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Specialized social media platform for integrated thematic based science learning

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Abstract. The development of high-order thinking skill of students is one of the keys to success in adapting to changing times and entering the world of technology. This ability should be developed since students in elementary school. The research aims to improve students' high order thinking skills through integrative thematic-based science learning with scientific approaches. The research was conducted at one of the elementary schools in Ambon, East Indonesia used the quasi-experimental method with pre-post-equivalent control group designs. Data collection techniques are carried out through high-order thinking tests with indicators determining aspects, making decisions, making ideas, reasoning, and communicating. Furthermore, the data were analyzed using an independent sample t-test with a significance level of 0.05. The results showed that the average N-gain value of the experimental group was 0.7427 higher than the control group 0.4338. So it can be concluded that thematic integrative science-based learning with a scientific approach can improve students' high order thinking skills in elementary schools.

1. Introduction

The 2015 literacy PISA results were released on December 6, 2016, showing the performance of Indonesian students was still relatively low. The average achievement scores for science, reading, and mathematics are ranked 62, 61, and 63 of 69 countries evaluated by PISA [1]. Furthermore, the results of the 2015 TIMSS study showed that Indonesian students were ranked 36 out of 39 countries with the lowest scores. Students' science scores from 1999, 2003, 2007, 2011 to 2015 were 435, 420, 433, 386, and 397 respectively respectively. Based on the acquisition of Indonesian science scores in 2015, the figure was still low [2]. The 2015 literacy PISA results have just been released on December 6, 2016, showing the performance of Indonesian students is still relatively low. The average achievement scores for science, reading, and mathematics are ranked 62, 61, and 63 of 69 countries evaluated by PISA [1]. Furthermore, the results of the 2015 TIMSS study showed that Indonesian students were ranked 36 out of 39 countries with the lowest scores. Students' IPA scores from 1999, 2003, 2007, 2011 to 2015 were 435, 420, 433, 386, and 397 respectively. Based on the acquisition of Indonesian science scores in 2015, the figure was still as low as [2]. The Organization for Economic Cooperation and Development (2016) explained that Indonesian students 'thinking skills were only 0.8% of 20% of participants who were



below level 2, Indonesia had 42.3% of students with abilities below level 2. That is, students' thinking skills Indonesia is still dominated by low order rank (LOT) [3]. The presentation of the Minister of Education and Culture (2013) on the level of understanding, deepening and mastery of student material in Indonesia is still very low when compared to other countries on the Asian continent. That is, the learning process that has been carried out so far has not been able to explore high-level thinking skills which include giving reasons with complete information, managing information, making generalizations, and presenting data [4]. The learning paradigm in the 21st century has changed the role of teacher positions in the classroom from experts to facilitators and the focus of teaching has changed from knowing to be able to use and apply information in a relevant way and require various skills that must be mastered by someone preparing students to master various skills in order to become successful individuals in life [5,6]. Important skills in the 21st century are still relevant to the four pillars of life which include learning to know, learning to do, learning to be, and learning to live together [7]. These four principles each contain specific skills that need to be empowered in learning activities, such as critical thinking skills, problem solving, metacognition, communication skills, collaboration, innovation and creation, information literacy, and various other skills [8], which are in the implementation of teachers expected to develop questioning skills oriented to high-level thinking skills. In the teacher's book, it has been explained that the fourth week's activities are projected activities and literacy that aim to improve high-level thinking skills and student reading and love reading skills (Kemendikbud in 2013) [4]. Integrative thematic learning in elementary schools is a consequence of the implementation of the 2013 curriculum which is the answer and solution for students' high-level thinking skills in the basic education unit [3]. The form of thematic learning is packaged in an integrated manner that covers all subjects [4], which are initially separated and then packaged into one unit in a particular theme [5], and each theme can be divided into several sub-themes.

Integrated thematic learning is learning that integrates various competencies from various subjects into specific themes, which facilitates students to find knowledge about new phenomena that exist [9,10]. To improve high-level thinking skills [11]. The essence of thematic learning can be done by students who learn holistic concepts and no longer discuss one subject with another [12]. Psychological learning can provide a useful experience for students because learning students will understand important concepts that will be learned through direct experience and relate them to other concepts that are integrated into their lives [13]. For this reason, teachers need to use learning that can train high-level students [14]. One lesson that can be used for high-level learning training is the method of science-based Problem Based Learning [15].

Scientific-based learning models provide new hope for the world of education, especially in the learning process [16]. Various research results have been proven in learning-based learning models that can encourage students to increase their level of knowledge and apply knowledge and train students to increase knowledge, apply knowledge to correct problems and encourage students to innovate [17-20].

