the characteristics and needs of students and teachers. For the feasibility of the E-module, the material expert obtained a score of 95% with very feasible criteria. Then, the media expert validator obtained a score of 100% with very feasible criteria. The language expert validator obtained a score of 93% with very feasible criteria. Both the effectiveness of the E-module based on the n-Gain results of 0.53 with moderate criteria and the effectiveness interpretation obtained a score of 89.82 with quite effective criteria. So, the developed teaching materials effectively support elementary school students' learning outcomes.

Keywords: E-modules, SETS, Learning Outcomes and Primary Schools.

INTRODUCTION

The Independent Curriculum is a curriculum with diverse intracurricular learning where the content will be more optimal so that students have enough time to explore concepts and strengthen their competencies. (Cholilah et al., 2023); (Berlian, U., C., Solekha, S., & Rahayu, 2022). (Suryana & Pratama, 2018) It is revealed that five

elements influence the implementation of the curriculum. The five components include support from the principal, support from fellow teachers, support from students, support from parents, and support from within the teacher as the main element. Currently, teachers experience difficulties during the learning process in delivering material that is understanding, especially in subjects with a wide scope of material in the Natural and Social Sciences (IPAS) subject, such as teachers have not varied in using IT-based learning resources (Kumala, 2016). In addition, students' attitudes towards science learning are less understood by students. (Alfatonah et al., 2023); (Umami, 2022). IPAS is required to always care about the natural and social environment (Ghaniem & Yasella, 2017).

The independent curriculum is expected to contribute to students' development according to their potential and abilities because, with the independent curriculum, they get critical, quality, expressive, applicable, varied, and progressive learning. The current problem is the readiness of teachers to adapt to the independent curriculum, which is oriented towards students' creative products, one of which is the lack of teaching materials or learning media (Azmi et al., 2023)(Rahayu, R., Rosita, R., Rahayuningsih, Y., S., Hernawan, H., A., 2022).

Students have difficulty in understanding material that is of a comprehension nature (Umami, 2022). Media use in learning is still limited to images and videos and has not maximized the use of IT-based media (Sahelatua, 2018). The learning models applied are also not varied. The models used have been adjusted to the material, but teachers still tend to use the cooperative learning model (Baehaqi, 2020). Teachers use lecture methods, and questions and answers have yet to be maximized in demonstrations.

Student involvement in direct activities can foster students' habits of caring for the environment, which is expected to help students improve, maintain, and preserve the environment around them (Ismail, 2021). Science learning with the SETS (Science, Environment, Technology, and Society) approach aims to introduce students to preventive and curative thinking about the environment and its systems (Khasanah, 2015) (Retno & Marlina, 2018). The SETS objectives are expected to provide opportunities for students to use the knowledge they already have better and with good intentions in everyday life and the future.

Science process skills and learning outcomes can be improved, one of which is by using teaching materials (Nikmatin Mabsutsah & Yushardi, 2022). E-modules are one of the practical teaching materials because they can be reproduced and are easily accessed wherever students and teachers are (Lastri, 2023); (Rohman et al., 2021). E-modules do not burden students in terms of duplication costs, so students can save E-modules on their Smartphones or laptops.

Based on the description in the introduction, this study will develop an E-Module for Plant Propagation with SETS (Science, Environment, Technology, and Society) Insights to Improve Learning Outcomes. with the hope of instilling environmental awareness behavior and improving learning outcomes for students that can be applied in everyday life.

MATERIALS & METHODS

The type of research used in this study is *Research and Development* (R&D) (Raihan et al., 2023; Mukaromah et al., 2024). The model used is Borg and Gall and has ten stages. The Borg and Gall development model will be used in the research and development of e-module learning media. However, the researcher limited it to only the 6th stage, namely product testing. So, for the ten development steps, the researcher will only carry out six stages of development, namely (1) potential and problems, (2) data collection, (3) product design, (4) design

validation, (5) design revision, (6) product testing.

