

The Effects of Contextual Teaching and Learning (CTL) Model and Initial Abilities of Students Critical Thinking Skills in Class VII Natural Science Subject MTsN 2 Kerinci



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ABSTRACT: The observation results show that students' critical thinking skills are still low. This is due to low learning activity, lack of teacher innovation, teachers do not pay attention to initial abilities and conventional learning. Efforts that can be made to overcome this problem are by using the Contextual Teaching and Learning (CTL) learning model. The purpose of this study was to see the effect of the CTL model and initial abilities on students' critical thinking skills in science learning. This research is a quasi-experimental research. The research population was students of class VII MTsN 2 Kerinci. The sample was taken by purposive sampling, so class VII d was the control class and class VII c was the experimental class. Data analysis on hypothesis testing was carried out using two-way ANOVA. The research results obtained were (1) The average value of critical thinking skills in the experimental class was 78.02 with high criteria while the control class was 67.60 with moderate criteria. (2) The value of students' critical thinking skills with high initial abilities in the experimental class was 83.96 with very high criteria while the control class was 72.12 with high criteria. (3) The value of critical thinking skills of students with low initial abilities in the experimental class was 72.08 with high criteria while the control class was 62.08 with low criteria. (4) There is no interaction between the CTL learning model and students' initial abilities in influencing students' critical thinking skills.

KEYWORDS: CTL, Initial Ability, Critical Thinking Skills, Science

I. INTRODUCTION

The era of the Industrial Revolution 4.0 was marked by the rapid development of science and technology. The Industrial Revolution 4.0 has an impact in the form of fundamental changes for humans in various sectors. The influence of the Industrial Revolution 4.0 is very important for the joints of life, one of which is the world of education (Oktavian and Aldya, 2020). The world of education as one of the main pillars for the advancement of the nation's next generation also needs to adapt to the times. This is necessary so that students will be able to compete in the global era and be able to keep up with the rapid development of the times. For this reason, the learning process is directed at the characteristics of 21st century learning which include: integrative, holistic, scientific, contextual, thematic, effective, collaborative, and learner-centered. Realizing learning in the 21st century, teachers must be able to create learning that is effective, systematic, accurate and precise (Razak et al., 2021).

Students are expected to be able to play an active role in the learning process. Students are also expected to have the ability to identify, analyze, and solve a problem creatively and logically so that they are able to obtain the right considerations and decisions in the learning process (Ramalisa, 2013). This ability is relevant to one of the 21st century skills, namely critical thinking skills.

Critical thinking skills are skills for carrying out various analyses, assessments, evaluations, reconstructions, decision making that lead to rational and logical actions (King, 2010). Critical thinking can be used as a driving factor for increasing students' knowledge (Sopranda and Chatri, 2020).

Current learning activities require teachers to implement learning that was previously teacher centered and is now student centered. This is because students can participate actively and are challenged to think critically. However, the fact remains that teachers have not implemented student-centered learning.

Researchers made observations on the science learning process in class VII MTsN 2 Kerinci. Observations show the ability of students to express thinking ideas as much as 10.05%, the activeness of asking the teacher in teaching and learning activities is as much as 14.20%, Listening or paying attention to the teacher when explaining the material (76.36%). From these three aspects it can be concluded that the percentage on the aspect of expressing students' thinking ideas looks the lowest.

According to Rahmi and Alberida (2017), one effort to develop critical thinking skills is to use an appropriate assessment. The assessment used by researchers is a matter of critical thinking. The results of the critical thinking test given at the

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time of observation in class VII in science subjects also showed that students' critical thinking skills were still low. The results of the critical thinking test are presented in Table 1 below.

Table 1. Observation Results of Critical Thinking Tests for Class VII Science Subjects

Class	\bar{X}	Criteria
VIIa	54,76	Low
VIIb	53,86	Low
VIIc	57,29	Low
VIIId	56,45	Low

The results of the analysis of interviews with science teachers show that teachers often explain material using the lecturing method interspersed with questions and answers and discussions. The teacher has never used a learner-centered learning model. This will have a negative impact on the development of students' critical thinking skills. If this is allowed, then students do not have the opportunity to develop thinking ideas so that students' critical thinking skills are not honed properly.

