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Project-Based Science E-Module to Stimulate the Scientific Attitude of Early Children

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Abstrak

Permasalahan yang terjadi saat ini adalah pembelajaran sains masih berpusat pada guru, sehingga perhatian anak perlu lebih difokuskan karena anak tidak diajarkan untuk terlibat langsung dalam proses sains. Penelitian ini bertujuan untuk mengembangkan e-modul sains berbasis proyek untuk menstimulasi sikap ilmiah anak usia dini. Metode yang digunakan dalam penelitian ini adalah metode penelitian dan pengembangan dengan model pengembangan 4D yaitu terdiri dari pendefinisian (define), perancangan(design), pengembangan (develop), penyebaran (disseminate). Subjek penelitian yaitu ahli media pembelajaran, ahli materi pembelajaran, dan ahli bahasa.Subjek uji coba produk yaitu guru TK IT yang berjumlah 4 guru. Metode pengumpulan data melalui angket. Instrumen pengumpulan data berupa lembar kuesioner. Teknik yang digunakan untuk menganalisis data yaitu analisis deskriptif kualitatif, dan kuantitatif. Hasil penelitian diperoleh melalui validasi ahli dan angket respon guru dengan hasil rata-rata dari validator ahli materi sebesar 2,94 (Cukup Sesuai), hasil rata-rata dari validator ahli media sebesar 3,6 (Sesuai), dan hasil rata-rata dari validator bahasa sebesar 4 (Sesuai). Untuk hasil dari respon guru terhadap e-modul sains berbasis proyek untuk menstimulasi sikap ilmiah didapatkan jumlah rata-rata persentase penilaian sebesar 46,528% dengan katagori "Layak" untuk digunakan. Berdasarkan hasil uji kelayakan e-modul sains berbasis proyek untuk menstimulasi sikap ilmiah anak usia dini dinyatakan layak untuk diaplikasikan sebagai bahan ajar tambahan.

Kata Kunci: *E-Modul, Sains Anak Usia Dini, Pembelajaran Berbasis Proyek, Sikap Ilmiah Anak*

Abstract

The current problem is that science learning is still centered on the teacher, so children's attention needs to be more focused because children are not taught to be directly involved in the science process. This study aims to develop a project-based science e-module to stimulate the scientific attitude of early childhood. The method used in this study is the research and development method with a 4D development model consisting of defining, designing, developing, and disseminating. The study subjects were learning media experts, learning material experts, and language experts. The subjects of the product trial were 4 IT kindergarten teachers. The data collection method was through a questionnaire. The data collection instrument was a questionnaire sheet. The techniques used to analyze the data were qualitative and quantitative descriptive analysis. The results of the study were obtained through expert validation and teacher response questionnaires, with an average result from the material expert validator of 2.94 (Quite Appropriate), an average result from the media expert validator of 3.6 (Appropriate), and an average result from the language validator of 4 (Appropriate). For the results of teacher responses to project-based science e-modules to stimulate scientific attitudes, the average percentage of assessments was 46.528% with the category "Feasible" for use. Based on the feasibility test results, the project-based science e-module to stimulate scientific attitudes of early childhood was declared feasible to be applied as additional teaching materials.

Keywords: e-Module, Early Childhood Science, Project-Based Learning, Children's Scientific Attitudes

1. INTRODUCTION

Early childhood is a different, unique individual and has its characteristics according to its age stage. Children must be guided to understand various things (**Marcos** et al., 2020;

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Yusa et al., 2021). Children also need to be guided to be able to understand various natural phenomena and be able to carry out the skills needed to live in society. Real experiences for children in everyday life provide direct learning by learning while playing (Irmansyah et al., 2020; Vartiainen & Kumpulainen, 2020). This aims to optimize children's growth and development, such as cognitive, physical-motor, language, and social-emotional development. Kindergarten will facilitate children's growth and development (Amantika & Aziz, 2022; Apriyanti, 2017; Ismartoyo et al., 2022; Mustika Sari et al., 2018)**.** The learning process will be successful if a teacher can understand learning planning well. Good learning can make children grow and develop according to their potential. Therefore, children must be equipped with various knowledge, including natural sciences, from an early age.

