



Development of P5 Teaching Modules Based on a Scientific Approach to Strengthen the Character of Elementary School Students

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Abstract: This study aims to develop a P5 teaching module integrated with a scientific approach in strengthening the character of students in elementary schools. The research method used is Research and Development (R&D) with a Design Based Research (DBR) development model with four stages: preliminary study, design and product development, interactive testing cycle and reflection on refinement. The sampling technique uses purposive sampling. Data collection techniques use observation, interviews, and questionnaires. Data processing techniques use descriptive statistics. Stages 1 and 2, the problem analysis and design and product development stages involve fourth-grade teachers of SD Negeri 2 Santong. Stage 3, validation involves 3 experts, namely design, material, and language experts. Stage 4, reflection and product refinement involve fourth-grade students of SD Negeri 2 Santong. The results of the study show that the P5 teaching module based on a scientific approach meets the eligibility criteria with a feasibility percentage of 88% from design experts with feasible criteria, 80% from media experts with feasible criteria, and 94% from language experts with very feasible criteria. The results of statistical testing using the T test obtained a significance value of $0.00 < 0.05$, which indicates that there is a significant difference between the pretest and posttest results, while the effectiveness criteria obtained a value of 62.21% with a moderate category in improving the character of fourth grade students at SD Negeri 2 Santong.

Keywords: Module P5; Character building; Scientific

Introduction

Character education is a crucial aspect of the Indonesian education system, particularly at the elementary school level. Character education is crucial for developing a superior and noble generation (Putri & Dinie, 2022). The erosion of national character is evident in the emergence of signs of a shift in character toward moral decline (Dalyono & Lestariningsih, 2017; Julaeha, 2019). These signs of character erosion can be seen in the increasing incidence of social deviations and immoral acts, such as inappropriate clothing for students, arriving late, drinking alcohol, using illegal drugs, promiscuity, brawls, abuse of authority, violence, and even murder (Almajid, 2019; Ekawati et al., 2018).

The solution to addressing character issues in Indonesia, particularly in education, is to implement learning using the P5 learning module based on a scientific approach. The P5 learning module is designed to strengthen national character through project-based learning (Muktamar et al., 2024). The P5 learning module offers an approach aimed at developing students' character and abilities (Hamzah et al., 2022), directing students to engage directly in the real world, making learning more enjoyable (Ulandari & Rapita, 2023). A fun learning process will develop independent thinking and initiative skills, thereby increasing learning independence (Mujiyatna et al., 2023), as well as increasing enthusiasm and motivation to learn (Khomsariyani et al., 2024). P5 learning not only focuses

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on cognitive abilities but also has an impact on strengthening character (Fitriani et al., 2023). The implementation of P5 learning can be carried out using several learning approaches, all of which are project-based (Muktamar et al., 2024). One learning approach that can be applied is the scientific approach (Budiyanto et al., 2016).

Several studies have shown that learning using scientific-approach-based learning modules significantly improves student learning outcomes. Research indicates that learning using scientific-approach-based learning modules significantly improves student learning outcomes (Sefrida & Enjoni, 2022; Cahyani & Eska, 2021). Research conducted by Setiyadi (2017) also shows that learning using scientific-approach-based learning modules can improve students' cognitive abilities. Improved cognitive abilities will impact student learning outcomes. Furthermore, the learning process using scientific-approach-based learning modules shows that students are more enthusiastic in the learning process, foster a collaborative attitude, and increase student interest and attention in learning (Nurfaidah et al., 2020). Therefore, learning using scientific-approach-based learning modules has proven effective in improving student learning outcomes (Rikizaputra et al., 2021; Juniar et al., 2023).

Based on the research presented, it is known that learning with a scientific approach can be a more effective alternative in improving learning outcomes. However, previous findings were more dominant in improving students' cognitive abilities. In the above research, no scientific approach learning has been found that leads to strengthening students' character. The novelty of this research lies in the development of a P5 teaching module based on a scientific approach as a character strengthening for elementary school students. Character strengthening is very appropriate when integrated into teaching materials collaborated with a project-based learning approach, this is because playing or interacting directly with the real world is an activity carried out in every child's life and is an inseparable part of the process of strengthening their personality (Wati et al., 2020). Programmed and continuous character formation needs to be instilled in students so they are able to apply it in family life, school, society, and national life, which will ultimately make a positive contribution to their environment (Isa, 2020). The importance of character building in learning is part of students' psychological development and also an effort to ensure students are able to act in accordance with the values prevailing in their surroundings (Roesmawati et al., 2022). Through character building in learning, students are able to distinguish between good and bad, thus developing good ethics and morals when

interacting in their lives, which will impact the development of their emotional intelligence (Prastyo et al., 2021). With this scientific approach-based P5 teaching module, it is hoped that students will not only understand the scientific stages but also be able to strengthen character values so they can make a positive contribution to their environment.