The low critical thinking skills of students will also affect the analysis of the questions given by the teacher, so that the final learning outcomes are also not good. This is evidenced based on the learning outcomes on students' daily test scores obtained from the VII grade science teacher which are presented in Table 2 below.

Table 2. Average Daily Deuteronomy Values in Class VII Science Subjects

Class	\bar{X}	KKM
VIIa	62,38	75
VIIb	64,61	
VIIc	62,29	
VIIId	63,21	

Table 2 shows the students' daily test scores are still below the Minimum Completeness Criteria (KKM), which is 75. The low learning outcomes of these students can be influenced by external factors, namely the influence of the learning method or model used by the teacher and internal factors, namely the low initial ability of students attention by the teacher so that it will have an impact on understanding the material to be studied next. Each student has varying initial abilities, therefore it is necessary to get the teacher's attention before carrying out learning, because the learning process will be influenced by the initial abilities possessed by students.

Initial ability is knowledge that students already have before continuing to the next level of material (De Cecco, 1968). The students' initial ability is quite influential on the learning outcomes to be achieved (Ali, 2004). By knowing the mastery of students' initial abilities, the teacher can determine where to start the lesson.

The conclusion from the observations that have been made is that science learning that has been going on is not going well. The problems that arise in learning is an obstacle that causes learning objectives not to be achieved properly. This problem needs to be addressed immediately, namely by paying attention to the initial abilities and critical thinking skills of students by determining the right learning model for students.

The importance of critical thinking skills is believed to make students able to solve problems in everyday life, be able to provide solutions, and become independent generations (Zulhilyah, 2013). Therefore, the appropriate learning model for improving critical thinking skills and overcoming existing problems in the field is by applying the Contextual Teaching and Learning (CTL) learning model. The results of Wulandari, et al., (2019) and Shantia's research (2021) regarding the application of the CTL learning model to 21st century skills has been shown to increase in aspects of critical thinking.

The positive impact of the CTL model on students' critical thinking skills is emphasized in the 21st century National Education Paradigm, namely the skills that must be possessed by 21st century students, namely CTL or contextual learning abilities (Moeloek, et al., 2010). CTL can help students see meaning in an academic subject being studied connecting scientific disciplines with their context in everyday life (Jonhson in Fitriyanti (2019). The CTL learning model is a popular learning concept today that can help students relate the material being taught to students' real-world situations (Sagala, 2010).

The steps of the CTL learning model are: (1) Develop the idea that students will learn more meaningfully by working alone, finding themselves and constructing their own new knowledge and skills; (2) Carry out as far as possible inquiry activities for all topics; (3) Develop the curiosity of students by asking questions; (4) Create a learning community; (5) Present the model as an example of learning; (6) Reflect at the end of the meeting (Sugiyanto, 2007).

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Moving on from the background of the problems and solutions to the problems found in the field, the researchers were interested in conducting a study entitled "The Influence of Contextual Teaching and Learning (CTL) Learning Models and Early Abilities on Students' Critical Thinking Skills in Science Subject Class VII MTsN 2 Kerinci".

II. METHOD

This type of research is a type of quasi-experimental research. The research population was students of class VII MTsN 2 Kerinci. The sample was taken by purposive sampling, so class VII d was the control class and class VII c was the experimental class. The research design used in this study is the Randomized Control Group Posttest Only Design.

III. RESULT AND DISCUSSION

3.1 RESULT

3.1.1 Data Description

Data on students' critical thinking skills were obtained after learning on KD 1 material on the interaction of living things with the environment and KD 2 on environmental pollution. Assessment is carried out through evaluation techniques in the form of written tests in the form of critical thinking essay questions given to research samples. The description of the research data on students' critical thinking skills is presented in Table 3.