Science learning for early childhood is focused on learning about oneself, the natural environment, and natural phenomena. Science learning conveys messages between teachers and students to achieve the expected goals (Handayani & Srinahyanti, 2018; Zahro et al., 2019). Developing students' attitudes in science learning is known as scientific attitudes. Scientific attitudes are behaviors that must be possessed by a scientist when undergoing research activities or carrying out experiments (Anggraeni, 2017; Sudana, 2018). Scientific attitudes must be trained early to become a true scientist (Septine & Wijayanti, 2019; Siregar, 2019). Children's attitudes need to be fostered from an early age so that in the future, children can become individuals who have good attitudes, have a high curiosity about learning, are responsible, and value honesty. Scientific attitudes are essential for children because they influence attitudes in learning, responding to problems, carrying out tasks, and developing themselves, so children's learning outcomes are influenced by scientific attitudes (Nu'man, 2023; Olua, 2022).

However, the current problem is that science learning is still centered on teachers, so children's attention needs to be more focused because children are not taught to be directly involved in the science process. Previous research findings also revealed that science learning for early childhood is still centered on teachers so that it could be more optimal (Amantika & Aziz, 2022; Dewi Setiawati & Ekayanti, 2021). Other studies also reveal that poor science skills are caused by a lack of learning media or inappropriate learning models that interfere with learning activities (Wati & Jayanti, 2022; Wijaya & Dewi, 2021). Based on the results of observations regarding science for early childhood that have been carried out at the Auladuna 1 Integrated Islamic Kindergarten, Bengkulu City, problems were found related to media and children's learning resources. The e-module available at the school has yet to be tested on teachers. This e-module cannot be said to be effective because teachers at the kindergarten have yet to use the e-module at school. The obstacle to utilizing the e-module is that many teachers need IT skills and help understanding how to manage applications other than Microsoft Word and PowerPoint.

Based on these problems, the solution offered is to develop a valid Project-Based Science E-module that teachers in science learning can use. E-modules are modules in electronic format that run on a computer (Syahrial et al., 2019; Winatha et al., 2018). Electronic modules (e-modules) themselves are almost the same as e-books. The difference is only in both content (Herawati & Muhtadi, 2018). E-Modules are electronic versions of modules that can be accessed and used via electronic devices such as computers, laptops, or even mobile phones (Herawati & Muhtadi, 2018; Syahrial et al., 2019; Winatha et al., 2018). The text in the e-module can be created using Microsoft Word. However, e-modules must be created to display interactive media using special e-book programs such as Flipbook Maker, iBooks Author, and Calibre. The advantage of e-modules over printed teaching materials is that e-modules are complete with interactive media such as video, audio, animation, and other interactive features that can be played and replayed by students (Imansari & Sunaryantiningsih, 2017; Nisa et al., 2020). E-modules are considered innovative because

they can display complete, engaging, interactive teaching materials and carry good cognitive functions so that they can be used to improve scientific attitudes in children.

Scientific attitudes in early childhood can be taught through project methods. Project-based learning makes children full of practical activities (Hands-on) (Motimona & Maryatun, 2023; Oktari, 2021). Practical learning can provide the broadest possible opportunities for students to be actively involved so that there are more opportunities for students to develop scientific attitudes, self-concept, self-confidence, and independence (Jaiton et al., 2016; Magta et al., 2019). Teaching scientific attitudes in early childhood can be done through project-based learning so that children can apply learning models to carry out scientific processes, which can also develop scientific attitudes to produce natural products. Children will implement all activities and steps of guidance that must be carried out in learning using modules (Ayu et al., 2021; Motimona & Maryatun, 2023; Oktari, 2021).

Previous findings revealed that science learning could improve scientific attitudes in children (Adawiyah & Mulyana, 2020; Indraswari et al., 2022; Wati & Jayanti, 2022). Other studies also state that using E-modules can increase students' enthusiasm for learning (Rosmawanti et al., 2020; Winatha et al., 2018). Based on the results of these studies, no research on literacy learning strategies for early childhood. Project-based electronic science modules to stimulate scientific attitudes in early childhood. This science module is used to stimulate scientific attitudes in early childhood. Therefore, this study aims to develop a project-based science e-module to stimulate scientific attitudes in early childhood.

2. METHOD

This research and development method is in English Research and Development (R&D). This study aims to produce a project-based science e-module to improve the scientific attitudes of early childhood using experimental methods. The design of this study uses a 4D (four-D) development model. The 4-D development model was developed by Sivasailam Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel in 1974 (Irnando et al., 2020). A development model can be used to develop various types of learning media (Riani Johan et al., 2023). This model divides the instruction development process into 4 stages: define, design, develop, and disseminate (Irnando et al., 2020). The first stage is initial-final analysis, student analysis, material analysis, task analysis, and specification of learning objectives. The second stage aims to produce a design that will be used to develop a product, namely an electronic-based module, commonly called an e-module, that will be used by teachers in schools to stimulate the scientific attitudes of early childhood in project-based science learning. The third stage is to develop products and test their validity from experts. The last stage is dissemination, a trial process for making products that are developed, validated, and tested for feasibility.

