

## Development of HOTS-Based Student Worksheets in Science Subject to Improve High-Level Thinking Skills of Grade V MI Thowalib Students

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**Abstrak:** Development of HOTS-based student worksheets on Science Subjects to improve high-level thinking skills of fifth grade students at MI Thowalib Pesagen. This study aims to 1) develop HOTS-based student worksheet teaching materials in science subjects 2) find out the feasibility of HOTS-based student worksheets in science subjects 3) find out the effectiveness of student worksheets in science subjects to improve thinking level skills student of class V MI Thowalib Pesagen. The type of research used is Research and Development (R&D), which refers to the ADDIE model. This development model uses the following steps: Analysis, Design, Development, Implementation and Evaluation. Instrumental data used were observation, interviews, questionnaires, and tests in the form of pre-test and post-test of students' higher order thinking skills. Product feasibility level data analysis and data analysis using the SPSS T Paired Sample T Test. Based on the results of this development research it is known that the product produced is in the form of HOTS- based student worksheets that meet very feasible criteria with the validation results of teaching material experts 95%, material experts 86.25%, learning experts 97.5%, and student questionnaires achieving 94.45%. The average value of the pre-test was 29.13 and the post-test was 83.47. Based on the results of the T-test using SPSS, the value of Sig 0.000 <0.05 means that there is a difference between before and after using the student worksheets. So it can be interpreted that HOTS-based student worksheet teaching materials are very appropriate and effective for use in science learning to improve high-level thinking skills of class V MI Thowalib Pesagen.

**Keywords:** HOTS, student worksheet, science

### INTRODUCTION

The fact that education should be able to produce human resources with complete abilities to overcome various challenges in life is one of the challenges faced by education when entering the knowledge of the 21st century. Learning skills, mastery of media, creativity, innovation and information, life and career skills, as well as adhering to the characteristics of 21st century education are some of the main competencies that a student must have (Abidin, 2014). According to Khotimah, the concept of Higher Order Thinking Skills (HOTS) or high-level thinking is in line with the guidance of 21st century education because it can focus learners to improve their knowledge and social skills by training individuals to share information, build opinions, generate ideas, and produce a project. High-level thinking skills can be improved through the learning process at school (Khotimah, 2020).

Higher Order Thinking Skills (HOTS) or high-level thinking skills can be achieved by individuals who are able to analyze, evaluate, and create. Based on Bloom's Revised Taxonomy 2001, which places HOTS in high-level thinking skills, students' competencies are obtained at the level of analysis, evaluation, and creation (Teti, 2018). In addition, high-level thinking skills not only require the ability to remember, but also require creative and critical thinking skills in

understanding learning (Antomi, 2018). The achievement of a competency in a subject is based on several aspects including learners, educators, subjects, curriculum, methods, learning models, facilities and infrastructure. In addition to teachers, the most important factor in improving competency achievement is methods, media, and teaching materials (Sigit, 2020). Teachers are expected to deliver learning materials that transform learning from teacher-centered to student-centered (Thira, 2021). Teaching materials are all forms of materials used to support educators in carrying out learning activities in the classroom. For example, textbooks, modules, handouts, audio or interactive materials, and student worksheets (LKPD) (Prastowo, 2014). According to Prastowo, student worksheets (LKPD) are printed teaching materials consisting of material summaries, activity instructions, tasks to be carried out by students referring to basic competencies, and objectives to be achieved.

Based on the results of interviews conducted by researchers with the science teacher of class V MI Thowalib Pesagen, it can be seen that many grade V students still have difficulty understanding HOTS-based learning and questions in science lessons. One way to overcome this problem is to train learners by providing HOTS-based questions or tasks using worksheets. However, teachers have not yet developed HOTS-based student worksheets and are still relying on textbooks that contain a lot of writing and are monotonous, causing students to become bored while working on these questions (interview results, 2023). High-level thinking skills in science learning for students can be improved and trained through HOTS-based LKPD, which can improve student understanding and be designed in an attractive way so that the learning process becomes effective, efficient, enjoyable, and can increase the success rate of learning goals, learning outcomes and focus students on critical thinking, as well as providing meaningful understanding to solve a problem (Marnita, 2021).

Based on this background, the research questions posed in this study are how to develop HOTS-based student worksheets in science learning to improve high-level thinking skills? How feasible are HOTS-based student worksheets in science learning to improve high-level thinking skills for grade VMI Thowalib Pesagen students? How effective are HOTS-based student worksheets in science learning to improve high-level thinking skills for students?

