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Development of Hots-Based Student Worksheets (LKPD) to Improve the Critical Thinking Skills of Fifth-Grade Students in Science and Social Studies (IPAS)

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Article

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Abstract

This study employed a Research and Development (R&D) approach using the 4D model, which consists of four stages: Define, Design, Develop, and Disseminate. The define stage involved analyzing learning needs, student characteristics, tasks, and concepts. The design stage focused on developing assessment instruments, selecting appropriate formats, and designing HOTS-based learning activities. The develop stage included expert validation, product revision, and limited trials conducted with fifth-grade students. Finally, the disseminate stage involved limited distribution and implementation of the developed worksheets.

The results of the study indicate that the HOTS-based Student Worksheet (LKPD) is valid, practical, and effective in improving students' critical thinking skills. The developed worksheet encourages active student participation, promotes analytical thinking, and connects learning content with real-life contexts. This study contributes to the development of innovative learning materials that are aligned with the demands of 21st-century learning and provides practical implications for improving the quality of elementary education.

INTRODUCTION

Learning in elementary schools, particularly in the subject of Science and Social Studies (IPAS), is fundamentally directed not only toward mastering concepts but also toward developing Higher Order Thinking Skills (HOTS), which include the abilities to analyze, evaluate, and create. In the context of 21st-century education, critical thinking skills have become one of the key competencies that students must possess to face increasingly complex global challenges. This is in line with the revised Bloom's Taxonomy, which places higher-order thinking processes as an important outcome of modern learning.

HOTS-oriented learning enables students not only to understand material conceptually but also to connect knowledge with real-life situations. Therefore, systematic efforts are needed to design learning experiences that encourage active student engagement and stimulate their critical thinking skills. The development of appropriate learning strategies is essential in creating meaningful learning experiences. Student Worksheets (LKPD) are one of the learning tools that play a strategic role in supporting active and meaningful learning processes. LKPD functions not only as a practice medium but also as a tool to guide students in discovering concepts and developing understanding independently. The use of systematically designed instructional materials has been proven to improve the quality of the learning process.

HOTS-based LKPD are designed by incorporating activities that require higher-order thinking skills, such as analyzing information, evaluating arguments, and creating solutions to problems. Through these activities, students are encouraged to become more active in the learning process, making learning no longer passive and teacher-centered. This approach is also aligned with contextual learning, which emphasizes the connection between learning materials and students' real-life experiences. However, the current condition of Science and Social Studies (IPAS) learning in elementary schools still faces various challenges. Learning tends to be teacher-centered, resulting in limited opportunities for students to actively participate in the learning process. In addition, many of the learning tools currently used remain conventional and do not fully accommodate higher-order thinking skills.

These conditions have an impact on students' low critical thinking abilities. Students tend to memorize material without deeply understanding the concepts. This indicates that the ongoing learning process has not been able to optimally develop students' thinking potential. In the topic of the human auditory system, learning often focuses only on recognizing the structure of the ear without providing a deeper understanding of the functions and working processes of the system. In fact, this topic has great potential to be developed into contextual and meaningful learning. The lack of connection between the material and everyday life causes students to have difficulty understanding the concepts comprehensively.

A number of previous studies have shown that the development of HOTS-based LKPD has a positive effect on improving students' critical thinking skills. LKPD designed by considering aspects of analysis, evaluation, and creativity have been proven to increase student engagement in learning. In addition, LKPD can serve as an effective medium for training students' problem-solving abilities. Research conducted by Putra, Gunamantha, and Sudiana (2023) demonstrated that HOTS-

based LKPD are effective in improving students' critical thinking skills through structured and challenging learning activities. These findings are supported by other studies showing that the use of LKPD can improve students' learning outcomes and conceptual understanding.

However, most of these studies are still general in nature and have not specifically developed LKPD for particular topics within the Science and Social Studies (IPAS) subject. In fact, each topic has different characteristics and therefore requires different learning approaches. Furthermore, some studies have not fully considered the contextual conditions of schools, such as student characteristics and learning environments. As a result, the developed learning tools are often less optimal when implemented in actual classroom settings.