The research subjects were 31 fourth-grade students and one teacher. The data collection technique in this study was non-test. Interviews, questionnaires, and document data were carried out using non-test techniques. The feasibility of Table 4.1 is seen in 2 tests, namely the first e-module feasibility test on the science learning of plant propagation material, which was tested by expert validators based on the feasibility questionnaire. For both validity with objective questions, the score for ordinary items is 1 (for items answered correctly) and 0 (for items answered incorrectly). In contrast, the total score is the sum of the scores for all items that build the question. The three reliability tests use both test-retest, equivalent, and combination. After the three tests are carried out, the teaching materials are tested widely to see the feasibility of the e-module product through question tests carried out twice, namely pretest and posttest. The values obtained by students are then calculated using the formula from Lestari Yudhanegara, 2017: 235 as follows::

$$N\text{-}Gain = \frac{Posttest - Pretest}{ScorMaks - Pretest}$$

RESULT

Characteristics of SETS-based Plant Propagation E-Module Development

The design of the learning media created is in the form of a prototype, which contains a picture or initial design of the E-Module learning product. The press results developed are in the form of E-Modules that can be accessed offline. The media uses bright and cheerful themes to attract students' attention. How to visualize material content can influence cognitive processes in critical thinking and independence in learning and influence learning outcomes (Siagian et al., 2021). This influence can occur due to limited sensory memory capacity (related to how information enters visually and/or audibly, as well as the learner's working memory in processing information into meaningful knowledge.

Eligibility of SETS-based Plant Propagation E-Module

The feasibility of the SETS-based Plant Propagation E-module carried out several tests to assess the feasibility of the product. The feasibility of the SETS-based Plant Propagation E-module went through the following stages: (1) expert validation on media, material, and language aspects (2) small-scale feasibility test to try out the use of the media and find out opinions on the use of the media.

There are four criteria for the feasibility of learning media: very feasible, feasible, less feasible, and not feasible. The requirements are feasible if they get a value of 76% -100 %, the requirements are feasible between 51% -75 %, the requirements are feasible between 26% -50 %, and the requirements are less feasible in the range of 0% -25 %. The summary of the results of the expert assessment validation instrument is in Table 1.

Table 1. Validator Assessment

Expert	Score	Percentage	Information
Subject Matter Expert Dr. Siti Rahati, M.Pd.	38/40	95%	Very feasible
Media expert Farid Ahmadi, S.Kom., M.Kom., Ph.D.	48/48	100%	Very feasible
Linguist expert Muhammad Habib Ramadhan, M.Pd	30/32	93.%	Very feasible

Suggestions for improvement are given by validators so that learning media can be used more effectively in learning. Suggestions for improvement from each expert validator are explained in Table 2.

Table 2. Suggestion from expert

No	Expert	Suggestion
1.	Subject Matter Expert	The material applied is in accordance with the learning achievements in class IV but still requires improvement in the standardization of the use of terms, then in the LKPD and evaluation questions, HOTS needs to be improved.
2.	Media expert	In the video section, it needs to be fixed and clarified. For explanatory texts that are too long, it may not be necessary to write them all, but write them briefly, others can be explained with sound, others can be explained with sound.
3.	Linguist expert	The use of language is good, but attention needs to be paid to EYD spelling.

Effectiveness of SETS-based Plant Propagation E-Module

A large-scale trial was conducted by giving lessons to 30 fourth-grade students. The SETS-based Plant Propagation E-module was used as a learning resource in learning activities. The effectiveness of using the SETS-based Plant Propagation E-module was measured through student learning outcomes.

DISCUSSION

Karakteristik Pengembangan E-Modul Perkembangbiakan Tumbuhan berwawasan SETS

The problem found was that the learning media used by teachers was still categorized as limited, namely in the form of student books, a lack of technology-based learning media (Winda & Dafit, 2021). The limited use of media and learning resources causes students to be less enthusiastic in understanding material that is of a comprehension nature, especially in science learning (Khaira Ummah & Mustika, 2024); (Zain, A., A., & Pratiwi, 2021). This is evidenced by the low learning outcomes of students in the subject of science: out of 31 students, 21 students (53.8%) have not met the KKM, and 18 students (46.2%) have met the KKM at KKM 65.

So, the author developed an e-module for SETS-based plant propagation, which was implemented at SDN Wonorejo 04 Semarang Regency. The product design was arranged according to the data obtained through interviews with teacher and student needs. The results of the developed media are in the form of applications that can be accessed online or offline.