2. Method

This study used a quasi-experimental design in the form of a pre-post-non-equivalent control group design. This design is used to compare the increase in high-level thinking skills of students after scientific based learning is carried out between the experimental class and the control class. The sample in this study were 52 students in grade 4 at SD Waiheru 91 in Ambon City, which was divided into two groups, 26 students for the experimental group and 26 students for the control class.

Learning in the experimental class is done by applying scientific-based learning, while in the control class is done by ordinary learning in accordance with thematic learning guidelines. The research data were obtained from the test results in the form of questions given to students, both in the experimental class and the control class. Data analysis was performed using quantitative and descriptive statistical analysis. Statistical analysis is done using:

2.1. N-gain test

N-gain test is used to determine the increase between pre-test and post-test or gain. The increased amount is calculated by the normalized gain formula [21], namely:

$$G = \frac{\text{post test score} - \text{pre test score}}{\text{maximum possible score} - \text{pre test score}}$$

The results of the Profit calculation above are then interpreted using the adapted categories as follows: high category if $\langle g \rangle > 0.70$; medium category if $0.70 > \langle g \rangle > 0.30$; and low category if $\langle g \rangle < 0.30$ [22].

2.2. Statistic test

Statistical tests are used to determine whether there is an increase between the pre-test and post-test using paired sample t-test statistical tests, while to determine the average score between the experimental classes using scientific based learning and the control class using technical assistance using statistical tests Independent t-test sample. Basic decision making on probability values, where if $\text{sig} > 0.05$, then it is accepted, but if $\text{sig} < 0.05$ then it is rejected.

3. Results and discussion

Research on improving high-level thinking skills in thematic learning through basic learning that can be learned in experimental groups and in control groups as follows:

The average value of the N-gain test results in the experimental class and control class can be seen in Table 1 below.

Table 1. Average values of the N-gain test results.

Experiment Class			Control Class		
Pres-Test	Post-Test	N-gain	Pres-Test	Post-Test	N-gain
41,35	84,83	0,74	39,97	66,54	0,43

Based on the average value of the N-gain test results in Table 1 above, the results obtained that N-gain in the experimental class (0.74) is higher than gain N in the control class (0.43) and based on the average data average N The experimental group is in the high category, while the N-gain control group is in the moderate category. This difference is caused by the effects given to the experimental class, which is a scientifically based learning method. Learning given on a scientific basis can improve students' higher order thinking skills.

In addition to the results of the research as in Table 1 above, this study also produced the assessment table above

Table 2. The results of calculating an increase in indicators of higher order thinking.

No	Indicator higher order thinking	Experiment Class			Control Class		
		Pres-Test	Post-Test	N-gain	Pres-Test	Post-Test	N-gain
1	Specifying aspects	32,14	79,29	0,69	50,00	66,43	0,33
2	Make decisions	51,43	85,00	0,69	35,71	55,71	0,31
3	Creating ideas	35,00	84,17	0,76	32,50	68,33	0,53
4	Reasoning	41,43	75,00	0,69	25,71	45,71	0,31
5	Communicate	46,67	88,33	0,78	50,00	77,50	0,55

The results of the calculation of improvement in each indicator in Table 2 show an average of five indicators, N-gain from the experimental group is greater than N-gain in the control group. The average N-gain of the five indicators of high-level thinking in the experimental group showed a high category,

while the average N-gain in the control group showed a moderate category. While the results of statistical calculations to test hypotheses can be described as in table 3 below.

Table 3. Summary of results of statistical tests of higher order thinking skills.

	Normality Test	Homogeneity Test	t-test
Experiment Class	p = 0.299	p = 0.005	p = 0.000
Control Class	p = 0.088		t' = 7.872

Hypothesis:

H_0 is accepted if: sig value > 0.05
 H_0 is rejected if: sig value < 0.05

Based on the independent sample table t-test, it can be stated that the sig value is 0,000 < 0,05, then based on the independent sample t-test, it can be approved, the sig value is 0,000 < 0,05, then H_0 is rejected, meaning H_1 is accepted. So it can be denied that learning is done by learning based on significant scientific differences with ordinary learning. And the average N-gain value of the experimental group is 0.7427 higher than the average N-gain value of the control group, which is 0.4338.

The thematic integrative learning model based on learning carried out in class IV of Waiheru 91 Elementary School in Ambon City, determined five indicators, namely determining aspects, making decisions, making ideas, reasoning, and trying [23]. The five indicators are learning components that cannot be used that enhance high-level thinking skills. Research-based scientific thematic learning that is integrated with this study produces several findings: 1). The data in table 1 above shows that N-gain from the group was given higher learning from the group that only did ordinary learning. While the results of the N-gain assessment increase for each indicator on the ability to assess high levels of students [18], 2) Table 2 above causes five indicators that determine aspects, make decisions, make ideas, reason, and convert given scientific-based learning only do ordinary learning [17]. 3) Likewise, after the Independent t-Test statistical test, the results are obtained as in Table 3 above which there is a significant difference between learning conducted with scientific-based learning [20].