The alignment between the design of learning tools and real classroom conditions is an important factor in determining learning success. Therefore, the development of LKPD needs to be carried out systematically by considering various aspects that influence the learning process. In this regard, the use of a systematic development model such as the 4D model can help produce valid and effective learning tools. This model allows the development process to be carried out in a structured manner, starting from the analysis stage through evaluation. The 4D development model also emphasizes the importance of expert validation and product testing before widespread implementation. This is intended to ensure that the resulting product truly meets learning needs.

Based on the description above, a gap can be identified between the ideal learning conditions that require the development of HOTS and the actual conditions in the field, which are still dominated by conventional learning. This gap indicates the need for innovation in the development of learning tools that can support the enhancement of students' critical thinking skills. One effort that can be undertaken is the development of HOTS-based LKPD that are designed contextually and tailored to the characteristics of the subject matter. This study aims to develop HOTS-based LKPD that are valid, practical, and effective in improving the critical thinking skills of fifth-grade students in Science and Social Studies (IPAS), particularly on the topic of the human auditory system.

The novelty of this study lies in the development of LKPD that are not only HOTS-based but also designed contextually and specifically for a particular subject matter. In addition, this study employs a systematic development approach to ensure the quality of the resulting product. Therefore, this research is expected to contribute to the development of innovative learning tools that are aligned with the demands of the 21st century. The findings of this study are also expected to serve as a reference for teachers in developing effective LKPD to improve students' critical thinking

skills. Ultimately, the development of HOTS-based LKPD is expected to create learning experiences that are more meaningful, active, and oriented toward the comprehensive development of students' competencies.

METHOD

This study employed a Research and Development (R&D) approach using the 4D (Four-D Model) development model proposed by Sivasailam Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel. The R&D approach was selected because it is oriented toward the development of educational products that are not only examined conceptually but also through validation and empirical testing processes. The product developed in this study was a Higher Order Thinking Skills (HOTS)-Based Student Worksheet (LKPD) designed to improve the critical thinking skills of elementary school students.

The 4D model consists of four main stages, namely Define, Design, Develop, and Disseminate. This model was chosen because it has a systematic and structured flow and is capable of guiding researchers in producing learning products that meet field needs. In addition, the 4D model emphasizes the processes of needs analysis and product validation, ensuring that the resulting product is not only theoretically valid but also practical and effective when implemented in learning. Therefore, this model is considered appropriate for developing HOTS-based LKPD, which requires design accuracy and relevance to student characteristics.

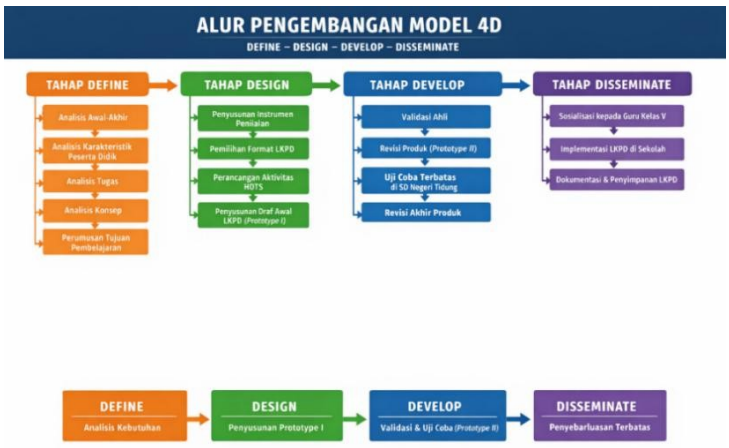

Figure 1. 4D Model Development Flow

The first stage is **Define**, which aims to identify and formulate learning needs as the basis for LKPD development. This stage is very important because it determines the overall direction of product development.

At this stage, a front-end analysis was conducted to identify learning problems based on literature reviews, previous research findings, and learning document analysis. The analysis results showed that the LKPD used in elementary schools is still dominated by activities based on Lower Order Thinking Skills (LOTS) and therefore has not been able to optimally develop students' critical thinking skills.

In addition, an analysis of student characteristics was conducted to understand the cognitive conditions, learning styles, and learning needs of fifth-grade elementary school students. Theoretically, students at this stage are transitioning from the concrete operational stage to the formal operational stage, enabling them to think logically while still requiring support in the form of concrete examples and appropriate stimuli. Therefore, the LKPD design must be adjusted to these characteristics so that learning can take place effectively and meaningfully.

