



# The Influence of Pop Up Book Learning Media on Students' HOTS Ability in Natural Science Materials in MI

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**Abstract:** Higher order thinking skills (HOTS) are the ability to solve problems, think creatively, think critically, give arguments, and make decisions. Giving an understanding of HOTS makes students have the capabilities according to the 21st century so that they are able to compete and get more space in various sectors needed in life. To realize HOTS student teachers must be more innovative in using learning media, one of which is by using pop up book media. This study aims to see the effect of pop up book learning media on the HOTS ability of students on science and weather material and its effect on class III humans at MIS Nurul Huda binjai. This research framework uses a quasi-experimental design where the research design used is a nonequivalent control group design. Data collection techniques using pretest-posttest. In analyzing the data, researchers used validity, reliability, normality tests with the Wilcoxon test and the Mann-Whitney test. For the validity test, 10 valid questions were found, for the reliability test the results of Cronbranch's alpha = 0.640 (reliable). In the Wilcoxon normality test, the output of the statistical test was found to be Asymp.Sig. (2-tailed) has a value of 0.001 because the value of 0.001 is smaller than 0.05 (0.001 < 0.05) there is an effect of using pop up book learning media on students' HOTS abilities. For the Mann-Whitney test, the Asymp.Sig value is found. (2-tailed) of 0.000 < 0.05. It can be said that there are differences in the HOTS of students between the experimental class and the control class. This means that there is an effect of using Pop Up Book learning media on the HOTS abilities of class III students on science material in MI.

**Keywords:** Higher order thinking skills; Learning; Media; Pop up book

## Introduction

Higher-order thinking skills in SD/MI are the main skills and must be possessed by graduates to meet the criteria of being competent. This is stated in Permendikbud no. 54 of 2013 relating to the competency standards for SD/MI graduates "Having the ability to think and act that has productivity and creativity values in imaginary and factual according to what is given to them". This causes the focus of learning to lie on building higher-order thinking skills, including the ability to analyze, evaluate, and create or be creative with scientific strategies through integrative thematic learning (Anugrahana, 2018).

Higher Order Thinking Skills is a way of thinking of students at a higher level of knowledge and is

improved through various cognitive concepts and methods, learning taxonomy such as problem solving methods, bloom taxonomy, and learning, teaching, and evaluation taxonomy. Higher order thinking skills include problem solving skills, creative thinking skills, critical thinking, skills in giving arguments, and decision making skills. Higher-order thinking skills (HOTS) can be interpreted as an important part of learning activities, especially in Natural Sciences (IPA) material.

According to Newman and Wehlage (Widodo & Kadarwati, 2013) through higher order thinking skills students are able to clearly examine differences in ideas or ideas, provide good arguments, can solve cases, interpret explanations, examine hypotheses and understand various complex things to become more real. Providing an understanding of higher order

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thinking skills makes students have the capabilities according to the current development of 21st century learning. Students who have abilities in accordance with the times will get more space in various sectors what is needed in life.

21st century learning includes the abilities needed by students in the 21st century, namely 4C which includes: communication, collaboration, critical thinking in problem solving, and creative and innovative. Krathwohl and Anderson added two abilities in Blomm's Taxonomy as HOTS abilities that students need to have, namely evaluation, and create. The abilities that students need to achieve are indicators of HOTS. In order to realize students' HOTS abilities that are in accordance with the 21st century, teachers need to have good process skills when the teaching and learning process takes place.

Process skills are the teacher's ability to present learning that can provide useful and fun learning experiences that are student-centered (student center), and can encourage students to be able to solve problems. In the teaching and learning process the teacher does not only act as a resource but also as learning facilitator (Rozi & Hanum, 2019).

The science learning concept presented at Madrasah Ibtidaiyah (MI) is natural science learning (IPA). Science content is learning whose implementation process is carried out scientifically, which in its implementation will attempt to analyze a problem based on scientific steps, starting with making observations that will bring up hypotheses or temporary conclusions, building experimental concepts that are useful for testing hypotheses that have been obtained, carrying out experiments, as well as interpreting the data and measurements that have been found (Priyatma et al., 2019). IPA is part of a scientific product in the form of knowledge which contains facts, laws, principles and theories that have been tested and accepted for truth (Marudut et al., 2020).

