

Effect of Quantum Learning Model on Higher Order Thinking Skills in Grade 4th Elementary School

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Abstract—In the context of the 21st century, it is important to teach Higher Order Thinking Skills (HOTS) to students. The existing HOTS learning seems more serious, so it is necessary to have a HOTS learning that is fun, through the Quantum Learning model. The aim of this study was to determine the differences between HOTS between students who learned with the aid of the Quantum Learning model and students who had achieved conventional learning. The method used was quasi-experiment with a sample of pupils of the fifth grade in the sub-district Cicalengka, which have been selected in a targeted manner. The instrument used was HOTS instrument with indicators for analysis, evaluation and creation. The results showed that HOTS students in the experimental class increased by 20.4 using the Quantum Learning model. This value denies that there are significant HOTS differences between students using the Quantum Learning model with conventional models because the value of the significance level is 0.001.

Keywords—HOTS; quantum learning; elementary school

I. INTRODUCTION

We all know that the 21st century is a digital era characterized by the rapid development of information and communication technology. The development of information technology offers changes in all aspects of the constellation of life. The implication is that every nation including Indonesia must adapt to the demands of the era. According to Binkley, et al. to be able to live in the 21st century, ten skills that students must possess, include creative thinking skills, critical thinking, metacognition thinking, communication, collaboration, information skills, ICT knowledge (information technology) Communication), citizenship, work and career, as well as receptive and individual and social skills [1]. Furthermore, Trilling and Fadel initiated the concept of rainbow skills and knowledge that must be present in the 21st century, such as skills in learning and innovation, creative thinking skills and problem-solving skills, communication and collaboration skills, and capacities to creativity and innovation [2]. These skills are an essential basis for someone to be able to exist in the 21st century.

In line with the above statement, one of the skills that students can let exist in the 21st century is the ability to think higher (HOTS). HOTS is an important ability, where students learn not only to remember and understand, but much more in

analyzing, evaluating and creating. HOTS are complex skills in which logical skills and reasoning, analysis, evaluation, creation, problem solving and decision making exist [3]. This is in line with the opinion of in which HOTS is mentioned as the ability to apply skills, knowledge and values in reasoning and thinking in problem solving, decision making and being able to create something that has innovative properties [4].

HOTS is very important when it is related to the 21st century, so learning HOTS has become a necessity. However, the facts in the field show that the capacities of HOTS students are still relatively low. Students still learn at the level of remembering, understanding and applying, and are not used to being trained in the ability to analyze, evaluate and create. The results of the study by Saido, et al. show that teachers have previously learned to remember students, while innovative learning, such as project learning, problem-based learning, collaborative learning and research, are still not being carried out by the teacher [5]. This is reflected in the results of the PISA study, which ranked 64th in 65 countries in 2012 [6] and in 2015 was 64th out of 72 countries [7]. The rating shows that Indonesian students are still at the low proficiency level.

A lot of research has been done on HOTS, including studies such as Fitri et al., which concluded that the application of the Project Based Learning (PjBL) model could increase HOTS [8]. Fatchiyah also concluded in his research that the problem-based learning model (PBL) had a positive and significant influence on HOTS [9]. Finally, the research by Nurhayati and Angraeni concluded that HOTS students have increased in learning physics through the problem-based learning model (PBL) [10].

However, there are not many studies that focus on good conditions for students, namely a pleasant and comfortable atmosphere in improving HOTS. That is why the researcher offers an alternative solution for growing HOTS students with a pleasant atmosphere, namely with the Quantum Learning model. The Quantum Learning learning model comes from the effort of George Lozanov, a Bulgarian educator who carried out an experiment he called suggestion. According to Lozanov the principle is explained that suggestions can indeed have an influence on learning outcomes, whether positive suggestions or negative suggestions [11]. Positive suggestions can be made by making the learning environment comfortable and increasing the participation of students in learning, therefore

the Quantum Learning model focuses on a comfortable and enjoyable learning process. In this model, there are steps in structuring the learning environment and giving motivation, so that an optimal learning environment can be created to achieve the learning objectives and the learning atmosphere becomes more comfortable and pleasant. In addition, this model frees the learning styles of students. By freeing the learning style, it can encourage students to actively learn. The application of this model is expected to involve students directly in the learning process, so that HOTS students can improve themselves.

Based on the background above, the researchers felt interested in conducting a quasi-experimental study with the title "Effect of Quantum Learning Model on Higher Order Thinking Skills in Grade 4th Elementary School".