The Define stage also includes task analysis and concept analysis. Task analysis was conducted to identify the critical thinking skills to be developed, such as the ability to identify problems, analyze information, provide logical reasoning, and draw conclusions systematically.

Meanwhile, concept analysis was carried out to organize learning materials in a structured and hierarchical manner according to the learning outcomes. Subsequently, learning objectives were formulated operationally, specifically, and measurably to align with the development of HOTS in learning. These objectives became the main reference for designing activities, materials, and assessment instruments in the LKPD.

The second stage is Design, which aims to produce the initial prototype of the HOTS-based LKPD. At this stage, a systematic design process was carried out regarding the structure and content of the LKPD based on the results of the previous analysis stage.

One of the main activities was the preparation of assessment instruments, including instruments for measuring students' critical thinking skills and LKPD validation instruments for experts. These instruments were developed based on HOTS indicators covering aspects of analysis, evaluation, and creation, and were aligned with the previously formulated learning objectives.

Furthermore, an LKPD format suitable for elementary school students was selected. The LKPD was designed with complete and systematic components, including learning objectives, usage instructions, contextual problem presentations, HOTS-based learning activities, and learning reflection. Each component was designed to support one another, creating a coherent learning flow that is easy for students to follow.

The use of communicative, simple language appropriate to students' developmental levels became an important consideration to ensure the LKPD would be easy to understand. In addition, visual aspects were also considered to make the LKPD attractive and capable of increasing students' learning motivation.

The learning activities within the LKPD were designed to accommodate higher-order thinking skills, particularly at the levels of analysis (C4), evaluation (C5), and creation (C6). The activities were based on contextual problems closely related to students' daily lives, encouraging them to think critically, express opinions, and solve problems logically.

The result of this stage was the completion of the initial LKPD prototype (Prototype I), which was ready to be validated and tested in the subsequent stage.

The third stage is Develop, which aims to produce an LKPD that is valid, practical, and effective. At this stage, expert validation was conducted through the expert judgment technique involving material experts, learning experts, and language experts. This validation aimed to assess the feasibility of the product comprehensively in terms of content, presentation, and language aspects. The validation process was carried out using previously prepared instruments so that the assessment could be conducted systematically and objectively.

Based on the validation results, product revisions were made to improve the LKPD according to the experts' suggestions. The revisions included improvements to material aspects, clarity of instructions, suitability of HOTS activities, and language usage. This revision process was conducted repeatedly until a product meeting the feasibility criteria was obtained.

Afterward, a limited trial was conducted with fifth-grade students at SD Inpres Manggala, Makassar City. The purpose of this trial was to determine the practicality and effectiveness of the LKPD in the learning process.

Data at this stage were obtained through a critical thinking skills test to measure students' improvement, an observation sheet to assess the implementation of learning activities, and a student response questionnaire to determine the practicality level of the LKPD.

The collected data were then analyzed descriptively and quantitatively using specific criteria. The analysis results were used as the basis for making final revisions to the product. This stage ensured that the developed LKPD was not only theoretically feasible but also effective in improving students' critical thinking skills in actual learning practices.

The final stage is Disseminate, which aims to introduce and implement the LKPD in a broader context. In this study, the dissemination stage was carried out on a

limited basis according to the research objectives, which focused on product development.

Dissemination was conducted through socialization activities with fifth-grade teachers at the research location. This activity aimed to provide teachers with an understanding of the use of HOTS-based LKPD and its benefits in improving the quality of learning.

In addition, the developed LKPD was also implemented in learning activities as a form of actual product utilization. Teachers were given the opportunity to use the LKPD in classroom learning so that they could directly observe its effectiveness. The developed product was then documented as a learning tool that can be reused or further developed according to learning needs in schools.

This stage demonstrates that the developed LKPD has the potential to be implemented sustainably and make a tangible contribution to improving the quality of learning in elementary schools.

RESULTS AND DISCUSSION

Results

The results of this development research were obtained through a series of systematic stages, namely expert validation, practicality testing, and effectiveness testing of the developed Higher Order Thinking Skills (HOTS)-Based Student Worksheet (LKPD). These three stages aimed to ensure that the resulting product was not only theoretically feasible but also applicable and capable of making a real impact on improving students' critical thinking skills.