This research was conducted at TK IT Auladuna 1 Bengkulu City. The research subjects were learning media experts, learning material experts, and language experts. The subjects of the product trial were 4 IT TK teachers. The data collection method was through a questionnaire. The module validation questionnaire consisted of validation for media experts, material experts, and language experts, which aimed to measure the quality of the e-module feasibility of the product developed. This teacher response questionnaire aimed to determine the teacher's response to the learning media in the e-module with the project learning model developed. The data collection instrument was in the form of a questionnaire sheet. The research instrument grid is presented in Table 1.

Table 1. Expert Validation Instrument Grid for Learning Media.

Assessment Aspects	Indicator
Screen Design Display	Background text color
	Layout (text and images)
	Relationship between illustrations, graphics, visuals and verbals according to
	Clarity of title and content of e-module
	Attractiveness of e-module design
Ease of Use	e-modules are presented sequentially
	e-modules are easy to operate
	Content is easy to access
	Operational buttons function properly
Graphics	Words, terms, and sentences in learning materials are consistent
	The shape and size of the letters are consistent
	Display layout
	The colors, sizes, and types of letters used are appropriate, suitable, and easy to read
	Illustrations/pictures, videos, video narration, and backsound are clear and can be heard and understood
Usefulness	The steps in the e-module make it easier for students to learn independently
	Teachers/educators can interact using the e-module easily
	Children can interact using the e-module easily
	Able to increase students' attention in learning

The techniques used to analyze the data are qualitative and quantitative descriptive analysis. Qualitative descriptive analysis is used to manage data in the form of input provided by experts regarding project-based science e-modules. Quantitative descriptive analysis is used to manage data in the form of scores provided by experts regarding project-based science e-modules.

3. RESULTS AND DISCUSSION

Results

This study aims to produce a project-based science e-module to improve the scientific attitude of early childhood using the 4-D model. The results of the study are as follows. First, the define stage. The results indicate that the electronic module has yet to be implemented in schools due to a lack of understanding of the use of IT applications; the module in schools is still in the form of instructions without guidance. The study showed that this e-module effectively increases children's involvement in exploratory activities and science learning. Children become more enthusiastic in observing, experimenting, and asking questions and experience significant development in critical thinking skills, curiosity, and conclusion. The material focuses on introducing various medicinal plants, the benefits of medicinal plants, parts of medicinal plants, how to plant medicinal plants, and how to care for medicinal plants. With this activity, children are invited to observe, experiment, and draw conclusions in simple experiments, namely the betadine and lime experiments. The learning objectives to be achieved in the research on the development of project-based science e-modules to stimulate the scientific attitudes of early childhood are to improve children's ability to think critically, observe, experiment, and draw conclusions. Through this e-module, children are expected to

develop scientific attitudes, such as curiosity, sensitivity to the environment, perseverance, discovery and creativity, open-mindedness and cooperation, and critical thinking by actively involving children in simple but meaningful exploratory projects.

Second is the design stage. At this stage, an initial design will be used to create a science to stimulate early childhood's scientific attitude. Researchers carried out an initial design for the e-module design using the Canva application, which was accessed online with the website addresses canva.com and bookcreator.com, to create books in electronic form with bookcreator.com. The opening section consists of the front or module cover, foreword, table of contents, learning greetings, learning objectives, general description, and concept map. The module's contents are filled with science material with the theme of medicinal plants sub-theme. This module contains learning materials, experimental activities, and competency tests for students. Each section is equipped with illustrations, examples, and assignments encouraging children to participate actively and help them master the material more effectively. The closing section consists of a bibliography listing various references used in compiling the research. The module material is displayed according to indicators by considering learning achievements per the syllabus. The material is taken from transparent sources and by the learning material. The study guide that will be created will focus on project-based science modules because this method allows students to find problems in more contextual projects or everyday life.

Third is the development stage. At this stage, develop the science e-module that was created before validation. The development of the e-module uses the Canva application and creates an electronic module using the Book Creator application. The creation of the teaching module begins with the preparation of the teaching module using the Canva.com and BookCreator.com applications. The design of the project-based science e-module prototype to stimulate the scientific attitude of early childhood uses the Canva.com application in PDF format. The development results are presented in Figure 1.