The design of the e-module that was developed, namely 1) The e-module design was made using Canva software, 2) The e-module design was made as attractive as possible (instructions for use, menus, concept maps, materials, LKPD, evaluation questions, conclusions adjusted to the needs of teachers and students). 3) Instructions accompany the e-module media so students can easily operate it. 4) The e-module contains text, images, and videos that are adjusted to the content of the plant propagation material. 5) E-modules containing plant propagation material are found in class IV science learning. 6) E-modules can be operated with a computer device or a cellphone (for students who do not have a computer), so they can be used and carried anywhere. 7) E-modules can be used with teacher guidance or independently to support online and face-to-face learning. 8) E-modules use short, concise, clear, and communicative language. The results of the developed E-module can be seen in Figure 1.

Figure 1.

Feasibility of Developing SETS-based Plant Propagation E-Module

Eligibility is assessed by experts (Ernawati, 2017). These experts assessed the presentation aspects of product design and material content of the SETS-based Plant Propagation E-module. Experts provided assessments through questionnaires as an assessment instrument for learning media (Nurhamidah, 2021). The questionnaire is in the form of a Likert scale and the experts are asked to provide a checklist on the scores for each aspect they assess and provide comments and suggestions as a reference for improving the learning media before being tested. Expert assessments are given by media experts, material experts and language experts (Rohmad & Sarah, 2016).

The results of the expert assessment showed that the material expert Validator obtained a score of 95% with very feasible criteria. Then, the media expert Validator obtained a 100% score based on feasible criteria. The language expert Validator obtained a score of 93% with very feasible criteria. The five Validators gave a very feasible value through the scoring, so the SETS-based Plant Propagation E-module is very feasible to use in learning. Even though it received a high score, the SETS-based Plant Propagation E-module still received suggestions for improvement. Improvements were made to obtain a feasible product during learning, as well as various inputs and suggestions from the expert validation stage (Siregar et al., 2023). The material expert advised that the material applied was following the learning outcomes in grade IV but still needed improvement in standardizing terms. Then, in the LKPD and evaluation questions, HOTS required improvement, and the media expert showed that the video section required improvement and clarification. It may not be necessary to write them all for explanatory texts that are too long, but write them briefly; others can be explained with sound, and others can be described with sound. The language expert advised to pay attention to the use of EYD and terms in the e-module.

The revised results of the SETS-based Plant Propagation E-module were then used in a small-scale test to strengthen the module's feasibility before being implemented in a large-group test. The results obtained in the small-scale test were carried out using the SETS-based Plant Propagation E-module on 17 fourth-grade students. The results of the data analysis showed that in the small-scale test, the use of media improved learning outcomes by up to 22.6%, with an effectiveness level of 58.64, according to the fairly effective criteria. Based on these results, the SETS-based Plant Propagation E-module has been feasible..

Efektivitas Pengembangan E-Modul Perkembangbiakan Tumbuhan berwawasan SETS

A large-scale trial was conducted by teaching 30 fourth-grade students of Wonorejo 02 Elementary School, Semarang Regency. The SETS-based Plant Propagation E-module was used as a learning resource in learning activities. Before using the SETS-based Plant Propagation E-module, students took a pretest first. The teacher and researchers provided learning using the SETS-based Plant Propagation E-module to support delivering the material. The media was displayed using a projector and individual devices to make it easier for students to watch and use the learning media. Students could pay attention to the teacher's explanation using the press that had been

provided. Students in groups discussed and worked on LKPD. After completing the learning activities, students worked on the posttest questions, distributed to all fifth-grade students of Kandanga 02 Elementary School, Semarang Regency. The results of the students' Pretest and Posttest answers were then subjected to statistical tests to measure the increase in students' mastery of concepts. The normality test results obtained a sig value of 0.249 in the pretest and 0.264 in the posttest. If the sig value> Significance value of 0.05, then *Ho* is accepted. The value of Sig is 0.170. So, the results of the Lilliefors test above show that the data is normally distributed.