Method

This research is a research and development (R&D), with the model used to develop the teaching module in this study is DBR (Design Based Research) or research-based design consisting of four stages: problem analysis, design and development, interactive testing cycles and reflection and product refinement. The subjects of this study were fourth-grade students of SD Negeri 2 Santong who were obtained by purposive sampling. The object of this research is the scientific-based P5 teaching module as a character strengthening for fourth-grade students of SD Negeri 2 Santong. Data were collected using interviews, observations, and questionnaires. Interviews and observations were used to analyze P5 learning problems with the reality of learning in strengthening student character obtained through teachers. The indicators were the achievement of dimensions and elements that were the target of expected achievement according to Pancasila values. The questionnaire was used for validation by design, material, and language experts whose parameters were product feasibility, the questionnaire was also used to measure the achievement of student character whose indicators were religious and creative characters. The questionnaire was formulated based on a linkert scale. Data were analyzed qualitatively and using descriptive statistics.

Result and Discussion

Problem Analyst

The results of interviews and observations on P5 learning in elementary schools, showed several findings as follows: based on the results of interviews with grade IV teachers of SD Negeri 2 Santong, it was found that there were obstacles faced by teachers in implementing P5 learning, this was because the P5 teaching module used in schools was not well structured, learning activities did not present material that was relevant to the needs of students, as a result P5 learning could not be realized properly. This statement was also supported by the results of observations that showed a lack of enthusiasm from students in participating in P5 learning, students did not pay attention well to the information conveyed by the teacher, students' lack of

understanding of P5 material resulted in the P5 learning objectives that had been formulated not being achieved as they should.

The results of the joint needs analysis found that teachers have high expectations regarding the implementation of P5 learning in schools. Teachers hope that learning can take place contextually, directing students to be actively involved in learning, encouraging students to think at a higher level so that they are able to solve problems faced through scientific exploration. However, in practice, the implementation of P5 learning has not fully met expectations. The reality that occurs in the field is that teachers experience several obstacles when implementing learning using P5 teaching modules such as limited facilities and infrastructure, the ability to determine time allocation, the ability to design structured and directed learning activities, and the ability to determine themes that suit students' needs.

The gap between expectations and reality indicates the need for a P5 learning module which more structured, directed, and relevant to student needs, teacher capacity building, adequate resource support, and ongoing coaching so that P5 learning can reflect the comprehensive implementation of the Pancasila student profile, which impacts the formation and strengthening of positive student character. Well-structured teaching modules play a crucial role in supporting the achievement of learning objectives (Arinie & Azmah, 2025). Teaching modules are a medium to support the quality of learning and learning outcomes (Maulida, 2022). Teachers can incorporate components such as character education and innovation into teaching modules or syllabi (Hasanudin et al., 2021). In the context of learning, teachers are the implementers of the

learning process and the continuity of learning. Teachers must be able to develop students' potential and provide meaningful learning experiences (Buchari, 2018). Rahayu & Anggraeni (2017) state that curriculum implementation must be accompanied by human resource empowerment through training and coaching. More specifically, Lembong et al. (2023) stated that the goal of teacher training and development is to improve pedagogical competence and skills to provide innovative, creative, and relevant learning to meet students' needs. Furthermore, school facilities and infrastructure will also support the quality of learning, outcomes, and the learning process (Jannah & Sontani, 2018).

Product Design and Development

The development of this model is based on the reverse design of Gagne et al. (1992), in the form of a formulation of learning objectives. Referring to the results of the problem analysis, the main focus of this study is strengthening student character. The formulation of learning objectives becomes the basis for the development of a module design consisting of four components: module profile, objectives, activities, and assessments. The learning activity component is modified from the learning variables according to Reigeluth and Merrill in the form of conditions, methods, and learning outcomes (Sukardi, 2016). Specifically, the learning procedure is adopted from the opinion of Reigeluth and Merrill, which consists of three components, namely organizing material, delivering material, and managing learning.

The initial design of the P5 teaching module based on a scientific approach is presented in Table 1.