At the expert validation stage, assessments were conducted by three validators consisting of a material expert, a language expert, and a learning expert. This validation process aimed to comprehensively examine the feasibility of the LKPD from various aspects before its implementation in learning activities.

Based on the validation results, the average score obtained from the material expert was **88%**, from the language expert **85%**, and from the learning expert **90%**, with an overall average of **87.6%**, which falls into the **very valid** category.

These results indicate that the developed LKPD has met the feasibility standards in terms of the suitability of the material content with learning outcomes, the appropriateness of language usage, and the alignment of the learning design with HOTS principles.

Discussion

More specifically, from the material aspect, the LKPD was considered to contain accurate concepts relevant to the applicable curriculum and capable of integrating higher-order thinking skills indicators into every learning activity.

The material on the human auditory system was not only presented in the form of factual information but was also developed through analytical questions that require students to understand the relationships among concepts.

From the language aspect, the language used in the LKPD was considered communicative, simple, and appropriate to the cognitive development level of elementary school students, making it easier for them to understand instructions and learning materials.

Meanwhile, from the learning aspect, the LKPD was designed by considering the principles of active learning, in which students are encouraged to engage in activities involving analysis, evaluation, and simple creation.

However, the validation results also indicated several aspects that required improvement, such as the need to simplify instructions in certain sections to make them easier for students to understand and the addition of contextual examples more closely related to students' daily lives.

These suggestions indicate that although the LKPD has been categorized as very valid, further refinement is still necessary to improve the quality of the product. Therefore, revisions were carried out gradually based on the validators' recommendations, resulting in a more optimal LKPD that was ready for testing.

Subsequently, during the practicality testing stage, the LKPD was tested on a limited basis with fifth-grade students to determine the ease of use and students' responses to the developed product.

This practicality test served as an important indicator in assessing whether the LKPD could be used effectively in real learning situations.

Based on the results of the student response questionnaire, it was found that **60%** of students strongly agreed, 30% agreed, and 10% somewhat disagreed with the use of the LKPD.

Overall, the practicality level of the LKPD reached 90%, which falls into the very practical category.

These results indicate that the developed LKPD has a high level of readability, is easy to understand, and possesses a systematic sequence of activities. Students did not experience significant difficulties in following each stage of the activities presented in the LKPD.

In addition, the attractive appearance of the LKPD and the presentation of contextual problems were able to increase students' interest in learning.

This can be seen from the increased student participation during the learning process, where students became more active in discussions, expressed their opinions more frequently, and became more involved in solving the given problems. The practicality of the LKPD was also supported by the clarity of the usage instructions, which enabled students to learn more independently. In this regard, the LKPD functions not only as a learning aid but also as a facilitator that guides students through the thinking process. Thus, the teacher's role in learning shifts from being the center of information to becoming a facilitator who guides and directs students' learning processes. This is in line with the principles of 21st-century learning, which emphasize the importance of student-centered learning.

At the effectiveness testing stage, measurements were conducted by comparing students' critical thinking skills test results before (pretest) and after (posttest) using the LKPD. The analysis results showed that students' average scores increased significantly, from 65 on the pretest to 85 on the posttest. In addition, the N-Gain calculation yielded a value of 0.57, which falls within the moderate-to-high category.

This value indicates that there was a meaningful improvement in students' critical thinking skills after the implementation of the HOTS-based LKPD.

This improvement was further supported by student learning mastery data, which showed a significant change from 40% before using the LKPD to 85% after using the LKPD. These data indicate that most students achieved the predetermined learning mastery criteria.

This finding suggests that the developed HOTS-based LKPD is not only effective in improving learning outcomes but is also capable of developing students' critical thinking skills more optimally.

The effectiveness of this LKPD is closely related to its characteristics, which are designed around contextual problems. The activities presented in the LKPD encourage students not only to receive information passively but also to actively identify problems, analyze information, and draw logical conclusions.

This process enables students to develop more complex thinking skills, making learning more meaningful. Furthermore, the connection between the learning materials and everyday life helps students understand concepts more deeply and apply them in real situations.

Based on the overall research findings, it can be concluded that the developed HOTS-based LKPD has fulfilled the three primary criteria of development research, namely validity, practicality, and effectiveness.

