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Article

The Effect of Higher Order Thinking Skill (HOTS) Based Student Worksheets (LKPD) on Science Learning Outcomes in Grade V Students of SD MIS YPI BTG. Quiz

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*Sindy Adella, Nurdiana Siregar[ab]
[12]Universitas Islam Negeri Sumatera Utara, Indonesia
[*]Corresponding Author: sindiadella238@gmail.com

A B S T R A C T

This study aims to determine the effect of the use of Student Worksheets (LKPD) based on Higher Order Thinking Skills (HOTS) on the learning outcomes of Natural Sciences (IPA) students in grade V at MIS YPI Btg Quiz. LKPD is designed to hone the ability to analyze, evaluate, and solve problems according to learning achievement indicators. The research used an experimental method with a two-group pretest - posttest design. The research population is all students of class V MIS YPI Btg Quiz which totals 55 students, while the research sample consists of class VA (29 students) and class VB (26 students) in the even semester of the 2024/2025 academic year. The research instrument was in the form of a description test totaling 5 items that had been validated (r count 0.458 - 0.730 > r table 0.278) and reliable (Cronbachs Alpha = 0.637). The results showed that there was a significant difference between the science learning outcomes of students who used HOTS-based LKPD and those who did not use it. The independent samples t-test obtained a value of Sig. (2-tailed) = 0.001 (< 0.05), so it can be concluded that the application of HOTS-based LKPD has a real effect on improving the science learning outcomes of grade V students.

Keywords: *LKPD, Higher Order Thinking Skills (HOTS), Science Learning Outcomes, Elementary School*

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INTRODUCTION

Basic education serves as the main foundation in preparing students for the next level of education, namely junior high school. In addition, elementary schools also play a role in equipping students with the necessary competencies to continue to the high school level. One of the crucial components in the process is the development of thinking skills, especially higher order thinking skills (HOTS). This skill can be honed through exercises that require students to solve complex problems independently. HOTS, according to Saputra (in Datuk & Arifin, 2020; Dong et al., 2020), includes advanced thinking processes that involve deep understanding as well as the application of high-level cognitive strategies, including problem-solving and classification in the learning taxonomy. This approach aims to develop critical thinking skills in dealing with and assessing various information (Yuangga & Sunarsi, 2020; Putria et al., 2020).

The government plays a strategic role in the implementation of national education, one of which is through the implementation of compulsory learning programs that cover the primary to junior high school education levels. Students who have completed basic education are expected to continue to the junior high school level as part of efforts to improve the quality of human resources in Indonesia. This step is very important in preparing young people who are adaptive and able to compete in increasingly complex global dynamics (Nurdin et al., 2023). In order to realize the goals of national education, the curriculum functions as the main component in the education system which is flexible and constantly improved. Curriculum

development is carried out on a sustainable basis so that it remains relevant to the demands of the times and the needs of society that continue to develop. (Khairunisa et al., 2020; Lathifah et al., 2021).

In the practice of learning in the field, there are still many teachers who have not fully provided opportunities for students to construct their own understanding of the concepts in Natural Sciences (IPA) subjects. In fact, the role of teachers is very important in getting used to the learning process that challenges students to think at a higher cognitive level, such as thinking critically, creatively, analytically, and being able to solve problems and make decisions independently (Subratha, 2004). Teachers' ability to encourage the development of *Higher Order Thinking Skills* (HOTS) is highly dependent on their level of pedagogical literacy, especially understanding of learning theory and the application of student-centered learning approaches. Thus, the professionalism of teachers is not only determined by mastery of teaching materials, but also by their capacity to design and implement learning strategies that facilitate students to develop high-level thinking skills actively and independently.

Based on guidelines from the Directorate of Junior High School Development, Directorate General of Elementary and Secondary Education (Ministry of Education and Culture, 2017), the types of questions that can be used to measure high-level thinking skills include short filling, completing sentences, short answers, and description questions. In the context of learning implementation, the ability of *Higher Order Thinking Skills* (HOTS) has a close relationship with the subject of Natural Sciences (IPA). This is because science learning naturally emphasizes the process of scientific thinking, which includes observation, analysis, data evaluation, and drawing conclusions based on logic and systematic procedures. Therefore, the development of HOTS is very relevant to be applied in science learning at the primary education level. (Rachmawati, 2022) (Purwasi & Fitriyana, 2020).

