THE INFLUENCE OF PROBLEM-BASED LEARNING MODELS - COMPUTATIONAL THINKING (PBL – CT) ON THE ABILITY TO THINKING ANALYTICAL VIEW OF STUDENTS' INTEREST IN THE SUBJECT OF NATURAL SCIENCES

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ABSTRACT

This study aims to find out whether there is an influence of the Problem Based Learning-Computational Thinking (PBL-CT) model on analytical thinking skills in terms of students' interest in Natural Sciences subjects. This research was conducted at the Kalam Kudus Christian Middle School in Malang in the 2022/2023 academic year. The design used in this study was a non-equivalent group design quasi-experiment. Retrieval of data using ten essay questions which are made according to indicators of analytical thinking ability and students' interest in science is measured by using a questionnaire. Data analysis was carried out by the Two Way Anova parametric test. Based on the results of the analysis carried out, the results were obtained: (1) there were differences in analytical thinking skills between students who were taught using the Problem Based Learning and Problem Based Learning - Computational Thinking (PBL-CT) learning models with a significance <0.05. (2) there is no difference in the ability to think analytically between students who have a high, medium, and low interest in learning science as shown by a significance value of 0.748 > 0.05. (3) there is an interaction between Problem Based Learning - Computational Thinking (PBL-CT) on students' analytical thinking skills in terms of students' interest in natural science subjects with a significance value of <0.05.

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INTRODUCTION

Technological, social, and environmental changes occur globally and this will impact all sectors including the education sector. In the draft Indonesian education roadmap for 2020 – 2035 issued by the Ministry of Education and Culture, it is stated that the future way of working will be very different from the current way of working where problem-solving, cognitive, and social abilities will increase in importance and the need for skills will decrease physically.

21st Century Skills is one of the answers in this growing technological era. 21st-century skills are carried out in various ways, including by designing learning activities that are relevant to the real world, emphasizing project or problem-based learning, empowering metacognition, and so on (Zubaidah, 2016).

Based on a questionnaire given to Kalam Kudus Christian Middle School students in February 2022, 58.1% of students were interested in science and 41.9% of students were not interested in science. There are various reasons that students express for their disinterest in science, most of them say that science is difficult to understand, and too many formulas and memorization.

In addition, the results of the Program for International Student Assessment (PISA) survey released by the OECD (Organization for Economic Co-operation and Development) in 2018 showed that the average score of Indonesian students for science reached 389 with an average OECD score of 489 (OECD, 2018), meaning that for science scores in Indonesia are below average. The development of the 21st century is marked by the rapid development of natural science and technology in various fields of life in society, especially information and communication technology.

Based on this, a learning method is needed that can prepare students to be interested in science, literate in science and technology, and able to think logically, critically, creatively, and argue correctly. So with sciences students' competence is built (Prasetyowati, 2014). In addition to learning methods or strategies, it requires interest from students to be able to master the material taught by the teacher because the interest from students is one of the supports for achieving success in learning science, besides that there is a significant influence between students who have high interest and students who have high interest. low on learning outcomes (Prihatini, 2017).

Problem Based Learning is an effective learning strategy (Yusof et al., 2012) and has been widely applied in learning and has positive effects (Sugiharto et al., 2019). In science, the application of Problem Based Learning turns out to be more effective in improving students' problem-solving skills and scientific attitudes compared to using conventional learning tools (Rahayu and FX, 2015). In addition, Problem Based Learning can develop analytical and strategic thinking skills (Schechter, 2011).

Based on a questionnaire filled out by science teachers at Christian Middle School Kalam Kudus Malang in February 2022, Problem Based Learning is one of the learning models used when teaching science. Teachers choose Problem Based Learning in learning because it trains students to think critically, sharpens students' curiosity, trains students to solve problems, and provides real experiences in learning so that students are more interested in learning science. But in its application in schools, teachers encounter obstacles such as it taking a long time to apply this learning method, difficulties in developing problems that can trigger students to think critically, and difficulties for students to find solutions to problem-solving.