Table 1. Initial design of P5 module based on scientific approach

Module Components	Explanation
Module Profile	Contains the title; theme; level or phase and illustration of the project to be implemented.
Learning objectives	Contains learning objectives; dimensions; sub-elements and development assessment indicators for each sub-element per phase. The objectives emphasize strengthening students' religious and creative character through the construction of learning device products in the form of P5 teaching modules based on a scientific approach.
Learning Activities	
Organizing materials	Includes material arrangement, text and image design, expected targets, and student worksheets. The ordering of the material is based on the sequence of student understanding.
Delivery of material	The material is delivered using a constructivist approach that refers to the active construction of knowledge, social interaction, emphasizing direct experience and reflection, problem solving and the utilization of diverse resources. Its implementation takes the form of: activating prior knowledge through face-to-face meetings; exploration; discussion, collaboration and explanation of concepts; structured assignments inside and outside the classroom.
Learning Management	The learning stages follow the scientific stages, namely: observing; asking; trying; reasoning and communicating through activities such as activating initial knowledge; presenting new knowledge; practicing understanding; practicing in and outside the classroom; and evaluating the process and results of the project.
Assessment	Assessment is directed at the use of project-based assessment. This includes: group assignment guidelines (LKPD); assessment criteria for each aspect (planning, implementation, results/products); and assessment rubric.

Interactive Testing Cycle

The first test uses expert validity testing to test the level of feasibility of a product. Gultom (2017) stated that validation testing is necessary to produce products that meet standards and are suitable for use, as well as to identify product weaknesses. This testing involved three experts: a design expert, a material expert, and a language expert. The results of this testing are shown in Table 2.

Table 2. Summary of the results of the design, material and language expert tests

Testing Aspects	Score	Assessment Categories
Design	4.35	Very good
Material	4.1	Very good
Language	4.75	Very good

The expert test interpretation criteria refer to Sukardi (2016), namely: very good, if the average assessment or response (pt) > 4; good, if 3 < pt < 4; sufficient, if 2 < pt < 3; less, if 1 < pt. Based on Table 2, it can be seen that the results of the expert test scores are 4.35, 4.1, and 4.75, respectively. All of these results are included in the very good category. So, the product is suitable for use in elementary schools. Thus, based on the test results, it is concluded that the P5 teaching module based on the scientific approach is suitable for use in elementary schools.

Effectiveness Test

This test was conducted to determine the effectiveness of the module in strengthening students' character in elementary schools. This test was conducted using a prerequisite test (normality) that must be met, followed by a t-test. The data were normally distributed because the significance value was greater than 0.05, namely 0.500. With the prerequisite test (normality) met, a parametric test was conducted using the t-test. The test results are as follows.

Table 3. Summary of hypothesis test results

Variables	N	Mean	Std	T	Df	Sig.
Character						
Pretest	23	-34.957	9.508	-17.632	22	0.000
Character						
Posttest						

Based on the data in Table 3, it shows that there is a very significant difference between the pretest and posttest results where the data shows a figure of 0.00 which means that $0.00 < 0.05$ so it can be concluded that the average results after being given treatment (posttest) are statistically higher compared to the results before being given treatment (pretest). To determine the level

of effectiveness, an N-Gain test was conducted, with the results shown in Table 4.

Based on Table 4, the data shows that the use of P5 teaching modules based on a scientific approach is effective in strengthening the religious and creative character of students in Elementary Schools, this is indicated by the percentage of 61.21% obtained with a moderate category. This result is based on the results of research by Uswah (2024) with the findings of his research that the use of teaching modules developed by paying attention to student needs can strengthen student character. Furthermore, Mulyanto et al. (2023) in their research results also showed that through the application of a scientific approach in learning can develop student character. The application of a scientific approach in learning makes students more active, creative, learning becomes more enjoyable, students can think more scientifically and students' characters are increasingly formed, in addition, students are increasingly more enthusiastic in participating in learning because the learning provided does not display too much theory but more practice (Paut, 2016).