Natural Science (IPA) learning needs to be designed with the underlying scientific essence in mind. In order for science learning to take place effectively and meaningfully, careful planning is needed, including the selection of media, strategies, and the right methods. In this context, it is important to reflect on the meaning of Surah Al-Alaq verse 4: "*Who teaches (man) with the pen*", which affirms the important role of aids in the process of education and scientific development. Teachers, as learning facilitators, are required to utilize various media and approaches, including scientific approaches, to support the learning process that encourages students' critical and analytical thinking skills (Nadifatinisa & Sari, 2021). In its implementation, learning does not only depend on the teaching method used, but also on the availability of supporting tools, such as the Student Worksheet (LKPD) (Pebriani et al., 2022). LKPD is a form of printed teaching material that contains tasks that are designed to be completed independently by students. In it there are work instructions and systematic stages that guide students in solving an activity or problem. The use of LKPD has a number of benefits, including helping teachers in managing learning activities, encouraging students to actively learn independently, and improving understanding of the material in a structured manner as well as training skills in doing assignments in writing. (Hwang et al., 2020)

The learning process should not only focus on the delivery of material by the teacher in one direction. More than that, students need to be given space to develop thinking skills through active and meaningful learning experiences. The implementation of the Independent Curriculum is one of the relevant approaches, because it focuses on competency-based learning and character strengthening. This curriculum encourages students to be more involved in learning, able to think critically, and be independent in solving problems. This is in line with the values contained in Surah Al-Alaq verse 5: "*He teaches man what he does not know*", which implies that the learning process is an important means of acquiring knowledge, not just information, but also as a way to develop human intellectual potential more broadly (Purwasi & Fitriyana, 2020). The goal of education at the school level is to shape students to be able to use the information they have to solve problems and make creative decisions, especially when faced with challenging and complex situations. In this context, Higher *Order Thinking Skills* (HOTS) are very necessary. Based on Bloom's revised taxonomy, HOTS consists

of three main aspects, namely the ability to analyze, evaluate, and create. (Sari et al., 2020; Pratiwi et al., 2020).

The Student Worksheet (LKPD) is one of the learning tools that is practical and easy to adapt to various teaching materials and student characteristics (Khikmiyah & Gresik, 2021). LKPD is designed to contain a series of core activities that aim to assist students in deepening their understanding of a topic, which is compiled based on indicators of achievement of predetermined learning outcomes (Umbaryati, 2018). According to Putri (2019), LKPD is a learning medium in print form that presents activity instructions, which students can use independently to develop their competencies. Thus, LKPD not only functions as a teacher's tool, but also as a means that allows students to learn actively and independently. (Marsa et al., 2016; Suryani et al., 2019).

According to Pamungkas and Fitriyani (2023), the Student Worksheet (LKPD) is a form of printed teaching material consisting of several sheets that contain subject matter, summaries, and instructions for the implementation of activities that must be carried out by students. Based on this understanding, LKPD can be understood as a learning medium that functions as a learning guide for students. It contains instructions, material information, and tasks designed to improve students' understanding and cognitive abilities. With the existence of LKPD, students can be helped in developing their way of thinking in a more structured way. At the elementary school level, the proper use of LKPD can be an effective means of fostering more in-depth and quality thinking skills.