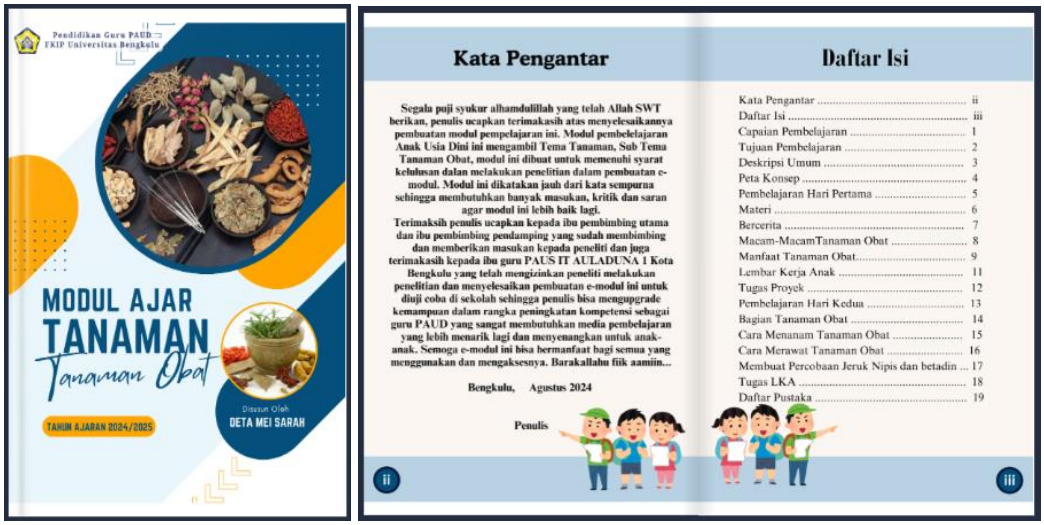

Figure 1. Results of Project-Based Science E-Module Development

Experts then validated the developed Project-Based Science E-Module. Validation was carried out by 3 expert validators: media, material, and language experts. The assessment process was carried out to validate the project-based science e-module to stimulate the scientific attitudes of early childhood that had been designed. The results of the validation test carried out by media experts showed that the project-based science e-module to stimulate the scientific attitudes of early childhood obtained an assessment result of 87 and an average assessment of the media validator of 3.6, which indicates that the e-module description agrees

to be used in learning. The results of the validation test carried out by material experts showed that the project-based science e-module to stimulate the scientific attitudes of early childhood obtained an assessment result of 53 and an average assessment of the material validator of 2.94, which indicates that the e-module description is quite suitable for use in learning. The results of the validation test carried out by language experts showed that the project-based science e-module to stimulate the scientific attitudes of early childhood obtained an assessment result of 24 with an average assessment of the language validator of 4, which indicates that the e-module description is suitable for use in learning. The results of the average value calculations are presented in Table 2.

Table 2. Total Average Results from Expert Validators

Validator	Assessment Results	Category
Material Expert	2.94	Quite Appropriate
Media Expert	3.6	Appropriate
Language Expert	4	Appropriate
Average Total Rating	3.51	Appropriate

Based on the assessment results from the expert validators of material, media, and language experts, the project-based science e-module to stimulate scientific attitudes of early childhood received a total average value of 3.51, which is said to be "appropriate", which means that the project-based science e-module to stimulate scientific attitudes of early childhood is declared appropriate. The teaching module that has been revised or improved is based on the comments and suggestions of the expert validator and has been declared suitable for field trials. Furthermore, the teaching module is given to teachers to assess whether the project-based science e-module can stimulate scientific attitudes in early childhood. The module is a hyperlink accessed via a computer/PC and smartphone. The trial response was given to 4 teachers at the TK IT AULADUNA 1 school in Bengkulu City. The results of the trial can be seen in Table 3.

Table 3. Data on the Analysis of the Feasibility of Teacher Responses to E-Modules to Stimulate Children's Scientific Attitudes

Respondents	Number of Items	Ideal Score	Score Obtained	Average Rating	Qualification
Teacher 1	18	36	14	38.889 %	Yes
Teacher 2	18	36	17	47.222 %	Yes
Teacher 3	18	36	18	50 %	Yes
Teacher 4	18	36	18	50 %	Yes
Total	**72**	**144**	**67**	**46.52775 %**	**Yes**

The results of the data analysis show that the average results of the feasibility test indicate that the project-based science e-module to stimulate the scientific attitude of early childhood obtained the assessment results obtained, namely 67 with an average language validator assessment of 46.52775%, which shows that the e-module is suitable for use in learning and with the statement "the project-based science e-module to stimulate the scientific attitude of early childhood is suitable for use in learning and tested without revision".