Based on research conducted by The Organization for Economic Co-operation and Development (OECD), the score given to HOTS abilities or Indonesian high-level thinking in PISA (Program for International Student Assessment) in 2009 was ranked 57 out of 65 with a total the score obtained was 383. In 2012 Indonesia was ranked 64th with a total of 65 participating countries which at that time received a score of 382. Next, in 2015 Indonesia was ranked 64th based on 72 participating countries with a score 403 (Argina et al., 2017).

In assessing the level of literacy in reading, mathematics, or science whether it is good, the OECD sets an international standard average score of 500. Through these surveys, the value of the ability of

Indonesian students' natural sciences is still far from meeting the score limit which has become an international standard set by the Institute OECD. The reason for the low acquisition of science learning outcomes is due to the method of teaching science which does not open up opportunities for students to maximize their higher order thinking skills. Of course this needs to be maximized (Robertson, 2021).

The lack of participation of students in the learning process makes the goals of HOTS learning difficult to achieve. This is because the process of providing material is still centered on educators, while educators only convey information using the lecture method. This will reduce the activity of students because they will only copy, sit, silently listen and do questions from the teacher.

Yuanita (2020) said that to gain knowledge of higher order thinking skills in natural sciences, students need experience in participating in learning, so that students are able to construct a knowledge within themselves which will build awareness to use higher order thinking skills during the learning process. This way of learning will help students to experience development and have good reasoning abilities.

Fajriyah et al. (2018) said that Science is part of a scientific attitude consisting of important values and ethics in the learning process which includes: critical thinking skills, humility, high curiosity, creative, open-minded about many things, receptive to criticism and suggestions, innovative, not easily give up, and others. So that in learning science, media is needed to support the learning process that will accommodate these values (Pertiwi et al., 2018).

Prasetyaningsih (2019) said that Pop up Book media can be interpreted in the form of 3D paper art cards which when opened will also fold when closed. Dini (2019), Sinta et al. (2020), and Masturah et al. (2018) concluded that pop learning media up book has practical value and is able to increase students' learning desires because it presents a form of visualization of learning with 3D images. Arjuna et al. (2019) defines Pop Up book media as a card that is made through paper and if it is opened at a special angle (90° and 180°), it will produce an image that appears. Pop up book presents a very captivating visual story. The book, which comes in the form of various surprises on each page, will invite curiosity when viewing the next pages. This will be the reason students will enjoy it the pop-up book learning media is caused by its charm, based on its unique and creative form in the form of a three-dimensional media presentation that exemplifies certain objects (Najahah et al., 2016).

Based on previous research, it states that with an average validation score of 4.68%, it proves that pop up

book media in the solar system material for class VI SD is very effective when used in learning practice (Sentarik & Kusmaryatni, 2020). In different studies it was also shown that there was a substantial increase in the use of thematic-based pop up book media when increasing student learning outcomes (Raesita et al., 2019).

Different research regarding the increase in pop-up book media concludes that it has been fully validated through income with a total score of 90 based on a percentage of 97.79%, showing that pop-up book media gets the criteria of "very valid" in making it easier for students to understand learning Where I Live (Dewanti et al., 2018). Learning with pop up book media makes students happy while learning takes place. Learners can easily be directed and focused on the material provided. Pop up book media is seen as being able to give an impression that can attract students' attention and is seen as being able to foster students' enthusiasm for learning (Komang et al., 2020).

Researchers then made observations on March 25 2023 at MIS Nurul Huda Payaroba. In science learning, students were observed not to focus when the teacher explained the material. In addition, students' activeness and interest in asking questions to increase their curiosity are also considered to be lacking. After conducting interviews with class III A and III B teachers, it was revealed that this happened because during science lessons the teacher still used conventional methods, namely only using the lecture method and utilizing blackboard media as a support. This also triggers a lack of interest in students to read. Based on the explanation that has been presented, the researcher is interested in conducting research on the effect of pop up book learning media on students' HOTS abilities in science material at SD/MI (Experimental Study of Class III A and III B MIS Nurul Huda Payaroba).