According to (Nugroho, 2018) Student Worksheets (LKPD) are understood as teaching materials in printed form consisting of sheets containing subject matter, summaries, and instructions for learning activities designed to be done by students. Each activity in the LKPD is generally arranged based on the basic competencies that are to be achieved in the learning process (Numa et al., 2023). Functionally, LKPD has similarities with the term Student Worksheet (LKS) which was previously known. However, in the implementation of the 2013 Curriculum, the use of the term LKPD was chosen as a substitute for LKS to emphasize the active involvement of students in learning (Marsa et al., 2016; Suryani et al., 2019). A well-prepared LKPD contains activity instructions, material summaries, and assignments that lead students to achieve learning objectives. In the current learning context, the use of LKPD is considered more effective than the full online method, because students tend to rely on the internet to find answers instantly. On the other hand, by using LKPD, students are encouraged to understand the material and practice high-level thinking skills (HOTS) through working on problems independently at home. (Khikmiyah & Gresik, 2021).

This research focuses on aspects of Higher Order Thinking Skills (HOTS) in the context of understanding the concept of style. although important in the development of a thorough understanding of HOTS, it was not the main focus of this study. So the formulation of the problem in this study is Is There an Effect of Higher Order Thinking Skill (HOTS) Based Student Worksheets (LKPD) on Science Learning Outcomes in Grade V MIS YPI BTG Quiz Students?

METHOD

This research was conducted at MIS YPI BTG KUIS, which is located on Jl. Mesjid jamik Dusun 1 Bintang Meriah Village, Kec. This research process lasts for 1 month from June 2025.

The research method used was an experiment with *a two-group pretest - posttest* design (Pebriani et al., 2022). This design compares conditions before being given treatment (*pretest*) and after being given treatment (*posttest*) in two groups, namely the experimental group that used HOTS-based LKPD and the control group that did not use HOTS-based LKPD (Almira Darlin et al., 2022).

Table 1. *Two-Group* Pretest-Posttest Design Scheme

Group	Pretest	Treatment	Posttest
Eksperimen 1	O1	X	O2
Eksperimen 2	O3		O4

Information:

Experiment 1 : The group receiving treatment A
Experiment 2: The group receiving treatment B
(or not receiving treatment at all)
O1 : Pretest for experimental group
O2 : Posttest for experimental groups
O3 : Pretest for control group
O4 : Posttest for control group
X : Treatment/Intervention given to the experimental group

The population in this study includes all students of classes VA and VB in MIS YPI BTG KUIS, with a total of 55 students from both classes. Suharsimi (in Widiyanti) states that the population is the entire subject that is the target of a study, which has been previously determined by the researcher (Salim, 2018). The determination of the sample in this study was carried out purposively, based on the recommendations of science teachers, namely the VA class with 29 students and the VB class with 26 students.

Table 2. KD Indicator - Style in Everyday Life

KD	Indicator	Levels Cognitive	Number Question
3.3	Based on the reading, students can analyze static electrical forces by referring to examples that exist in everyday life	C4(Analyze)	1
3.3	Based on the reading, students can assign examples of muscle styles.	C5(Evaluate)	2,3
3.3	Based on reading, students can understand static electric force by referring to examples that exist in daily life	C2 (Understand)	4
3.3	Based on the reading, students can create electrical forces by referring to examples that exist in everyday life	C6 (Create)	5

The instrument used was a description test consisting of 5 questions that measured the ability to analyze, evaluate, and solve problems in style material. The instrument was tested for validity using *Product Moment correlation* (r count 0.458–0.730 > r table 0.278) and declared valid. The reliability of the instrument was tested using Cronbach's Alpha and a value of 0.637 was obtained, which belongs to the reliability category ($0.60 \leq \alpha < 0.70$).

The data analysis in this study began with a normality test using Kolmogorov-Smirnov to ensure that the data was distributed normally. Furthermore, a homogeneity test was carried out with *the Levenes Test* to determine the similarity of variance between groups. The validity test is done with *Product Moment* correlation to ensure each question item is usable, while the reliability test uses Cronbach's Alpha to measure the consistency of the instrument. After the data met the assumptions of normality and homogeneity, hypothesis testing was carried out using *the Independent Samples T-Test* to determine the significant difference in learning outcomes between the experimental group and the control group.