To overcome the obstacles faced by teachers when implementing Problem Based Learning, especially when developing problems and finding solutions to the problems discussed, other methods are needed that are integrated with Problem Based Learning. Computational thinking is the ability to think to solve problems as a whole, logically and structured. In addition, computational thinking is not only applied in learning computer science but has been integrated into subjects by applying the concept of computational thinking (Wing, 2006). One method that is often used in developing Computational Thinking is Problem Based Learning.

Based on the description above, the researcher will conduct a study entitled The Influence Of Problem Based Learning Models - Computational Thinking (PBL – CT) On The Ability To Thinking Analytical View of Students' Interest in The Subject of Natural Sciences.

LITERATURE REVIEW

Problem Based Learning

Problem Based Learning is a learning strategy that collects and integrates new knowledge by using problems as the initial stage of learning. Problem Based Learning aims to develop two-way active learning to improve students' ability to construct knowledge independently. Students will work in groups to understand, generate possible hypotheses, construct ideas from each other and refer to problem questions (Kek and Huijser, 2016).

The essence of Problem Based Learning is to present problems in real situations to students, by making identification and investigation as the initial stages, helping students think at a higher level and being able to direct themselves in learning, which means that Problem Based Learning departs from the paradigm that learning is no longer just a process. receiving and storing information through a repetition process, but more than that the meaning of learning in Problem Based Learning is approaching new problems with existing knowledge by assimilating and building knowledge independently (Arends, 2008).

Computational Thinking

Computational thinking is an intellectual revolution that is happening all around us. In today's technological era, most people have a computer on their desk which is usually used to send emails, play games, surf, process words, and so on. But the computational thinking revolution is more than using computers to perform these activities, computational thinking changes the way of thinking and has a more profound effect on its implementation (Bundy, 2007).

In its application computational thinking can develop students' logical thinking skills and problem-solving skills (García-Peñalvo and Mendes, 2018). In the research conducted by Tsai et al (2017), it was stated that computational thinking helps students develop practical computational skills whereas the research conducted shows that students who receive u-learning treatment by applying computational thinking can have much better computational skills in using PowerPoint and Word than those who don't (Tsai et al., 2017). In addition, computational thinking can increase students' confidence in solving problem*s*.

Computational thinking consists of 4 key techniques according to Inggriani Liem (Marieska, et al., 2019), which are as follows: (1) Decomposition: solving complex problems into simpler and easier parts to work on, (2) Pattern Recognition: Look for similarities between problems. The pattern in question is a shared characteristic that occurs in each problem. Finding these similarities in small unraveled problems can help us solve complex problems more efficiently (3) Abstraction: focusing only on important information and ignoring information that is considered irrelevant. This means that to reach a solution, we need to ignore unnecessary characteristics to focus on the things we are doing. In abstraction, the focus is mainly on the general characteristics of each element, not specific details. After having general characteristics, a problem model can be created, which means that the model becomes the general idea of the problem to be solved (4) Algorithms: a plan/set of instructions for solving the problem.

Analytical Thinking Ability

The ability to think is needed in the learning process where the thinking process will involve the management of mental operations in one's cognitive system that aims to solve problems and change representations of information to new and different forms that aim to answer questions and solve problems (Latipah, 2012). The ability to think analytically has several indicators that can be used as a guide for someone to reach the realm of cognitive analysis (C4). According to Anderson and Kratwohl indicators in measuring analytical thinking skills consist of: a) outlining relevant or important parts of a structure, b) identifying systematic and integrated relationships among relevant elements, and 3) concluding (Anderson and Kratwohl, 2010).

Interest in the Subject of Natural Sciences

Interest is important to have in every student. Interest is one of the psychological aspects in a person that influences his interest in something. Interest in science subjects means a person's interest in science subjects is driven by psychological aspects within him.

Student interest can be measured based on several interest indicators such as student attitudes toward science, learning atmosphere, learning difficulties experienced, commitment to learning, and student participation in learning (Wang et al., 2015).

RESEARCH METHOD

The design of this research uses non-equivalent group design quasi-experimental research. This is based on the condition that the researcher does not have the authority to determine the experimental class randomly, meaning that the researcher must accept the class determined by the school (Tuckman and Harper, 2012). Therefore, the design of this study considers that subjects are selected by 'random assignment to treatment' where subjects are determined by class conditions (Tuckman and Harper, 2012) (Setyosari, 2020).