The planning used in this study is in the form of HOTS-based student worksheets, and the product specifications of the development can be known as follows: (1). the development of HOTS-based student worksheets in this study includes a cover, student identity, usage instructions, KD to be achieved, stated objectives to be achieved, HOTS-based material summaries, and HOTS-based questions; (2). HOTS-based student worksheets that will be developed contain pictures and information related to HOTS questions that will be worked on by students; (3). Equipped with question columns divided into easy (C4), moderate (C5), and difficult (C6) levels, answer columns, and value columns with several categories (Fighting, Spirit, Good job, Perfect) as rewards for students; and (4). Includes a date, student signature, and teacher signature.

## **METHODS**

This type of research is a research and development study, which aims to create or produce a product. In this research and development study, the focus is on educational products, specifically the development of Higher Order Thinking Skills (HOTS)-based student worksheets in science to improve high-level thinking skills for grade VMI Thowalib Pesagen students. The development model used in this study is the ADDIE approach model by Robert Maribe Branch. This model is suitable for developing learning modules, student worksheets,

and textbooks (Cahyadi, 2019). The ADDIE development model consists of several orderly stages, which include analysis, design, development, implementation, and evaluation. The ADDIE system design model is simple and can be implemented gradually (Yudi, 2020).

Data analysis techniques involve processing and interpreting data according to the research objectives to combine relevant information that has significant meaning for the research direction (Arifin, 2016). Qualitative descriptive analysis is necessary to analyze data in the form of notes, suggestions, and comments from validation experts, while quantitative descriptive analysis is used to examine the validity of the developed teaching material obtained from the results of the questionnaire filled out by HOTS-based student worksheets experts, subject matter experts, learning experts, and students. The validity assessment is used to test the validity of the developed teaching material. The validation questionnaire responses by experts and the students' responses using a Likert scale are used to assess the validity of the teaching material.

## **RESULT AND DISCUSSION**

The development of Higher Order Thinking Skills (HOTS)-based student worksheets was carried out using the ADDIE design model consisting of analysis, design, development, implementation, and evaluation stages that are systematic, simple, and can be easily implemented gradually (Cahyadi, 2019). This is in line with a previous study conducted by Asha Quranul Khafiza et al. (Khafiza, 2023). Before implementing the HOTS-based student worksheets in the learning process, the worksheets need to be validated to obtain data for improving them. Data were obtained from comments or suggestions provided by HOTS-based student worksheets experts, subject matter experts, and learning experts.

The HOTS-based student worksheets developed by the researcher were deemed highly valid. This can be seen from the scores obtained from the validation tests conducted, which included validation by HOTS-based student worksheets experts, subject matter experts, and learning experts. The validation results for the HOTS-based student worksheets by two IPMAFA lecturers obtained a percentage of 95%, indicating that the HOTS-based student worksheets were highly valid. The validation by subject matter experts in science for the topic of changes in the state of matter obtained a percentage of 86.25%, indicating that the HOTS-based student worksheets were highly valid, while the validation by two MI Thowalib Pesagen teachers obtained a percentage of 97.5%, indicating that the HOTS-based student worksheets were highly valid. The student response to the HOTS-based student worksheets was categorized as highly valid, with a percentage of 94.45%.

Based on the field test results (effectiveness test) conducted on grade V MI Thowalib Pesagen students, it was concluded that the use of student worksheets improved students' higher order thinking skills in the cognitive domain in science, particularly the topic of changes in the state of matter. This was evident from the differences in the pre-test and post-test scores. The average score increased from 29.13 to 83.47 after using the HOTS-based student worksheets. The data were analyzed using paired sample t-test, and a significance value (2-tailed) of 0.000 was obtained, indicating that the difference in the higher order thinking skills of the students before and after using the HOTS-based student worksheets was significant ( $p < 0.05$ ).

The improvement in the students' higher order thinking skills was not only seen in the pre-test and post-test scores but also through observations during the learning process and answering questions. The students at MI Thowalib Pesagen were able to analyze, identify, and differentiate the causes and effects of an event based on the given material. In the evaluation

stage, the students were able to provide ideas, accept or reject assumptions based on predetermined criteria, but they still needed guidance to reach the creation stage, such as designing or planning according to their imagination.

## CONCLUSIONS

The student worksheets developed to improve students' higher order thinking skills in the cognitive domain in science, particularly the topic of changes in the state of matter, were categorized as effective. This was evident from the differences in the pre-test and post-test scores. The average score increased from 29.13 to 83.47 after using the HOTS-based student worksheets. The data were analyzed using paired sample t-test, and a significance value (2-tailed) of 0.000 was obtained, indicating that the difference in the higher order thinking skills of the students before and after using the HOTS-based student worksheets was significant ( $p < 0.05$ ).

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