Table 3. Data on the Value of Critical Thinking Skills

Class	N	\bar{X}	Criteria
Experiment	24	78.02	Tall
Control	24	67,60	Currently

Table 3 above shows the results of the critical thinking skills test with an average score of 78.02 with high criteria in the experimental class while the control class is 67.60 with moderate criteria. So, it can be concluded that the critical thinking skills of students in the experimental class who were treated with the CTL learning model were higher than the control class who were treated with conventional learning.

The value of students' critical thinking skills in the experimental and control classes were divided into two groups, namely the group of students who had high initial ability and the group with low initial ability. Data on the results of research on critical thinking skills based on initial abilities are presented in Table 4.

Table 4. Data on the Value of Critical Thinking Skills Based on Initial Ability

Class	Initial Ability	\bar{X}
Experiment	Tall	83.96
	Low	72.08
Control	Tall	72,12
	Low	62.08

Table 4. shows that students' critical thinking skills based on high and low initial abilities show that the average value of critical thinking obtained in the experimental class treated with the CTL learning model is higher than the control class treated with conventional learning.

3.1.2 Data Analysis

The analysis requirements test is carried out before proceeding to the hypothesis test, the first test to be carried out is the normality test using the Shaviro-Wilk test and the homogeneity test of variance using the Levene test with the help of SPSS software. The results of normality and homogeneity test calculations on the value of critical thinking skills based on students' initial abilities, can be presented in Table 5.

Table 5. Nomality and Homogeneity Test Results

Parameter	Sample Class		Information
	Experiment	Control	
Average Value	78.02	67,60	CTL>Conventional
Normality test	Significance Level 0.13>0.05		Normal Distributed
Homogeneity Test	Significance Level		Homogeneous Variance

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0.08>0.05

Table 5. The results of the data normality test in the two sample classes show that the data is normally distributed because the significance level is $0.13 > 0.05$. The results of the data homogeneity test in the two sample classes show data that has a homogeneous variance, due to the significance level of $0.08 > 0.05$.

Furthermore, the results of hypothesis testing using a two-way ANOVA test through the SPSS 16 application are presented in Table 6.

Table 6. Hypothesis Test Results

Parameter	Sig.	H1
Class (Model)	0.00	The 1st hypothesis is accepted
Initial Ability	0.00	The 2nd and 3rd hypotheses are accepted
Class*Initial ability	0.29	The 4th hypothesis is rejected

Based on Table 6, the results of the two-way ANOVA test on class parameters obtained a significant level of $0.00 < 0.05$ so that it can be concluded that the first hypothesis is accepted, because there is a significant difference in the value of students' critical thinking skills between the experimental class and the control class. On the initial ability parameter, a significant level of $0.00 < 0.05$ is obtained, so it can be concluded that the second and third hypotheses are accepted, because there is a significant difference in the value of students' critical thinking skills between groups of students who have high initial abilities and groups of students who have low initial ability.

In the interaction parameter between classes and initial abilities, a significant level of $0.29 > 0.05$ is obtained, so it can be concluded that the fourth hypothesis is rejected, because there is no significant difference, there is no interaction between the CTL learning model and initial abilities in increasing the value of critical thinking skills learners.

3.2 DISCUSSION

3.2.1 Achievement of Critical Thinking Skills

Research data shows an increase in students' critical thinking skills by applying the CTL learning model. Judging from the average value of critical thinking skills in science learning in the experimental class, the average score is 78.02 with high criteria, while the control class that follows the conventional learning model is 67.60 with moderate criteria. Based on the first hypothesis test, it shows a significance level of $0.00 < 0.05$, meaning that there is a significant difference between the two sample classes so that the first hypothesis can be accepted. So, the critical thinking skills of students who follow the CTL learning model are better than the critical thinking skills of students who take conventional learning.