In terms of validity, the LKPD meets feasibility standards in content, language, and learning aspects. In terms of practicality, the LKPD has proven easy for students to use and capable of increasing their engagement in the learning process. Meanwhile, in terms of effectiveness, the LKPD has been shown to significantly improve students' critical thinking skills.

These findings reinforce previous studies stating that HOTS-based learning can improve both the quality of the learning process and student learning outcomes. Learning activities that require active student involvement have proven to develop deeper thinking skills compared to conventional learning approaches.

In addition, the contextual approach implemented in the LKPD plays an important role in helping students connect learning materials with their real-life experiences. In the topic of the human auditory system, the developed LKPD not only presents information regarding the structure of the ear but also guides students to understand the working process of the auditory system and its relationship to everyday phenomena, such as hearing disorders and efforts to maintain ear health.

Thus, learning becomes not only theoretical but also practical and relevant to students' lives.

Overall, the results of this study indicate that the development of HOTS-based LKPD is an effective alternative solution for improving the quality of Science and Social Studies (IPAS) learning in elementary schools. A systematically and contextually designed LKPD can create learning that is more active, interactive, and oriented toward the development of students' critical thinking skills.

Furthermore, the success of this development also confirms the importance of using a systematic development model, such as the 4D Model, in producing high-quality learning tools that are aligned with the needs of 21st-century learning.

CONCLUSION

Based on the overall results and discussion, it can be concluded that the development of Higher Order Thinking Skills (HOTS)-Based Student Worksheets (LKPD) in fifth-grade Science and Social Studies (IPAS) learning, particularly on the topic of the human auditory system, has successfully addressed the research problem and achieved the established objectives.

The developed LKPD has fulfilled the three main criteria in educational product development, namely validity, practicality, and effectiveness, making it suitable for use as an innovative learning tool in elementary schools.

The implementation of the 4D Development Model (Define, Design, Develop, Disseminate) has proven to be systematic and effective in producing structured and contextually relevant learning tools. This model not only helps align learning objectives, materials, and assessments but also ensures that the resulting product

is consistent with students' cognitive characteristics and the demands of 21st-century learning, particularly in strengthening critical thinking skills.

The findings of this study indicate that the integration of HOTS into the LKPD is capable of transforming learning from a passive knowledge-transfer process into an active, student-centered learning experience.

From a broader perspective, the developed LKPD contributes to improving both the learning process and learning outcomes. It provides opportunities for students to engage in analytical thinking, evaluate information, and construct knowledge through contextual problem-solving activities.

This transformation is important in bridging the gap between conventional teacher-centered learning practices and the ideal learning conditions that emphasize active student participation and meaningful understanding.

In addition, the contextual approach used in the LKPD helps students connect abstract scientific concepts with real-life situations, enabling deeper and longer-lasting conceptual understanding.

Practically, this study demonstrates that HOTS-based LKPD can be effectively utilized by teachers as an alternative learning medium to improve students' critical thinking skills in Science and Social Studies (IPAS) learning.

Teachers are expected to adapt and develop similar learning tools for other topics while considering the characteristics of the materials and students' needs. On the other hand, schools can support the implementation of this learning innovation through training programs and collaborative development among teachers.

SUGGESTIONS

1. For School Principals

The development of HOTS-based LKPD requires policy support and adequate facilities. Therefore, school principals should provide supporting facilities such as learning equipment, dedicated time for teacher training, and encourage a learning culture that emphasizes critical thinking skills within the school environment.

2. For Teachers

Teachers should consistently use and develop HOTS-based LKPD in Science and Social Studies (IPAS) learning. The use of this LKPD is expected to help students become accustomed to analyzing, evaluating, and solving problems.

Teachers also need to conduct regular reflection and evaluation of the LKPD used to ensure that it remains aligned with students' needs and curriculum demands.

3. For Future Researchers

Further research should be conducted on a broader scale, both in terms of the

number of participants, grade levels, and different schools. This is important for obtaining a more comprehensive understanding of the effectiveness of HOTS-based LKPD in improving critical thinking skills.

4. Improvements for Similar Future Research

Future studies are recommended to improve the LKPD design, add more varieties of HOTS-based activities, and utilize digital technology as a supporting tool. This is expected to produce more innovative LKPD so that improvements in students' critical thinking skills can achieve more optimal results.

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