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The Development of Teaching Materials Based on Self-Directed Learning to Improve Students' Problem-Solving Ability

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Abstract

As the demands of educational world, which emphasizes the importance of problem-solving skills, social studies learning needs to be optimized to equip students with relevant skills for overcoming challenges in society. This study aims to design and develop teaching materials that apply self-directed learning, and also to evaluate the effectiveness of the implementation of these teaching materials in the context of social studies learning. The form of teaching materials in this study consist of a Student Book and a Teacher Book designed using an approach that emphasizes the development of students' independence in the learning process. By producing a product that aligns with students' needs, Research and Development (R&D) employs in this study. In the process of developing teaching materials, media expert and subject matter expert are involved to ensure the quality and success of the products. The effectiveness of the learning materials was tested through an experiment two seventh-grade classes at SMP Negeri 3 Ungaran. This study demonstrates that teaching materials applying self-directed learning can enhance students' problem-solving skills. This finding is supported by statistical tests confirming the effectiveness of these teaching materials in achieving learning objectives.

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INTRODUCTION

The social studies subject covers various fields of knowledge, including geography, economics, history, anthropology, and sociology. All of these subjects are based on the problems that occur in daily life of the society. Purnomo et al. (2016) stated that social studies learning must focus more on educating students holistically rather than delivering required materials. In social studies learning, students are expected to understand various concepts, develop them, and enhance their skills, morals, and attitudes based on the concepts they have mastered. This process takes place through the interaction between educators and students in the learning context to achieve the intended goals (Sudwiarrum et al., 2023). According to the Ministry of Education, social studies learning objectives include four main aspects. First, students are expected to be able to understand and connect plans that relate to their lives in the family, community, and environment. Second, students need to develop basic skills such as critical and analytical thinking, the ability to explore, solve problems, and increase their curiosity, in addition to social skills which are very important. Third, the objective of learning is to build the awareness and commitment towards sosial and humanitirian principles. Last, students are expected to develop the ability to collaborate effectively, communicate clearly, and compete responsibly in a multicultural society including local, national, and international levels (Gianistika et al., 2021). These days teachers are required to make innovation according to the needs of times in various aspects from the objectives, programs, models, processes, to evaluation. (Sarahono et al., 2024). To achieve the goal of learning social studies in society, students must be able to recognize problems in their environment and actively participate in solving them. This requires students to develop sensitivity and problem-solving skills to address societal challenges effectively. Nowadays, Social studies learning commonly only utilizes conventional learning models or lectures. This method does not foster students' character development, including their problem-solving skills, due to the passive role of learners in the process. As a result, the learning objectives of social studies, particularly in developing problem-solving ability, have not been achieved. In the real world, problem-solving skills is one of essential skills that students have to be mastered. Students' learning readiness can serve as a foundation and means for addressing various societal issues, helping to shape their mindset and better prepare them to overcome challenges (Kurniawati et al., 2019). Students' problem-solving ability is also a social attitude. Social attitudes develop throughout a person's life and influence individual behavior toward various situations (Utami et al., 2019). Problem-solving skills will be possessed by students if educators teach and sharpen it effectively. It can be train by applying effective problem-solving to find the solutions. Students are involved by introducing them to research steps, guide them to identify conceptual problems or methodology in research, and also help them to plan the solution in overcoming the issues (Prastiwi & Nurita, 2018).

There is still a lack of convincing evidence on the impact of self-directed learning on student learning outcomes. Thus, it is an important step to examine this learning model as an approach that focuses on individual self-development, starting with their own initiative through independent planning of the learning process. (Sugerman et al., 2022). Additionally, self-directed learning model has the advantage of allowing students to adjust their learning style and pace of learning. (Baharuddin et al., 2022).