The high acquisition of the average value of students' critical thinking skills in the experimental class, due to the treatment of the CTL learning model. This agrees with the results of Shantia's research (2021) which shows that the CTL learning model has a better effect on students' critical thinking skills compared to the control class which applies conventional learning. Antika (2019) and Destria (2019), also stated that after using the CTL learning model there was an increase in the test results of students' critical thinking skills.

According to Alberida (Alberida and Barlian 2018), the effectiveness of the learning model is seen from the activities of the students and the knowledge of the students. Therefore the effectiveness of the CTL learning model is marked by increasing the value of critical thinking and student activities in the syntax of the CTL learning model, namely finding/inquiry, constructivism and learning communities. At the discovery/inquiry stage, students are involved with observing the material being studied. The steps at this stage are observing, asking, analyzing, and formulating theories, both individually and together. At this stage students are able to analyze and solve problems by linking the material to their real life. Thus students' critical thinking skills can be well stimulated.

At the constructivism stage, students are required to build understanding and knowledge from their new experiences. Constructivism activities can encourage students to actively obtain information from the material being studied so that students' critical thinking skills can be honed properly. According to Bybee in Syamsurizal, *et al.* (2014), that students must be able to construct their own knowledge by carrying out active activities in learning such as searching for information and learning independently, so that the information is embedded in the memory of students as new knowledge.

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Learning with the CTL model in the experimental class was developed through group discussions or the learning community stage. Group members are formed into 1 group of students with different abilities consisting of 4-5 people. By implementing a learning community students can be more efficient and effective in solving problems and finding solutions in the discussion process. According to Setyaningsih and Abadi (2018), group learning is able to generate more ideas so that it is easier to find solutions to the problems given. In addition, the existence of mutual sharing in the group makes all group members able to achieve the same understanding, so that students with a low level of understanding of the material will be more helpful. Suyanto in Rando (2016) in general, the learning activities of students in groups aim to understand the material and solve problems that are considered to be the topic of student discussion.

To solve this problem, students are asked to find out for themselves by connecting the material studied with their daily lives. thus spurring students to construct their own knowledge and new skills. When learning takes place, it can be seen that students find more new ideas which are poured based on their respective understandings obtained from the experiences of students. Amalia and Advinda (2020), state that the process of inquiry during learning has a constructive impact which provides many opportunities to increase the effectiveness of teaching and learning.

During the learning activities, it can be seen that students are very involved in pouring new knowledge or ideas based on their findings in their daily lives. Learning becomes more effective and meaningful, if a question is asked to students, they can easily answer it. This means, they are already able to connect the material they are learning into real or everyday life.

According to Berns and Erickson (2001), CTL is a teaching and learning concept in helping teachers relate subject matter to real-world situations and motivate students to be able to relate their knowledge to the context of everyday life. Sugiyanto (2007) emphasized that one of the goals of implementing CTL is to train students to be able to think critically and be skilled in processing knowledge in order to find and create something that is beneficial to themselves and others.

In the control class the value of critical thinking skills is lower than in the experimental class, this can be influenced by learning activities in the control class that use conventional learning, namely lectures and discussions or questions and answers. In this case the proportion of the lecture method is greater than the time allotted by the teacher to carry out discussions or questions and answers. Thus the time for students to share together is much less. In addition, the material presented in the control class emphasized more on the material in the teaching materials, which made it difficult for students to explore their new knowledge and had an impact on students' way of thinking. When students are confronted in discussions, students find it difficult to interact with friends and teachers. Only a few students were active in discussions, the rest of the students were more silent and relied more on material explanations delivered by the teacher. Students are also less able to solve problems during discussions so that it will affect the development of students' critical thinking skills.

This is in accordance with the results of research by Erda., et al (2018) that by applying conventional learning when studying, students tend to be passive and students do not have the initiative to communicate in groups to discuss matters related to the material being discussed. Furthermore, Wahyuni and Razak (2021) also explained that conventional learning of students had a negative impact on the activity and participation of students.

