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The Effect of Project Based Learning (PJBL) Learning Model Assisted with Animated Video on Students' Creative Thinking Abilities and Science Processing Skills in Reaction Rate Materials

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Abstract

The research aims to: (1) To determine the influence of the Project Based Learning (PjBL) learning model assisted by animated videos on the ability to think creatively on reaction rate material. (2) To find out whether there is a correlation between students' creative thinking abilities and science process skills taught using the Project Based Learning (PjBL) learning model assisted by animation videos on reaction rate material. The research design uses a quasi-experiment design. The population in this study were all class XI students of SMAN 10 Medan. Sample selection was carried out using purposive sampling, namely XI IPA 3 and XI IPA 1. The instruments used were an essay test on creative thinking skills with 12 valid questions and an observation sheet on science process skills. Animated videos are used in experimental classes as learning media to help learn how to use the PjBL model. The research results showed that there was a difference in the average value of creative thinking ability in the experimental class of 83.06, which was greater than in the control class of 73.11. From the right-sided t-test with a significance level = 0.05, the t count is 8.706 and the t table is 1.668. Then, in the correlation test between creative thinking abilities and scientific process skills, a correlation coefficient value of 0.661 was obtained in the high category. In conclusion, the use of the Project Based Learning model assisted by animated videos has proven to be an effective learning model and media and can be used as an alternative in the teaching and learning process to see students' creative thinking abilities and science process skills.
Keywords: Project Based Learning, creative thinking abilities, science process skills

Introduction

Chemistry is a science based on experiments and a science that studies natural phenomena that are closely related to life. The process of developing chemical knowledge includes process skills and scientific attitudes possessed by scientists (Fadhilah et al, 2019). The paradigm that is developing in society views chemistry as something that deals with and comes into contact with dangerous materials. Generally, students think that chemistry lessons are difficult, memorizing knowledge, lots of formulas, and always dealing with complicated calculations.

Based on interviews conducted at SMA Negeri 10 Medan, it is known that students' scores in chemistry subjects, one of which is reaction rate material in daily tests and final semester exams, show low results with an average score of 60, below the KKM standard of 70 which has been implemented. Students who received KKM scores were only 40% of the total. This is caused by the assumption that learning chemistry in reaction rate material is difficult material, the use of learning models which only use conventional models makes the learning process only go in one direction and students only memorize the material given. There is no practicum carried out making it difficult for students to understand and they tend to be passive because it is not proven in real terms, it is just an imagination, this is what makes students less interested in learning it (Kartini et al, 2021).

When activities or learning activities take place in the classroom, students still have difficulty and are halting in expressing their ideas and opinions, sometimes students also tend to be silent and not express their opinions. Creativity not only enables students to solve complex world problems but is also able to have an impact on their thinking patterns (Rafik et al, 2022). The cause of the low creative thinking ability of students in schools, especially in chemistry learning, is due to the lack of application of less innovative learning models and each tends to use learning models that are still conventional (Sinta et al, 2020).

Apart from the ability to think creatively, students' science process skills are also low. This can be seen from the low level of several aspects of students' science process skills, including the aspect of interpreting, when the learning process in the classroom takes place, students still have difficulty in concluding an opinion. This is a means of achieving a science learning orientation, namely, apart from being product-oriented, it is also process-oriented. Practicum is the best means of developing KPS. Learning using the practical method gives students the opportunity to experience for themselves or do it themselves (Fadhilah et al, 2019).

Based on the problems above, efforts are needed to develop students' science process skills and creative thinking. One effort to overcome this problem requires effective learning activities to shape students so they can learn independently without forgetting cognitive, affective, and psychomotor aspects, one of which is using project-based learning. The Project Based Learning (PjBL) model can improve learning activities that are linked to objects that are able to explore and develop the academic abilities of students. Apart from that, it can bring out students' skills and creativity so that students will be more proactive in learning activities (Lestarsi et al, 2021). Project Based Learning is learning that uses media in the learning process to achieve competency in attitudes, knowledge, and skills (Nirmayani and Dewi, 2021). The steps for the project-based learning approach are as follows: a) determining the project, determining the project can be in the form of a direct task or from problems that must be resolved, b) designing steps to complete the project, arranging activity steps that will lead to completing the task or project, c) preparing a project implementation schedule including preparing a schedule according to the steps to complete a predetermined task or project, d) completing the project with teacher facilitation and monitoring. Project-based learning has the advantage of its characteristics, namely helping students make decisions and frameworks, helping students in designing a process to determine results, training students to be responsible in managing information, then students can produce a real product (Widyasari et al, 2018).

To support the implementation of the Project Based Learning model, one of the media that can be used is animated video. Animation is an image created using certain techniques so that the image appears to move when seen by the eye. This animation media is a combination of images, writing, sound, and moving animation, which is used to make it easier for someone to understand the material (Marlina et al, 2021). The use of animation in learning will make learning more meaningful. more specifically explains the advantages of using animation media in learning, namely 1) eliminating intellectual barriers to learning, 2) allowing students to create real actions or imagine an event or process, and 3) is useful for evaluating students' knowledge or analytical abilities in learning material certain. This media can attract interest, interest arises from wanting to pay attention to the object. Then, after attracting attention, it can make students spontaneously interested in seeing and observing the animated video, and the emergence of changes in grades that increase from before.