Previous research that examined the model of self-directed learning and its implementation in school lessons has been conducted by Ajeng Ayu Novelia Sidmewa and team, with the title "*The Effect of Self-Directed Learning Model on Student Learning Outcomes in Economics Subjects*". This research began with a problem related to the low learning outcomes of students, which is a key indicator to assess the extent to which the learning process is successful in achieving educational goals. This problem indicated the importance of finding solutions that could increase the effectiveness of learning and student achievement. In order to solve this problem, Ajeng's research adopted a quantitative approach with an experimental design, which allowed them to directly compare student learning outcomes between two groups that were

given different treatments. The findings of this study showed that there was a significant difference between the group of students who applied the self-directed learning method and the group of students who did not apply this method. This is demonstrated that the implementation of self-directed learning method positively contribute in increasing student learning outcomes (Sidmewa et al., 2021).

Based on the data and findings of the previos studies, there is a gap between the learning objectives of social studies and the reality in practice. Therefore, this research aims to help in achieving the goal of social studies learning, particularly problem-solving skills. The researchers created teaching materials based on self-directed learning method to examine whether this learning model is suitable for social studies lessons and can help students improve social skills, especially in solving problems (Utama et al., 2023).

This study aims to design and develop an initial prototype of teaching materials based on self-directed learning, which is not only focused on delivering material, but also on developing students' independence in managing their learning process. By implementing this method, students are expected to take more initiative in learning, sharpen their ability to learn independently, and increase their sense of responsibility for their own academic progress. Furthermore, this study also examines the effectiveness of the implementation of the self-directed learning in improving students' skills in solving problems, both in the context of learning and in everyday life. By using this approach, the developed teaching materials are expected to not only fulfill student' learning needs, but also strengthen other important skills, such as critical thinking, analytical, and the ability to find solutions to various challenges. It is expected that this teaching material can contribute positively to the development of students, assisting them to be more aware of the challenges that will occur in the future.

METHOD

Through this study, researchers adopted the Research and Development (R&D) approach. As the originator of this approach, Borg and Gall explained that this approach is not only focused on improving existing products, but also aims to produce new insights or practical solutions to the problems faced. Sumarni (2019) explained that this approach plays a crucial role in creating products that are relevant, effective, and meet the needs of users. In line with self-directed learning, which focuses on learners and aligns with their needs. Thus, the learning objectives of the self-directed learning are in line with the R&D approach. As explained by Sugiyono, research using the R&D method aims to develop a product and evaluate the extent to which the developed product is effective in its use. This research is at level four, which aims to develop new products and evaluate how effective they are (Siregar, 2023).

Borg and Gall suggested that R&D includes 10 steps, 10 of these steps include (Effendi & Hendriyani, 2016) :

a. Reseacrh and Information Gathering
   This stage serves to collect important information from previous studies and understand potential issues that may arise during the product development process.
b. Planning
   This stage includes steps such as setting research objectives and estimating the cost, effort, and time needed to develop the product.
c. Develop Preliminary Product
   There are several steps that need to be taken to ensure the development process goes well. This trial will provide an overview of the effectiveness and readiness of the materials or products that have been developed before being applied more widely.
d. Preliminary Field Testing
   At this stage, the product is tested repeatedly in the field to ensure that the design is appropriate. By conducting repetitive trials, it is hoped that improvements can be found to improve the quality of the product before it is implemented more widely.
e. Main Product Revision
   The revision stage involves improvements to the model or design, based on the results of the preliminary field test. The evaluation process is

essential to verify that the improvements made are internal and focused on improving the quality and effectiveness of the product before the next stage.

f. Main Field Testing
In this stage, the developed product is tested more widely, which can also include testing the effectiveness of the product.

g. Operational Product Revision
This stage is the second revision after the main field test. The product was improved based on feedback and findings from previous trials or main field test. The revisions aim to enhance its quality and effectiveness to better meet users' needs and expectations.

h. Operational Field Testing
At this stage, trials are conducted on a wider scale than before. The function of this trial is to evaluate the extent to which the developed product can be effective and accepted. This trial provides an opportunity to identify the strengths and weaknesses of the product in more depth, so that improvements can be made before the product is launched.

i. Final Product Revision
The final revision stage is the last improvement process for the developed product. Here, the product is tested to ensure it functions properly and meets its objectives. A feasibility test is conducted to assess its effectiveness and confirm that it meets set standards, ensuring quality and user benefits.

j. Dissemination and Implementation
This dissemination stage can be done by creating group forums to help provide information that the product is ready for use, besides that it can also be posted on mass media.