The results of the tests that have been carried out above indicate cognitive-based learning that exists above which improves students' thinking skills in thematic learning in elementary schools. Experiencing a significant increase, this enhances the results of research conducted by Aizikovitsh with the title Developing Critical Thinking Skills from Disposition to Ability: Mathematics Education from Early Childhood to High, which discusses development strategies that focus on students in elementary schools in American Towson Union. The results of the study showed an increase in the critical learning of students in mathematics [14]. Learning carried out by the teacher is related to indicators that determine aspects, students work on small projects under the guidance and direction of the teacher. This was also done by Kettler, T. with the title Critical Thinking Skills among Primary School Students: Comparing the Identification of Gifted Students and the Performance of Student General Education, this was increased in improving the thinking skills of 5th-grade elementary school students in Texas. Successfully there were no significant differences between gifted students and general education students towards critical thinking skills [15]. The same study was also conducted by Abdur Rahman Asari with the title Ideas for Developing Critical Thinking at the Elementary School Level. This is the most important in the global era, which is carried out on 4th-grade students of Muhammadiyah Elementary School in Makassar City. The results of the study show that the critical facts in K-13 can be done with various ideas: (1) asking students to ask for reasons, implications, strengths, and weaknesses of each argument; (2) asking students to consider alternative ideas; and (3) using problem-based learning or projects [16].

In experiments conducted by students in the laboratory, the teacher always controls students to make correct decisions based on valid data. The same thing that was rejected on the application of the Problem Based Learning method to creative thinking conducted by Ersoy with the title of the influence of problem-based learning methods in higher education, thinking about the application of the Problem Method [8], his research was also carried out by Florea researchers with the title Critical Thinking in Children elementary school children Critical Thinking in Elementary School Children, investment researchers on developing appropriate methods and procedures are integrated with support for 4th grade students, with the results of research showing appropriate methods and procedures very effective for developing critical thinking in school students basis [17]. Creating ideas is a very pleasant thing for elementary school students, especially for female students. Research on perspectives in learning. Studying gender learning models conducted by Fuad with the title Improving Critical Middle School Thinking Skills Based on Tests of Three Different Learning Models. SMP, with the results of the study, revealed that there are differences in the application of critical learning and gender in different learning models. [18]

In the learning process, a teacher must pay attention to the material to be delivered and students must be asked to ask questions, this is supported by research conducted by Rooney titled How do I use inquiry-based learning to improve my practice and to encourage high-level change among students my math? In elementary school students in mathematics learning to improve critical thinking, the results of the study show how to use taxonomy. Structure of Observed Learning Results (SOLO) students is more active in critical thinking in inquiry-based learners [19].

To further enhance the ability of higher-order thinking, in the learning process the teacher directs students to use an "org" code site to hone their creative thinking skills in solving problems, this has been approved by Kaleliog, entitled computer in the way humans behave -12: Code. org, who succeeded at the Kode.org discussion site on the ability to think reflective in solving problems with the triangulation method in elementary school students in the Turkish city [24]. The results of the study found that there were significant differences in student code-usage programs in students and gender reflective thinking skills [20]. In accordance with the past students are ready to be prepared in the world of work in the 21st century, discussed with research conducted by Dwyer et, entitled Integrated critical thinking for the 21st century, research proposed in work research Critical and creative thinking [25]. The results of the study indicate that there is a relationship between the evolution of 21st century work developed through the learning of this critical and creative thinking skills increasing by exponential [23].

Scientific-based learning used by teachers in the process of thematic learning in fifth-grade elementary schools can improve students' high-level thinking skills [26], this is developed by the results of student answers to the test questions given. where the results of the N-gain experimental class, experimental class (0.74) > control class (0.43).

4. Conclusion

An integrative thematic learning model based on scientific learning is a learning model that discusses high-level learning, develops creativity, determines aspects, makes decisions, makes ideas, reasoning, and communicates with students who are centered and develop after discussion in classroom learning is guided by the teacher. Thus scientific learning can be a good choice for teachers in conducting thematic learning in an effort to improve students' thinking skills so that they can be prepared in the era of the 21st century. For this reason, it is hoped that scientific knowledge can be disseminated to primary school teachers through training, seminars, and conferences, which are developed through the Teacher Working Group (KKG) More references

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