## Method

The research method used in this study is a quasi-experimental method (quasi experiment). Sugiyono defines experimental research as a research method that is used to see the effect of giving certain treatments to others under controlled conditions. The use of experimental research in this study was intended to see the effect of classes using Pop Up book learning media and those that did not on students' HOTS abilities in science subjects. The design used in this study is the nonequivalent control group design. This study used two groups, namely the experimental group as the group that was subjected to treatment and the control group as a comparison that was not subject to treatment. Sugiyono designed a research design as follows (Simbolon & Fitriyani, 2021).

**Table 1.** Nonequivalent Control Group Design

Group	Pre-Test	Treatment	Post-Test
Experiment	O <sub>1</sub>	X <sub>1</sub>	O <sub>2</sub>
Control	O <sub>3</sub>	X <sub>2</sub>	O <sub>4</sub>

Information: X<sub>1</sub> = Learning with the treatment of Pop up book learning media, X<sub>2</sub> = Learning without media treatment Pop-up book, O<sub>1</sub> = Pre-test of experimental class, O<sub>2</sub> = Post-test of experimental class, O<sub>3</sub> = Pre-test of control class, O<sub>4</sub> = Post-test of control class.

This study used the MIS school. This research used the Nurul Huda Payaroba MIS school as a population where the research samples were students of class III A and class III B. Class III A was the experimental class which was treated with pop up book learning media while class III B did not get treatment with pop up book learning media. The use of research instruments through question test sheets. The test sheets are in the form of pre-test and post-test questions. Giving questions must be the same between pre-test and post-test questions. Tests that have been carried out by students will be assessed from after getting treatment with the test results before getting treatment. In data collection techniques used, namely the use of learning achievement tests.

The use of learning outcomes tests is carried out to measure students' HOTS abilities. Bloom's cognitive domain HOTS domains are C4, C5, and C6 namely analyzing, evaluating, and creating. However, in making the test questions in this study only included 2 levels of thinking from HOTS, namely analyzing (C4) and evaluating (C5).

Analysis of the research data used is correlational analysis. To obtain data, instruments are needed as data collection devices in the form of a set of questions given by researchers to respondents. Instruments in the form of questions about the weather and its effects on humans. In order for the questions to become data collection instruments, it is necessary to test the instrument. The purpose of instrument testing is to assess the level of validity and reliability. In this study, researchers also conducted a normality test because it relates to whether or not the selection of statistical tests was appropriate.

The validity test used in this study is construct validity, where construct validity is used to measure the extent to which the instrument is able to accurately represent the research concept (Hair et al., 2019). Construct validity is a test with the widest coverage compared to other validity tests. The way to test validity with construct validity is to use the product moment correlation technique with the following formula (Siregar, 2017).

$$r_{\text{count}} = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}} \quad (1)$$

In this study, a reliability test was carried out using the SPSS software tool with the Cronbach's Alpha test. The purpose of carrying out a normality test is to understand whether the sample comes from a normally distributed population or not. In this study, normality testing uses the Chi-Square formula. The use of this formula is because it can be used by anyone and does not require special facilities. The normality test begins with estimating the acquisition of pre-test scores. The formula needed is as follows.

$$\chi^2 = \sum \left( \frac{(f_o - f_h)^2}{f_h} \right) \quad (2)$$

Based on the data obtained in this study which were not normally distributed, and then data analysis was carried out using the Wilcoxon test. The Wilcoxon test is a nonparametric statistical test intended for two paired samples. The thing that needs to be considered during the Wilcoxon test is not only to see the sign of change but also the big difference in each pair (Lubis, 2021).

In this study, the researcher conducted a t-test with the SPSS software tool to see whether there was an effect of using Pop Up Book learning media on the HOTS abilities of Science Material Students in MI obtained from the variations have the same characteristics or not. The formula of the homogeneity test is as follows.

$$F = \frac{s_1^2}{s_2^2} \quad (3)$$

Description:

Ho : data groups have no variance

Ha : data groups have different variants

Assessment criteria: if  $F_{\text{count}} \leq F_{\text{table}}$ , then Ho is rejected.

In this study, researchers conducted a homogeneity test with SPSS software tools. Because the researcher found that there were different variants in each data group, the researcher used an alternative test using the Mann-Whitney test. The Mann-Whitney test is a non-parametric test that is performed if the t-test cannot be used because the normality test requirements are not met. What is seen in the Mann Whitney test is the median value (median) of the comparison of data groups (Artaya, 2018). In this study the researchers conducted the Mann-Whitney test with SPSS software tools.