Research and Development (R&D) is a systematic approach designed to produce products that are not only innovative but also truly meet the needs and expectations of users. The approach involves a structured series of steps with the primary objective of creating a product that is relevant, effective and appropriate to the context in which it will be applied. The process consists of four interconnected stages. First, an initial assessment was conducted to evaluate the results of previous research, ensuring the product to be developed was relevant and useful. Next, the product development phase focused on the findings from the problem analysis to produce innovative and contextually appropriate solutions. After that, the product is tested in real conditions to get a clear picture of its effectiveness as well as challenges that may arise. Finally, the results of the field test are used to refine the product, correct any shortcomings, and improve its quality before it is widely implemented. With this approach, the R&D process ensures that the resulting product is not only functional but can also truly meet the needs of users well (Waruwu, 2024).

The advantages of the research and development (R&D) approach, according to Okpatrioka (2023) are:

a. Producing a model with a high validation value because the final product has undergone through multiple trials.
b. Ensuring that research and development work always prioritize a new innovation so that it has good durability.
c. Serving as a bridge to connect practical and theoretical research.

Providing model that is quite comprehensive.

RESULT AND DISCUSSION

a. Initial Prototype

The initial prototype is a preliminary design that still requires further development by the researchers. The teaching materials for self-directed learning are prepared so that they can be assessed by subjcet matter expert and media expert so they can be improved and developed in the next stage.

The development of teaching materials based on self-directed learning was carried out by designing a teacher book and a student book that focus on the material of "Environmental Economic Potential". In the first step, the researchers conducted an in-depth analysis of relevant literature to compose reading materials that would be the introductory material in learning. In addition, the researchers designed exercises to evaluate the effectiveness of the teaching materials through

experiments. The teaching materials, consisting of a Student Books and a Teacher Books, were then reviewed by subject matter and media experts to obtain constructive feedback. The feedback received was used to improve teaching materials, making them more relevant to students' needs and more effective in achieving learning objectives. This ensures that the materials align with the curriculum while also supporting students' optimal skill and knowledge development. Before being used in the experiment, the exercises in the student book were tested for validity and reliability through an initial trial. This stage is an essential step in ensuring the successful implementation of teaching materials.

At this initial stage, after being examined by subcjet matter expert and media expert, the initial prototype received several questionnaire assessments. The evaluations are as follows: according to the subjct matter expert, the material is good enough to be presented. It aligns with students' proficiency levels. The material in the student book is coherent and organized systematically, while the teaching materials are appropriate for learning. The definitions are accurate, and the material aligns with current knowledge development.

The chapter that discusses the suitability of the learning model explains that the model applied is in accordance with the material taught and proven to be efficient in improving students' ability to solve problems. Based on the assessment of the subject matter expert, the student book used is considered good enough and eligible to be applied in learning. However, some experts expressed disagreement regarding the model's effectiveness in assisting students with problem-solving. This disagreement arises due to a lack of sufficient evidence confirming that the designed questions have been tested and are effective in improving students' problem-solving skills. Therefore, further evaluation is needed to ensure the questions support the achievement of learning objectives.

The chapter discussing the appropriateness of language use, according to expert, emphasizes that the chosen language should be easily understood by students, clear and unambiguous. The language should maintain its scientific and formal nature to prevent confusion or ambiguity. Additionally, it must have a coherent structure to ensure effective communication and fully support its intended purpose. This clarity enables students to understand the material easily and interpret the information accurately.

In the chapter that discusses problem-solving skills, the subject matter expert stated that the story problems are not fully relevant to the learning material. The material presented has not been able to encourage students to recognize problems in the surrounding environment, collect information needed for problem solving, or raise creative thinking in finding alternative solutions. In other words, the material has not provided encouragement for students to solve the problems around them. The suitability of learning materials and exercises questions to support the development of problem-solving skills in students has not been optimal.

According to the subject matter expert, there should be a rubric for adjusting the instrument, such as the need to test the instrument to potential readers instead of validators, and the need for internal validators and external validators.