Discussion

The study results indicate that project-based science e-modules are suitable for learning activities. This is due to the following factors. First, project-based science e-modules can stimulate scientific attitudes in early childhood. Project-based science e-modules can stimulate scientific attitudes in early childhood by encouraging active learning, and children are directly involved in experiments (Dewi et al., 2018; Magta et al., 2019). Through this practical experience, children can understand scientific concepts more deeply (Nurinayah et al., 2021; Zulkarnaen et al., 2023). Science learning for early childhood is designed to introduce basic science concepts through fun and interactive exploration activities. This learning process involves observation, simple experiments, and questions and answers to arouse children's curiosity (Handayani & Srinahyanti, 2018; Zahro et al., 2019). Science for children is unique, discovered, and considered exciting; it provides knowledge or stimulates them to know and investigate (Nu'man, 2023; Olua, 2022). Using a play-while-learning approach, science learning at an early age develops children's knowledge of the surrounding environment. It forms critical thinking skills, observation skills, and scientific attitudes such as curiosity and perseverance. Science learning in early childhood will shape children's mentality to become burdensome individuals and ready to face various rapid technological advances.

Second, project-based science e-modules can increase learning motivation. The use of e-modules stimulates their curiosity and provides opportunities to learn in a fun way (Asrial et al., 2019; Darmaji et al., 2022). In addition, group collaborative activities create a positive social atmosphere where children can interact, share ideas, and support each other. This approach also allows them to feel a sense of accomplishment when they complete a project, increasing motivation and learning satisfaction (Handayani & Srinahyanti, 2018; Nu'man, 2023; Olua, 2022; Zahro et al., 2019). The use of e-modules in science learning for early childhood is considered practical and exciting to improve children's scientific attitudes in terms of aspects of use, including varied and innovative media in the form of pictures/illustrations and videos and accompanied by children's worksheets and assessment sheets. The use of e-modules is also considered more efficient. The learning process becomes more flexible and can be done anywhere, anytime, and from any source (Komikesari et al., 2020; Rahayu & Sukardi, 2020). This e-module can stimulate the scientific attitude of early childhood because it provides an interactive and exciting learning experience, encouraging children to explore and experiment actively. This e-module learning media has proven effective in improving learning grades and abilities and positively affects students' digital literacy.

Third, project-based science e-modules can create a fun learning atmosphere. Well-designed e-modules involve creative elements, such as art or technology, which can add fun to learning (Sofyan et al., 2019; Winatha et al., 2018). Project-based science e-modules teach scientific concepts and create an environment that supports exploration, creativity, and togetherness, making the learning experience more enjoyable and meaningful. Science learning activities are fun, bringing children closer to nature and developing thinking and science process skills (Nu'man, 2023; Olua, 2022; Wijaya & Dewi, 2021). Children will not only learn science but also develop a scientific attitude in themselves. This is what causes project-based science e-modules to create a fun learning atmosphere.

Previous findings also revealed that E-modules can increase student enthusiasm (Ramadhan et al., 2020; Seruni et al., 2019). Other findings also revealed that E-modules can improve learning outcomes (Nisa et al., 2020; Winatha et al., 2018). The advantages of E-Modules are 1) Project-based science E-modules to stimulate scientific attitudes that are developed have attractive images/illustrations; 2) Made with a good layout arrangement so that it provides convenience and comfort for users; 3) Science E-modules are developed with

project-based learning modes; 4) E-modules are also easily accessible via mobile phones, tablets, or laptops. The limitations of this study are that it did not reach the product effectiveness test, but it can be used because it has received very good qualifications from experts. This study implies that the Science E-module is valid for stimulating scientific attitudes because it has gone through a validation process that ensures that the content, design, and learning methods are by the objectives and needs of early childhood learning. Thus, the project-based science e-module to stimulate scientific attitudes in early childhood can be used as additional teaching materials in the learning process. Therefore, the science e-module to stimulate the scientific attitudes of children is very important to implement because it can increase children's curiosity, perseverance, cooperation, and critical thinking.

4. CONCLUSIONS AND SUGGESTIONS

The results of the study indicate that project-based science e-modules can stimulate children's scientific attitudes, in accordance with the feasibility of the learning modules that have been implemented. E-modules are considered feasible to use because they can be used and implemented in schools. Electronic teaching modules can stimulate children's scientific attitudes in science learning. With this science e-module, it can help teachers in implementing more interesting learning so that children focus on learning and do not get bored easily.

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