## Result and Discussion

This research was carried out by going directly to the field to obtain the data needed for research. The researcher obtained the results by carrying out the experimental stages, namely: Conducting preliminary research, Determine learning problems, Perform validity testing and reliability, calculate the normality of the sample, and Carrying out trial activities.

This preliminary research was carried out in order to obtain important facts regarding the HOTS ability of class III MIS students Nurul Huda Payaroba as respondents on weather science material and its effects on humans, as well as determining research subjects namely class III A students as the experimental class and class IIIB as the MIS control class. Nurul Huda. What the researcher did in the preliminary research was the observation activity through the homeroom teacher. Based on the things that were obtained through observation and initial discussions at MIS Nurul Huda with the homeroom teacher for class III A and class III B, the researcher found problems for students in class III A and III B who had difficulty understanding science material.

Implementation of reliability validity tests, as well as pre-test post-test control class to 25 students of class III B MIS Nurul Huda aim to obtain validity in the test instrument. This activity will be held on Monday, 10 April 2023 at 08.30- 10.00 WIB. The total number of items tested is 10 questions in the form of filled-in questions.

In order to obtain the validity of the test instrument, the researcher uses test result data and calculates it using the correlation between the score of each item and the total score of all questions using the Pearson Product Moment statistical test. Based on the results of the Pearson Correlation test, the questions are considered valid if the calculated R value is greater than the R table. The R table value for a number of 25 samples is 0.396. If the calculated R value is lower than the table R value, the question is considered invalid and cannot be used. Below is the acquisition of the validity test questions which are as follows.

**Table 2.** Test Validity Results

Items	Test Results ( $r_{\text{count}}$ )	Criteria ( $r_{\text{table}}$ )	Information
Question 1	0.478	0.3809	Valid
Question 2	0.621	0.3809	Valid
Question 3	0.428	0.3809	Valid
Question 4	0.428	0.3809	Valid
Question 5	0.416	0.3809	Valid
Question 6	0.428	0.3809	Valid
Question 7	0.476	0.3809	Valid
Question 8	0.622	0.3809	Valid
Question 9	0.536	0.3809	Valid
Question 10	0.438	0.3809	Valid

Based on the acquisition of the validity count above, it was found that the rcount facts for question no. 1 is

0.478 and then correlated to the rtable based on the number of subjects  $N = 25$  for a significant level of 5% and a rejection limit of 0.3809 (table value rtable). Based on this, the total acquisition count item question no. 1 is greater than the rtable ( $0.478 > 0.3809$ ), which means that the component of question number 1 can be said to be validated because the result is greater than the rtable value. The same method was also carried out for question no. 2 to no. 10.

To find out whether the questions used by researchers can really be trusted as a data collection tool, the questions must first be tested for reliability (level of trust). The reliability test serves to determine the level of consistency of the questions used by researchers. The purpose of this test is that the questions can be used to measure research variables, even though this research is being carried out continuously using the same questions. In his book, Sujarweni (2014) explains that the reliability test can be carried out together for all research questions.

The basis for determining the reliability test results is successively as follows: if the results of Cronbach's Alpha  $> 0.60$  it can be stated that the problem is reliable or consistent; if the results of Cronbach's Alpha  $< 0.60$  the item is declared unreliable or inconsistent (Budiman & Riyanto, 2013). The results of the reliability test for 10 questions are as follows.

**Table 3.** Realibility Test Results for 10 Questions

Conbranch'sAlpha	Criteria	Information
0.640	0.600	Reliable

The acquisition of Cronbranch's Alpha for 10 questions is 0.640 with a criterion of 0.60 where Cronbranch's Alpha is  $0.640 >$  of 0.60 criteria. So that it can be said that the 10 questions used are reliable or consistent. In the normality test, the researcher found that the pre-test and post-test data for the experimental class and the control class were not normally distributed, therefore the researcher used the Wilcoxon test to test the hypothesis. The test results can be seen in the table below.

**Table 4.** Pre-Test Normality Test for Exprimental Class and Control Class

Class	Statistics	df	Sig	Information
Exprimental Class	0.214	25	0.005	Abnormal
Control Class	0.231	25	0.001	Normal

Based on Table 4, the normality calculation results show that the Sig value in the pre-test for the experimental class is  $0.005 < 0.05$ , while the data from the pre-test for the control class is  $0.001 < 0.05$ . Based on these results it can be concluded that in the experimental

class and control class the data is not normally distributed.