Several criteria are presented for media experts in evaluating the teaching materials based on self-directed learning.

These include visual aspects such as text readability, appropriate font size and style, and well-chosen colors for the cover and images. The color combinations are considered visually attractive. However, some illustrations do not fully align with the subject matter. Additionaly, media components of the teaching materials are sufficiently complete.

In the accessibility chapter, the ability of media to facilitate students in learning is considered good, the media used is adequate to minimize teacher dependence during learning. Lastly, the ability of media to facilitate teachers and students can maximize time efficiently.

The media expert's feedback on the initial prototype highlights the lack of clear usage instructions in both the student and teacher books.

b. Self-Directed Learning Teaching Materials After Development

The Teacher Book and Student Book were revised based on feedback, suggestions, and critiques from subject matter and media experts through questionnaires. The subject matter expert

stated that the content presented aligns with students' comprehension levels, is well-organized, and is in line with current developments.

The chapter on the suitability of the learning model explains that the chosen model aligns with the material being taught. It is considered effective in measuring students' problem-solving skilss and has been shown to enhance their problem-solving skills.

According to the subject matter expert, the chapter on language suitability emphasizes that the language used is clear, unambiguous, natural, standardized, coherent, and communicative.

In the chapter that discusses problem-solving skills, the subjct matter experts agreed that the story problems given are in accordance with the learning material in the book. The material helps students recognize real-world problems and stimulates creative thinking. It encourages active involvement in problem-solving while the exercises support the development of their problem-solving skills.

Based on the suggestions and feedback from the subjct matter expert, the researchers then tested the questions on the students to find out which one was most suitable for measuring their problem-solving ability. At this stage, researchers conducted two types of tests that support each other, i.e. validity test and reliability test. The validity test ensures that the questions effectively measure students' problem-solving skills. While the reliability test assesses whether the questions are consistent and trustworthy, ensuring they objectively measure students' abilities (Janna & Herianto, 2021).

The results are shown as follows:

Question Number	1	2	3	4	5
R calculated	0.576	0.798	0.561	-0.226	0.815
R table	0.553	0.553	0.553	0.553	0.553
Result	valid	valid	Valid	Not valid	valid

The validity test process was carried out by comparing the R calculated value with the R table value. If the R calculated value is higher than the R table value, the question is considered valid and suitable for measurement. Based on the validity test results, four questions met the established validity criteria, while one question did not meet the requirements and was considered invalid. The next step is to conduct a reliability test. Reliability test is crucial to ensure that the questions used are not only valid but also capable of producing consistent and reliable results in assessing students' abilities. Thus, both validity and reliability tests complement each other to ensure that the instrument used in the experiment provides accurate and credible results.

Cronbach's Alpha	N of Items
0.711	5

The data presented in the table above shows a value of 0.711, which exceeds the minimum threshold of 0.70. This demonstrated that the test instrument has a high level of reliability, demonstrating sufficient consistency and dependability. As a result, the instrument can be considered appropriate and effective for use in further research or experiments, ensuring that the results obtained will be stable and trustworthy.

At the final stage, media expert also stated that the self-directed learning teaching materials were suitable for trial implementation with students. In terms of appearance, the text used is clearly legible, and the selected font size and type are appropriate. The book's cover and images feature well-chosen colors, with an attractive color combination. The quality of the colors in the images and cover is good. The illustrations used are relevant, and the printing and overall media design are neat. Additionally, all necessary components of the teaching materials are complete.

Regarding to the appearance, the text used is appropriate and clearly readable. The chosen font size and type are suitable. The accessibility of the revised teaching materials is also well-developed, including the media's ability to facilitate student learning effectively, minimize dependence on the teacher, assist teachers in delivering lessons, and enhance time efficiency for both teachers and students.