The difference between the two sample classes is evident in the learning process. With these differences, there are also differences in learning outcomes in students' critical thinking skills. Thus it is hoped that teachers can apply the CTL learning model to improve students' critical thinking skills in science learning.

3.2.2 Achievement of Critical Thinking Skills Based on Initial Ability

Initial ability is knowledge or skills that students already have when they are about to learn a new knowledge or skill (Davis, 1974). Results students' critical thinking skills grouped into students who have high initial ability and low initial ability. Determination of students' high and low initial abilities by dividing students with a percentage of 50% in the section with high initial abilities and 50% with low initial abilities based on the scores obtained by students.

Research data shows an increase in the critical thinking skills of experimental class students based on high initial abilities and low initial abilities by applying the CTL learning model. Judging from the average value of critical thinking skills based on high initial abilities, the experimental class obtained an average score of 83.96, which was higher than the control class which followed the conventional learning model, namely 73.12. While the value of critical thinking skills based on the low initial ability of the experimental class obtained an average score of 72.08 higher than that of the control class which followed the conventional learning model, namely 62.08.

Based on the second and third hypothesis testing, it shows a significance level of $0.00 < 0.05$, meaning that there is a significant difference between the two sample classes so that the second and third hypotheses can be accepted. So, The critical thinking skills of students with high initial abilities and low initial abilities who follow the CTL learning model are better than the critical thinking skills of students with high initial abilities and low initial abilities who take conventional learning. According to Svinicki in Irawati (2015), one of the benefits of early skills is to help students to connect initial abilities and new concepts so that good conceptual understanding can be formed by students.

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The high average value of critical thinking skills based on initial abilities in the experimental class compared to the control class is due to the learning activities that apply the CTL learning model itself. This is because the CTL model is a learning model that presents contextual problems, thus attracting students' attention to learning in class. Problems that are confronted contextually or problems that exist in students' daily lives, can make it easier for students to carry out investigations / discoveries to solve problems.

Based on the CTL steps or syntax it is clear that the involvement of students in the learning process is more active, collaborative, and student-centered. This shows that the CTL model can spur students to think critically in solving problems.

3.2.3 Interaction of Learning Models and Early Abilities on Critical Thinking Skills

The results of the two-way ANOVA test (Table 6) show that in the interaction parameters between class (model) and initial abilities, a significance level of $0.29 > 0.05$ is obtained, so there is no significant difference, meaning that the fourth hypothesis is rejected. So, there is no interaction between the CTL learning model and the initial ability of students' critical thinking skills.

The CTL learning model implemented is able to improve students' critical thinking skills in science learning so that it can be used as an appropriate model in the learning process to see students' initial abilities. According to Sadirman (2006) it is very important for the teacher to know the initial abilities of students so that they can provide the right learning model. So, the main factor that can improve students' critical thinking skills in science subjects is not initial ability but the application of the CTL learning model.

There is no interaction between the CTL learning model and the initial ability of students' critical thinking skills due to the following reasons: (a) The teacher is able to solve problems in the learning process well., (b) The CTL learning model involves all students with high initial abilities or Low initial ability in the learning process, so that collaboration in groups is seen in solving problems and presenting discussion results. (c) CTL learning relates material to the real life of students, so that students are able to explore their own knowledge and have an impact on increasing critical thinking skills. Hung lin in Fitria (2020), states that learning outcomes will be influenced by learning models, curriculum design, and teaching.

IV. CONCLUSION

Based on the results and discussion, then can be concluded:

- a. The critical thinking skills of students who follow the CTL learning model are better than the critical thinking skills of students who take conventional learning.
- b. The critical thinking skills of students with high initial abilities who follow the CTL learning model are better than the critical thinking skills of students with high initial abilities who take conventional learning.
- c. The critical thinking skills of students with low initial abilities who follow the CTL learning model are better than the critical thinking skills of students with low initial abilities who take conventional learning.
- d. There is no interaction between the CTL learning model and students' initial abilities in influencing students' critical thinking skills.

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