Table 4. N-Gain test results

Profit (%)	Interpretation
61.21	Medium to high

This opinion is in accordance with the syntax of the scientific approach which is very supportive in the formation of 21st century learning, namely learning that provides meaning to students in the learning process that involves high-level thinking activities, critical and scientific skills (Pribadi et al., 2022), providing valuable learning experiences because students not only receive information but also contribute to building knowledge through exploratory activities (Qolbi et al., 2025). In line with that, Hidayat & Muliyani (2020) also stated that the scientific approach allows students to understand concepts in depth because students are involved in the process of discovering knowledge through experiments and direct experience. Learning with a scientific approach is considered the most appropriate and suitable in developing students' attitudes, skills and knowledge (Indriyanti et al., 2017). The learning process that involves students actively and exploratively allows students to be more challenged and increase motivation so that it directly influences learning outcomes in various aspects, both cognitive, affective, and psychomotor (Lestari & Yuliani, 2020), teachers can carry out the learning process that will be given to students in more detail so that it is easier for students to follow the instructions given to achieve the target learning objectives. Learning instructions need to be delivered specifically to students to facilitate understanding of the learning material.

The P5 teaching module, based on a scientific approach, facilitates students' habituation to scientific action and scientific thinking, which will impact the development of positive character. It not only strengthens in-depth conceptual understanding but also teaches students to apply understanding and knowledge through contextual, higher-order thinking activities. Thus, the P5 teaching module, based on a scientific approach, contributes to the formation and strengthening of Pancasila-based character in students.

Final Design Revision

The final result of a series of testing processes was the creation of a final model of an integrated scientific approach in P5 learning. During the testing process, several suggestions, input, and improvements were obtained, resulting in the final module. The description of the final results is shown in Table 5.

Table 5. Final design description

Module Components	Explanation
Module profile	In the module profile component, there are changes to the title section to better reflect the project that will be carried out while still paying attention to the needs of schools and students.
Objective	<p>There are no changes to this component. Its structure remains aligned with the competencies to be achieved in accordance with the predetermined project theme, based on the Pancasila values developed through project activities.</p> <p>The learning objectives are directed at the development of the dimensions of the Pancasila student profile. The chosen project theme is specific and relevant to the learning objectives while still paying attention to the needs of students, namely emphasizing strengthening religious character and creative character as the main focus.</p> <p>The projects being implemented include competencies that are to be developed, namely faith and piety towards God Almighty and noble morals (religious) and creative competencies.</p>
Activity Organizing the material	<p>The organization of the material remains focused on active learning experiences and experiential learning through direct experience and exploration.</p> <p>Organizing the material remains focused on mapping the material, presenting learning objectives, designing text and images, and evaluating.</p> <p>The ordering of the material is based on the learning objectives and competency profiles of Pancasila students that they wish to achieve.</p> <p>Each material is presented in a communicative manner, complemented by colorful illustrations. Text is arranged according to appropriate margins, appropriate font choices, and attractive image designs.</p>
Delivery of material	<p>There are no fundamental differences in this component from the initial design. The delivery of the material is based on constructivist principles: learning to actively build knowledge, interaction and collaboration, in-depth understanding, and practice-based activities.</p> <p>Learning builds knowledge actively, where students not only receive information, but are also active in the process of constructing their own knowledge based on experience and interaction with the environment.</p> <p>Learning in study groups, where each study group has a clear structure and clear division of tasks both during learning in class and practice outside the class.</p> <p>Face-to-face meetings are held in class to discuss each material that will be practiced inside and outside the class.</p>
Learning management	<p>The design of this component has not changed.</p> <p>Learning begins by activating knowledge through observing videos, images and stimulating questions. The learning stages follow the scientific stages, namely: observing; asking; trying; reasoning and communicating.</p> <p>Learning takes place inside and outside the classroom.</p> <p>Reflection of understanding is carried out by answering student worksheets (LKS) in each learning activity.</p>
Assessment	<p>The assessment is conducted using project-based assessment. This component is also not different from the initial design, including: Guidelines for individual and group assignments (LKPD) starting from planning, implementation, results and reporting. assessment criteria for each aspect (planning, implementation, results/products, and reporting). assessment rubric to measure student character achievement.</p>

Conclusion

Based on the quantitative data and discussion presented above, it can be concluded that the use of the P5 teaching module based on a scientific approach is effective in strengthening students' character. This is proven by the achievement of an N-Gain percentage of 61.21%, which is in the moderate category. This means that learning using the P5 teaching module integrated with a scientific approach can be used in elementary schools because it can strengthen students' character.

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Author Contributions

Conceptualization and formal analysis, resources-data curation-original draft preparation, W.A.; methodology, data curation resources, S.; formal analysis, reviewer and editor, S.I. All authors have read and approved the published version of the manuscript.

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Conflicts of Interest

The author declares no conflict of interest.

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