The user guide in the self-directed learning-based teaching materials has been added and appropriate according to the suggestion of media experts, as evidenced by clear instructions on how

to use the book. The instructions are well-structured, understandable, and presented in proper Indonesian language following the rules. The guide also uses correct spelling and formal language, ensuring clarity and ease of comprehension. Additionally, the language used is concise and effective.

c. The Effectivenese of Self-directed Learning Teaching Materials

In assessing the success and effectiveness of self-directed learning teaching materials in improving students' problem-solving skills, the researchers conducted an experiment involving two class groups. The first group was the experimental class, which received special treatment by learning with self-directed learning teaching materials.

On the other hand, another group was control classs which did not accept the same treatment. They continue to learn using traditional method. By comparing between these two groups, researchers was able to evaluate whether the use of teaching materials had a significant impact on students' problem-solving skills. At the end of the learning, both classes are given exercises, and the scores obtained were used to find how effective the self-directed learning materials are in improving students' problem-solving skills.

To test whether the differences in scores obtained are statistically significant, a T-Test was used. This test served to analyze one or two groups of data while comparing the average scores between them. By using the T-Test, researchers could evaluate whether there is a clear and significant difference between the two groups. The results of this test provide evidence that any detected differences are not merely due to chance but instead reflect actual influencing factors in the experiment. In other words, the T-Test helped to ensure that the findings have strong validity and can be reliably used to draw accurate conclusions. This test is particularly valuable in experimental data analysis to assess the effectiveness of a given intervention or treatment (Waluyo et al., 2023). Before conducting the T-Test, certain prerequisites must be met, including the Normality Test and the Homogeneity Test (Usmadi, 2020). The Normality Test serve to ensure that the collected data follows a normal distribution, which is an important step in validating subsequent statistical analyses. Meanwhile, the Homogeneity Test verifies whether the data values are consistent and uniform across all tested groups or samples. Conducting this test is essential at every stage of data processing, as homogeneous results encourage the accuracy and reliability of conclusions drawn from the data (Qurnia Sari et al., 2017). The data is considered to meet the homogeneity and normality criteria if the significance value is greater than 0.05. This indicates that the data is suitable for further analysis. In the T-Test, if the significance value is less than 0.05, it suggests that self-directed learning-based teaching materials have a significant impact on improving students' problem-solving skills. In other words, a low significance value confirms the effectiveness of these materials in achieving the desired learning outcomes.

1. Normality Test

	Control Class	Experimental Class
Sig (2-tailed)	.623	.088

Based on the table, the significance are 0.623 dan 0.088 Since both significance values exceed 0.05, the data follows a normal distribution.

2. Homogeneity Test

Levene Statistic	Df1	Df2	Sig.
.133	1	52	.717

According to the table, the significance is 0.717. This value is considered greater than 0.005 so that the data is homogeneous.

3. T-Test

	Df	Sig. (2-tailed)
Equal varience assumed	52	.001

Based on the table, the significance value is 0.001, which is lower than 0.05. This indicates that self-directed learning teaching materials are proven

to be effective in helping students improve their problem-solving skills.

Based on the Homogeneity Test, the data is homogeneous; based on the Normality Test, the data is normally distributed; and based on the T-Test, it can be concluded that self-directed learning-based teaching materials are effective in enhancing students' problem-solving skills.

CONCLUSION

In conclusion, this study shows that the development process of teaching materials is carried out gradually and in a planned manner. It began with the creation of an initial draft, which was evaluated by subject matter expert and media expert using questionnaires. Some aspects of the self-directed learning materials needed improvement. After identifying these areas, the materials were revised to enhance their quality. Once development was complete, they were tested to assess their effectiveness in helping students. To measure its effectiveness, the researchers used a T-test. Before conducting this test, it was essential to ensure that the data met statistical requirements, such as normality and homogeneity. Therefore, Homogeneity and Normality Tests were conducted beforehand, and the results indicated that the data met the established criteria. The T-test analysis results showed a significance value of 0.001, which is lower than the 0.05 threshold. This finding demonstrates that the implementation of teaching materials through the self-directed learning-based is proven effective in enhancing learners' problem-solving skills. The significance value below 0.05 further strengthens the evidence that this method has a significant positive impact on students' problem-solving skill development. This finding provides clear evidence that this learning approach can positively influence students' skills, helps them become more independent learners, and enhances the overall learning process.

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