The treatment given to the experimental class and the control class was not the same. The experimental class was given treatment in the form of PBL-CT learning while the control class was in the form of learning with the Problem Based Learning model.

In this study, the instrument used to measure the dependent variable was the ability to think analytically which was measured using ten essay questions that were made according to the indicators of analytical thinking ability Krathwohl et al, namely differentiating, organizing, attributing, and the measurement instrument consisting of a questionnaire of students' interest in science.

RESULT AND DISSCUSION

Data analysis in this study used SPSS 27.0. And the results of the statistical description can be seen in Table 1

Descriptive Statistics

Dependent Variable: Analytical Thinking Ability

Model	Interest in Natural Science	Mean	Std. Deviation	N
PBL_CT	Low Interest	72.73	17.234	11
	Moderate Interest	60.31	15.760	16
	High Interest	76.41	15.343	32
	Total	71.36	17.010	59
PBL	Low Interest	53.83	14.163	24
	Moderate Interest	69.40	9.970	20
	High Interest	55.42	16.718	19
	Total	59.25	15.333	63
Total	Low Interest	59.77	17.385	35
	Moderate Interest	65.36	13.468	36
	High Interest	68.59	18.750	51
	Total	65.11	17.206	122

Figure 1. Ability to think analytically by applying PBL-CT and PBL

Figure 1 shows that 59 students do learning using PBL-CT with an average score of analytical thinking skills of 71.36. In the experimental class, it was also seen that the average student with a high-interest category was 76.41, the average in the medium-interest category was 60.31 and the average student who had a low interest was 72.73. Meanwhile, in the class that used Problem Based Learning, 63 students attended with an average score of 59.25 for analytical thinking skills. Of the 63 students, it can be seen that the average student who has a high interest is 55.42, the average student with moderate interest is 69.40 and the student with low interest is 53.83.

The hypothesis test using two-way Anova is shown in Figure 2

Tests of Between-Subjects Effects

Dependent Variable: Kemam **Critical Thinking Abilities**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	10293.512ᵃ	5	2058.702	9.356	<.001
Intercept	457876.784	1	457876.784	2080.761	<.001
MinatTer Interest in Natural Science 3.179		2	64.090	.291	.748
Model	2882.212	1	2882.212	13.098	<.001
MinatTerl Interest in Natural Science 5.392 Model		2	2622.696	11.918	<.001
Error	25526.103	116	220.053		
Total	552961.000	122			
Corrected Total	35819.615	121			

a. R Squared = .287 (Adjusted R Squared = .257)

Figure 2. The SPSS Test Output Hypothesis

Based on Figure 2 in the class column shows the experimental class (Problem Based Learning - Computational Thinking) and the control class (Problem Based Learning) show a significance value of 0.000 <0.05 meaning that there is a significant influence between the experimental class and the control class in students' analytical thinking abilities. This means that Problem Based Learning - Computational Thinking (PBL-CT) has a significant effect on students' analytical thinking abilities. In addition, based on the SPSS output, it is also seen that the significance value is 0.748 > 0.05, meaning that there is no effect of student interest on analytical thinking skills.

The interaction between Problem Based Learning - Computational Thinking and Problem Based Learning on analytical thinking skills in terms of student interest can also be seen from the SPSS output in Figure 2. It can be seen that a significance value of 0.000 <0.05 means that there is an interaction between Problem Based Learning - Computational Thinking (PBL- CT) on students' analytical thinking skills in terms of students' interest in science subjects.

CONCLUSION AND SUGGESTION

Based on the formulation of the problem and the submission of hypotheses, it can be concluded that (1) there are differences in the ability to think analytically between students who are taught Problem Based Learning and Problem Based Learning - Computational Thinking (PBL-CT) learning models. (2) There is no difference in the ability to think analytically between students who have high, medium, and low interest in learning science. (3) There is an interaction between Problem Based Learning - Computational Thinking (PBL-CT) on students' analytical thinking skills in terms of students' interest in science subjects.

Based on the conclusions, suggestions that can be given for further research are to use other integrated learning models such as Project Based Learning or other innovative learning models or can be developed with the help of learning media to improve analytical thinking skills.

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