**Table 5.** Post-Test Normality Test for Exprimental Class and Control Class

Class	Statistics	Df	Sig	Information
Exprimental Class	0.359	25	0.000	Abnormal
Control Class	0.193	25	0.014	Abnormal

Based on Table 5, the normality calculation results show that the Sig value in the post-test for the experimental class is  $0.359 < 0.05$ , while the post-test results for the control class are  $0.193 < 0.05$ . Based on these results it can be concluded that in the experimental class and control class the data is not normally distributed.

**Table 6.** Wilcoxon Test

	Post-Test Experimen- Pre-Test Experimen	Post-TestControl- Pre Test Control
Z	-3.222 <sup>b</sup>	-2.321 <sup>b</sup>
Asymp.Sig. (2-tailed)	0.001	0.020

Based on Table 6 the output of the statistical test is known as Asymp.Sig. (2-tailed) has a value of 0.001 because the value of 0.001 is smaller than 0.05 ( $0.001 < 0.05$ ). So it can be concluded that the "Hypothesis is accepted" means that there are differences in HOTS learning outcomes for the Pre-Test and Post-Test, so that it can be concluded that "there is an effect of using pop up book learning media" on the HOTS abilities of Science material students in MI.

**Table 7.** Homogeneity Test

		Levene	df1	df2	Sig.
		Statistic			
Student	Based onMean	2.713	1	48	0.106
Learning	Based onMedian	2.063	1	48	0.157
Outcomes	Based on Median and With Adjusted Df	2.063	1	47.508	0.157
	Based on Trimmed Mean	2.984	1	48	0.092

Based on the output above, it is known that the significance value (Sig.) Based on Mean is  $0.106 < 0.05$  so it can be concluded that the variance of the Experiment Class Post-Test data and the Control Class Post-Test data are not the same or heterogeneous. Thus, one of the requirements (not absolute) of the independent sample t-test is not fulfilled, then the alternative Man Whitney test will be used.

**Table 8.** Mann-Whitney Test

	HOTS Learning Outcomes
Mann-Whitney U	116.500
Wilcoxon W	441.500
Z	-4.008
Asymp.Sig. (2-tailed)	0.000

Based on the Statistical Test, it is known that the value of Asymp.Sig. (2-tailed) of 0.000 < 0.05, it can be concluded that the "Hypothesis is accepted". Thus it can be said that there is a difference in the HOTS of students between the Experimental class and the Control Class, because there is a significant difference it can be said that "There is an effect of using Pop Up Book learning media on the HOTS abilities of Science Material Learners in MI".

### Conclusion

Based on the results of the research and discussion, the researcher can conclude that the pop up book media has an effect on the HOTS ability of students on science and weather material and its effect on humans in class III A and III B MIS Nurul Huda Payaroba, this is due to the results of the Wilcoxon test calculation results of statistical tests that obtained Asymp. Sig. (2-tailed) has a value of 0.001 because the value of 0.001 is smaller than 0.05 (0.001 < 0.05). Then it was found that there was a difference between the HOTS learning outcomes for the Pre-Test and Post-Test, so it can be concluded that there is an effect of using pop book learning media on the HOTS ability of students on science material in MI. In the Mann-Whitney test the researcher also obtained an Asymp.Sig value. (2-tailed) of 0.000 < 0.05, so it can be said that there are differences in the HOTS of students between the Experiment class and the Control class. Because there is a significant difference, it can be concluded that there is an effect of using Pop Up Book learning media on the HOTS abilities of science material students in MI. Through the use of Pop Up book media, students get new teaching methods, which causes students to be so enthusiastic when participating in the learning process. In addition, by using this Pop Up book media the teacher can also attract the attention of students when understanding the material, which in the end the use of this media will make it easier for students to answer questions related to the weather and its effects on humans.

### Author Contributions

This writing is a real work and the result of collaboration, between students and lecturers. The first author is a student who plays an active role in finding data. While the second writer is a supporter in analyzing the data. So that, this writing can be a scientific work.

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In the activity of writing this article, there is no element of conflict. But the form of collaboration between students and lecturers.

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