FINDINGS AND DISCUSSION

Based on the results of the scores after students worked on the HOTS questions, it was found that there were 17 students who met the KKM and 12 students who did not meet the KKM with the lowest score of 0 - 40 and the highest score of 60. The following are the results of the student test based on Table 3:

Table 3. Student Test Score Results

	Class 5A		Class 5B	
	Pre test	Post test	Pre test	Post test
Total Value	1.805	2.150	1.505	1.830
Grade Point Average	62,24	74,14	57,88	70,38
Maximum value	90	100	80	95
Minimum score	40	55	30	45

Based on Table 3, it can be seen that the test scores of students in Classes 5A and 5B have increased from pre-test to post test. In Class 5A, the total score increased from 1,805 to 2,150 with an average from 62.24 to 74.14, a maximum score from 90 to 100, and a minimum score from 40 to 55. Meanwhile, in Class 5B, the total score increased from 1,505 to 1,830 with

the average from 57.88 increasing to 70.38, the highest score from 80 to 95, and the lowest score from 30 rising to 45. These results show that both Class 5A and 5B obtained an increase in academic achievement after the post test, although the increase in Class 5A was seen to be higher than Class 5B.

Initial data analysis was carried out by validity test. The results of the validity test can be seen in the Table

Table 4. Validity Test

Variabel	Question No.	r-count	r-table	Information
	1	0,458	0,278	Valid
	2	0,663	0,278	Valid
	3	0,563	0,278	Valid
	4	0,724	0,278	Valid
	5	0,730	0,278	Valid

Based on Table 4, the results of the validity test of the question items using the Pearson Product Moment correlation with the number of respondents 55 people and a significance level of 5% (r table = 0.278), it was obtained that all question items had a greater r value than the r table and a significance value (p-value) < 0.05. The correlation value of the item to the total score of each question is as follows: question 1 is 0.458, question 2 is 0.663, question 3 is 0.563, question 4 is 0.724, and question 5 is 0.730. This shows that the five question items have a significant positive relationship with the total score, so that all items are declared valid and suitable for use in the test instrument.

After the data is declared valid, a reliability test is carried out. The results of the reliability test can be seen in Table 5.

Table 5. Reliability Test

Variabel	*Cronbach's Alpha*		Information
	0,637	0.60 ≤ a < 0.70	Reliabel

Based on Table 5, the results of the instrument reliability test using *Cronbach's Alpha* coefficient, obtained an alpha value of 0.637 for the number of items as many as 5 questions. According to the reliability criteria, the alpha value is in the category of sufficient or reliable ($0.60 \leq \alpha < 0.70$).

Next, a normality test was carried out using Kolmogorov-Smirnov. The results of the normality test can be seen in Table 6.

Table 6. Normality Test

Tests of Normality				
Value	Class A Pretest	.968	29	.516
	Class B PreTest	.973	26	.698
	Class A PostTest	.972	29	.612
	Class B PostTest	.981	26	.743

Based on Table 6, the results of the normality test using Shapiro-Wilk show that all research data have a significance value greater than 0.05. The significance value in class A PreTest was 0.516, class B PreTest was 0.698, class A PostTest was 0.612, and class B PostTest was 0.743. Thus, it can be concluded that the data in each group, both PreTest and PostTest, are normally distributed so that they meet one of the basic assumptions for subsequent parametric statistical analysis.

After the data is normally distributed, a homogeneity test is carried out. The results of the homogeneity test can be seen in Table 7.

Table 7. Homogeneity Test

Value	Based on Mean	.395	1	53	.532
	Based on Median	.458	1	53	.501
	Based on Median and with adjusted df	.458	1	52.996	.501
	Based on trimmed mean	.410	1	53	.525

Based on the output of the Test of Homogeneity of Variances (Levene's Test), it is known that the significance value (Sig.) on the four bases of the calculation (Based on Mean = 0.532; Based on Median = 0.501; Based on Median and with adjusted df = 0.501; Based on trimmed mean = 0.525)

is entirely greater than 0.05. This shows that the data variance between groups is homogeneous, there is no significant difference in variance between groups. The assumption of variance homogeneity is fulfilled so that parametric statistical analysis that requires t-test homogeneity can be continued.