The results of the t-test on the results of the pretest and post-test values state a sig value of 0.00 while the significance is 0.05. This shows that there is an increase in learning outcomes. So, the results of the t-test regarding the learning outcomes of grade V students of Wonorejo 02 Elementary School, Semarang Regency, before and after using the SETS-based Plant Propagation E-module that has been carried out and developed there is a difference in the average pretest and posttest scores where the average student learning outcome score increased to 83.50 from the previous score of 56.67, the increase was 26.8%.

The results of the N-Gain test on the pretest and posttest scores obtained an average difference in the experimental class of 39.8 with an n-gain of 0.53, and the criteria are Medium. In interpreting effectiveness, it received a score of 89.82, with the requirements being quite effective. The data description shows that classes that implement the SETS-based Plant Propagation E-module achieve higher learning outcomes with the requirements of being quite effective.

Implications

The implications of research results are the direct impacts obtained from the research results, the implications obtained consist of:

Theoretical Implications

Theoretical implications can involve research results with theories studied in theoretical studies. This research can add insight into the theory of learning science, especially in Plant reproduction material. The development of an E-module on Plant reproduction with SETS insight can help teachers apply learning innovations. With the E-module on Plant reproduction with SETS insight, it is easier for students to improve their understanding of concepts and learning outcomes that are in accordance with the learning activities applied (Isfi, 2015).

Practical Implications

The practical implications referred to in this study are the relationship between the research results and the subsequent learning implementation process. These practical implications include researchers, teachers, students, and schools. For researchers, it increases insight and knowledge about the SETS-based Plant Propagation E-module media, which can be used as workshop material. For teachers, it is to increase references in science learning, especially in plant propagation material. After conducting this research, it is hoped that teachers will be interested and have innovations to create similar media. The SETS-based Plant Propagation E-module also provides benefits for schools, namely, providing motivation for schools to develop media that suits the needs of their students. In addition, the SETS-based Plant Propagation E-module also provides benefits for students, namely 1) increasing students' conceptual understanding and creativity in science lessons, especially plant propagation material, 2) increasing students' interest and motivating them to learn, 3) providing new learning experiences for students and 4) improving student learning outcomes.

Pedagogical Implications

The results of this study indicate that the SETS-based Plant Propagation E-module is

feasible and effective for use in science learning media and can improve student learning outcomes. This SETS-based Plant Propagation E-module can motivate students to be more active in the learning process. The SETS-based Plant Propagation E-module was developed by considering the needs of teachers and students and the components of the SETS-based Plant Propagation E-module that experts have validated. In addition, the SETS-based Plant Propagation E-module also improves the quality of learning following the objectives formulated to enhance student learning outcomes.

CONCLUSION

The characteristics of the SETS-based Plant Propagation E-module designed in this study are as follows. (1) The e-module design is made using Canva software. (2) The e-module design is made as attractive as possible (instructions for use, menus, concept maps, materials, LKPD, evaluation questions, and conclusions are adjusted to the needs of teachers and students). (3) Instructions accompany the e-module media so students can easily operate it. (4) The e-module contains text, images, and videos that are adjusted to the content of the plant propagation material. (5) The e-module contains plant propagation material found in class IV, Science learning. (6) The e-module can be operated with a computer device or a cellphone (for students who do not have a computer), so it can be used anywhere and is easy to carry. (7) The e-module can be used with teacher guidance or independently to support online and face-to-face learning. (8) The e-module uses short, concise, clear, and communicative language. The expert assessment showed that the material expert Validator obtained a score of 95% with very feasible criteria. Then, the media expert Validator obtained a 100% score based on very feasible criteria. The language expert Validator obtained a score of 93% with very feasible criteria. Through the scoring, the five Validators gave a very feasible value, so it can be concluded that the SETS-based Plant Propagation E-module is very feasible to use in learning. The increase in learning outcomes was measured using the N-gain score; the results of the N-Gain test on the pretest and posttest values obtained an average difference in the experimental class of 39.8 with an n-gain of 0.76 and Medium criteria in the effectiveness, interpretation obtained a score of 76.50 with quite effective criteria. The control class, with an average difference of 26, obtained an N-Gain score of 0.52 in the moderate criteria and an effectiveness level of 52.35, which was less effective. Indicating that the class that implemented the SETS-based Plant Propagation E-module learning media obtained a higher increase in learning outcomes with quite effective criteria.

Declaration by Authors

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