II. METHODOLOGY

This study used experimental research methods. Abidin calls experimental research as a research that is used to measure a variable directly with other variables and can test the hypothesis of a causal relationship [12]. Therefore, experimental research with characteristics groups, the manipulation of treatment of independent variables and the presence of randomization can be compared [12]. In particular, this study used a quasi-experimental design. This design included two groups of samples, one group as a comparison or control group and one group as an experimental group. In this study, the experimental group used a Quantum Learning model, while the control group used a conventional model. The quasi-design experiment used the matching pretest post-test design.

The population in this study were all pupils of the fourth year of the primary school year 2018/2019 in the district Cicalengka. Sample selection was done using targeted sampling technique. This targeted sampling is a well-considered sampling method in accordance with the objectives, considerations and requirements of the required sample. Based on the results of curriculum considerations, interviews with teachers and school conditions were performed in two elementary school in Cicalengka district with almost the same or homogeneous capabilities need.

The instrument in this study is about HOTS with indicators according to Anderson and Krathwohl, namely analysis, evaluation and creation that refers to the material of Heat Energy in class IV [13]. Data analysis techniques use quantitative data analysis. The processing of pre- and post-measurement is done with the SPSS version 24.0 for Windows.

III. RESULTS AND DISCUSSION

A. Result

The pretest was conducted in two classes, namely the experimental class and the control class. This pretest is a preliminary test carried out by researchers on the research sample, in an effort to obtain initial information from the sample before being given treatment. The results of the analysis and processing of pretest data can be seen in the following table.

TABLE I. VALUE OF PRETEST DESCRIPTIVE STATISTICS EXPERIMENTAL CLASS AND CONTROL CLASS

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Pretest_Experimental Class	30	36	92	1696	56.53	13.925	193.913
Pretest_Control Class	30	32	80	1736	57.87	12.897	166.326

Based on the table above, the average value of the experimental class pretest was 56.53 with a minimum value of 36 and a maximum value of 92. The standard deviation was 13.925 and the variance was 193.913. While the average value in the control class was 57.87 with a minimum value of 32 and a maximum value of 80. The standard deviation was 12.889 and the variance was 166.346. There was a difference in the pretest average of 1.34 between the experimental class and the control class. Based on the results of the pretest, it can be

concluded that the experimental class had a lower learning outcomes compared to the control class. To find out more about the difference in the value of the pretest, it can be done by comparing the two means.

Testing the hypothesis is done by using the t-test through the help of a computer program software SPSS 24.0 for Windows. The results of the two-mean difference test for the experimental class and the control class are as follows.

TABLE II. DIFFERENCE TEST RESULTS OF TWO PRETEST AVERAGE EXPERIMENTAL CLASSES AND CONTROL CLASSES

		Levene's Test for Equality of Variances		95% Confidence Interval of the Difference				
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Score Pretes	Equal variances assumed	.198	.658	-.385	58	.702	-1.333	3.465
	Equal variances not assumed			-.385	57.662	.702	-1.333	3.465

Based on table 2, the significance level is 0.702. This shows that the significance level was more than 0.05, so it can

be concluded that there was no significant difference in HOTS between students using the Quantum Learning learning model

in the experimental class with conventional learning models in the control class.

Furthermore, after carrying out the treatment using the Quantum Learning learning model in the experimental class and conventional learning models in the control class, students

were then given the posttest. This posttest was conducted to determine the difference in HOTS of students in the experimental class and control class after being given the action. Posttest was conducted in two classes, namely the experimental class and the control class. The results of analysis and processing of posttest data can be seen in table 3 below.

TABLE III. VALUES OF DESCRIPTIVE STATISTICS POST-TEST CLASSES AND CONTROL CLASSES

	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Variance
Posttest_Experimental Class	30	58	100	2308	76.93	11.671	136.202
Posttest_Control Class	30	20	92	1912	63.73	16.993	288.754

Based on table 3 above, the average posttest value of the experimental class was 76.93 with a minimum value of 58 and a maximum value of 100, the standard deviation was 11.671 and the variance was 136.202. While the average value in the control class was 63.73 with a minimum value of 20 and a maximum value of 92, the standard deviation was 16.993 and the variance was 288.754. There was a difference in posttest average of 13.20 between the experimental class and the

control class. Based on the results of the posttest, it can be concluded that the experimental class had a higher HOTS than the control class. However, the value cannot be concluded statistically, therefore statistical testing of two-mean differences was required done with the pretest. The two-mean difference test for the experimental class and the control class can be seen in table 4 below.