Finally, a T test was performed to determine the significant difference in learning outcomes between the experimental group and the control group. The results of the T test can be seen in Table 8

Table 8. T Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Itself.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Value	Equal variances assumed	.395	.532	1.242	53	.001	4.35676	3.50733	-2.67806	11.39158
	Equal variances not assumed			1.235	50.772	.000	4.35676	3.52665	-2.72405	11.43758

Based on Table 8 of the results of the Independent Samples T-Test, the Levene's Test value was obtained with a significance of 0.532 (> 0.05) which shows that the data of the two groups have homogeneous variances so that the analysis uses the Equal variances assumed line. Furthermore, the results of the t-test showed that the value of Sig. (2-tailed) = 0.001 (< 0.05), so it can be concluded that there is a significant difference between the average science learning outcomes of students who use HOTS-based LKPD and those who do not use it. This means that the implementation of HOTS-based LKPD has a real influence on improving science learning outcomes in grade V students of SD MI YPI BTG.

Discussion

The results showed that there was a significant difference between the science learning outcomes of students who used HOTS-based LKPD and those who did not use it. This is evidenced by the value of the independent samples t-test which shows Sig. (2-tailed) = 0.001 (< 0.05), so it can be concluded that the application of HOTS-based LKPD has a real effect on improving student learning outcomes. These findings reinforce that the use of learning instruments designed with an emphasis on high-level thinking skills can help students be more active, critical, and directed in understanding science concepts.

These results are in line with research by Masruroh, et al. (2022) which shows that the implementation of HOTS-based LKPD is able to significantly improve critical thinking skills as well as student learning outcomes. In line with that, Lestari, et al. (2024) also found that the use of HOTS-based learning tools contributes positively to improving the mastery of concepts and learning motivation of elementary school students. Research by Hujatulatif, et al. (2017) emphasized that HOTS-based learning media helps students develop analysis, synthesis, and evaluation skills, so that learning outcomes are more optimal.

In addition, research by Putra, et al. (2023) shows that LKPD that integrates HOTS questions can improve students' science problem-solving skills, so that they not only understand the material, but also are able to apply it in daily life. Pamungkas & Fitriyani (2023) found that the application of HOTS to LKPD had a significant impact on critical thinking skills and learning outcomes, because students were required to analyze and draw conclusions independently. In line with that, Cahyati & Mustika (2024) stated that HOTS-based learning provides meaningful experiences and fosters students' scientific attitudes, which ultimately improves their academic achievement.

The findings of this study are consistent with various previous studies that show that the application of HOTS-based LKPD not only has an impact on improving learning outcomes, but also developing high-level thinking skills. This emphasizes the importance of the role of teachers in developing innovative, contextual, and HOTS-oriented learning tools so that science learning in elementary schools is more effective and relevant to the demands of the 21st century.

Theoretically, these findings are in line with Ausubel's theory of meaningful learning, which states that new information will be easier to understand if it is linked to existing knowledge. This is also in line with Piaget's theory of constructivism which emphasizes that knowledge is actively constructed by students through interaction with the environment (Lestari et al., 2024). In addition, Vygotsky's theory of the developmental zone supports the importance of scaffolding from teachers through media such as LKPD, which can help students complete tasks that were initially difficult to do independently (Hujatulatif et al., 2017). In the Independent Curriculum, HOTS-based learning allows students to understand the concept of science.

CONCLUSIONS

Based on the results of the study, it can be concluded that the implementation of LKPD based on Higher Order Thinking Skill (HOTS) has a significant effect on the science learning outcomes of grade V students of SD, Mis, YPI BTG. QUIZ. The use of HOTS-based LKPD has been proven to be able to improve students' analysis, evaluation, and problem-solving skills compared to learning without HOTS-based LKPD. These findings confirm the importance of the use of innovative and HOTS-oriented learning tools, such as HOTS-based LKPD, in improving the quality of science learning at the elementary school level. HOTS-based LKPD not only serves as a teacher's tool, but also as a means that allows students to actively and independently develop, as well as develop their high-level thinking skills. so that science learning in elementary schools is more effective and in accordance with the demands of the 21st century.

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