TABLE IV. RESULTS OF DIFFERENCE TEST RESULTS FOR TWO POST-TEST AVERAGE CLASSES OF EXPERIMENTS AND CONTROL CLASSES

		Levene's Test for Equality of Variances		95% Confidence Interval of the Difference				
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Score Post	Equal variances assumed	3.349	.072	3.507	58	.001	13.200	3.764
	Equal variances not assumed			3.507	51.379	.001	13.200	3.764

Based on table 4, the significance level was 0.001. This shows that the significance level was less than 0.05. It can be concluded that there was a significant HOTS differences between students who use the Quantum Learning model in the experimental class with conventional learning models in the control class. So that it can be seen that the Quantum Learning model has a positive effect on HOTS students.

B. Discussion

When building a fun HOTS, it is necessary to have a learning concept that is also fun but can improve the students' intellectuality. One of the concepts of learning is Quantum Learning. In the Quantum Learning model there is a syntax that can make students happy after analysis but does not forget the cognitive aspects, in this case HOTS.

In the first step, which must grow, students are encouraged and motivated to first learn through "pat spirit" and "pat tonj-tonji" together with students. Giving enthusiasm with various ice breaks is very effective in building interest in learning. This is in line with Bakhtiar's opinion that breaking ice is effective in building social skills [14], which will certainly make learning more effective and more passionate. When learning is effective and passionate, students are ready to learn well, in this case learn with the HOTS concept.

In the next step, namely Natural, students are invited to gain first-hand experience and to be actively involved in learning. Of course, learning as this means meaningful

learning. Students must be active and able to discover knowledge from real objects and from direct experience based on relevant sources and to discover new concepts themselves. This is in line with the theory of Jean Piaget that children between the ages of seven and eleven or twelve are in a concrete operational stage, would be better if they were in the learning process to be confronted with objects so that students can understand and construct knowledge that is abstract by these concrete objects [15]. This condition is also relevant to Bruner's learning theory, which offers students opportunities to manipulate concrete objects. So that everything in the learning process is aimed at students. Experiencing directly means conducting an investigation and this will be important when building HOTS. This is in line with Madhuri et al., which explains that learning where students are directly involved (research) can increase HOTS [16]. The use of sensory co-operation tools in natural activities helps students to strengthen their memories of learning materials [17], and strong memories will certainly reinforce HOTS. So it is clear in the natural phase that students can build their own HOTS by learning fun.

The third phase in the Quantum model is the Namai phase, where the researcher at this stage instructs students to mention the concepts that are obtained when the discussion takes place. The naming of this concept can be done with a strategy of using images, colors, tools and wall posters. Researchers and students use color on the implications in the field to give a concept a name.

In the fourth phase, the demonstration phase, students report the results of their discussion for the class. This phase is an opportunity for students to show that they are aware of the material they are learning. This phase is still the core activity. The core of this phase is to give students the chance to show that students know. This also gives students the opportunity to show a level of understanding of the material being studied. The strategy that researchers use in the demonstration phase is that students re-practice and bring the results of their discussion to the classroom. Then students must respond in other groups. During the demonstration process, the researcher sends students' answers to the correct answers.

The fifth stage is the stage of Repeat at this stage students and researchers conclude the material learned together and the researcher gives questions about the material that has been studied, giving this question is to find out to what extent the ability of students to understand the lessons that have been done. Work on these questions is done individually. Of course in this case the questions given are questions that have HOTS properties.

The final phase is the Celebration phase, at this stage researchers and students celebrate the success of the group that successfully works at LKS and students who are active in learning. This phase is described in the conclusion of learning, with the intention to give a sense of completion, to respect effort, perseverance and success, which ultimately gives a feeling of satisfaction and joy. With the final status of students who are happy, this will lead to the enthusiasm of students to continue learning. The strategy that researchers are using at this stage is to give compliments, sing together and give rewards in the form of pat and others. it is clear that the Quantum Learning model is very nice and is in line with the characteristics of the child. This joyful learning model like this can increase HOTS.

Thus, this research shows a positive thing. This research is also in line with the research put forward by Indriyani which states that there is an increase in improving the ability of mathematical understanding of elementary students through the use of Quantum learning models based on SAVI learning styles [18]. Furthermore, the research conducted by Setiawan states that learning outcomes with the application of the VAK strategy in science learning to the concept of light has increased in each cycle [19]. The same thing expressed by Ningrum states that by using the Quantum Learning model learning outcomes increase as well as student responses show positive [20]. So it is clear that HOTS can be improved through learning Quantum Learning.

IV. CONCLUSION

It can be concluded that HOTS of students in the experimental class with the Quantum Learning model increased by 20.4. The increase can be seen in the difference in the average value for the pre-measurement of 56.53 with an average value on the post-test of 76.93. HOTS of students in the control class using the conventional learning model had an increase of 5.86. The increase can be seen in the difference in the mean value at the pre-measurement of 57.78 with an average value on the post-test of 63.73.

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