Based on the problems above, the author wants to know the effect of the project-based learning model assisted by animated videos on students' creative thinking abilities and science process skills on reaction rate material. This research aims to (1) To determine the influence of the Project Based Learning (PjBL) learning model assisted by animated videos on the ability to think creatively on reaction rate material. (2) To find out whether there is a correlation between students' creative thinking abilities and science process skills taught using the Project Based Learning (PjBL) learning model assisted by animation videos on reaction rate material.

Method

The population in this study were all students in class XI semester 1 of SMA Negeri 10 Medan, totaling 68 students divided into 2 classes. Sampling used a purposive sampling technique, namely XI IPA 1 as a control class with a conventional model and XI MIPA 3 as an experimental class with a Project Based Learning learning model assisted by animated videos. The research design used in this research is Quasi-experimental with a Two-Group Pretest-Posttest Design.

Test the validity of the questions to measure whether or not the questions to be used are valid. The results of the validity test analysis can be seen in the following table:

Table 1. Question Validity Analysis

No.	r_{count}	r_{table}	Validity
1	4.6268	0.3494	Valid
2	0.2638	0.3494	Invalid
3	5.0648	0.3494	Valid
4	0.3023	0.3494	Invalid
5	2.6011	0.3494	Valid
6	0.0878	0.3494	Invalid
7	3.8713	0.3494	Valid
8	2.7466	0.3494	Valid
9	0.2219	0.3494	Invalid
10	3.9452	0.3494	Valid
11	4.7035	0.3494	Valid
12	3.7877	0.3494	Valid
13	2.3758	0.3494	Valid
14	0.3216	0.3494	Invalid
15	0.1006	0.3494	Invalid
16	2.1301	0.3494	Valid
17	0.2219	0.3494	Invalid
18	1.1082	0.3494	Valid
19	3.3507	0.3494	Valid
20	0.3216	0.3494	Invalid

In the table above it can be seen that the results of the validity analysis of creative thinking that have been tested show valid questions. Based on this table, there are 12 valid questions and 8 invalid questions. How to determine the validity of questions can be seen from rcount > rtable.

The reliability test is used to test the level of consistency of the instrument used. This reliability test is used to determine that the questions being tested can be used more than once. The reliability test results are as follows:

Table 2. Question Reliability Analysis

number of item variants	6.75
total number of variants	15.935
reliability	0.6068

Table 2 above shows that the reliability value is 0.6068, which indicates that the reliability test data has a high category, so the data is said to be reliable.

From the validity and reliability tests, a valid test instrument in the form of 12 essay questions is used to measure students' creative thinking abilities with four indicators including flexible thinking, originality, elaboration, and fluency. providing a pretest before learning, a posttest after learning, and an observation sheet on science process skills for the experimental class with three aspects: asking questions, designing experiments, and communicating. Homogeneity and normality tests of pretest and post-test results were carried out before testing the hypothesis. To test whether the hypothesis is accepted or rejected, the tests used in this research are the one-sided t-test (right side) and the Product Moment correlation test.

Results

Creative Thinking Ability

The results of the normality and homogeneity tests show that the pretest and posttest results in the control class and experimental class are normally distributed and homogeneous. Hypothesis testing in this research is the right-hand t-test, with a significance level of α = 0.05. Below are presented the results of the pretest hypothesis test in Table 1

Table 3. Results of hypothesis testing with t-test

$Sd_{control}$	$Sd_{experiment}$	t_{count}	t_{table}	Interpretation	information
4,99	4,98	8,70	1,668	8,70 > 1,668	Ha accepted

Based on the data above, the result obtained is tcount = 8.70. Then look for the t table with (dk) = (n1 + n2–2), dk = (32+36-2) = 66 at the significance level α = 0.05, so from the t distribution table the t value is obtained t (0.05) (66) = 1.668. Because it is 8.70 > 1.668, therefore, based on the hypothesis testing data, it can be said that there is a significant influence of the project-based learning model assisted by animated videos on students' creative thinking abilities in reaction rate material in the experimental class compared to the control class.

Science Process Skills

In this study, researchers used three PPP aspects. The percentage of students' KPS based on the KPS aspect using the project-based learning model in the experimental class can be seen in Table 2

Table 2 Average Value of Science Process Skills per aspect

	aspects of science process skills					
	asking question	criteria	plan the experiment	Criteria	communication	criteria
Average	3,06	good	4	Very good	3	good
value	75,5		100		78,9	

Based on table 2, it shows 3 aspects of science process skills with the highest score on the indicator of designing experiments of 100. And the lowest with a score of 75.5 on the indicator of asking questions.

Correlation Test

The Correlation Test is used to determine how much the Project Based Learning model contributes to students' creative thinking abilities and students' science process skills on reaction rate material. The results of creative thinking ability obtained a value of 83 and creative thinking ability obtained a value of 85. The results obtained from this data were that the correlation coefficient value of Creative Thinking Ability with students' science process skills was 0.611 in the high category.

Discussion

Creative Thinking Ability

In this study, creative thinking abilities were measured using 4 indicators: flexible thinking (flexibility), original thinking (originality), detailed thinking (elaboration), and fluent thinking (fluency). To assess creative thinking abilities, researchers used tests in the form of initial essay questions (pretest) and final stage tests (posttest), each of which consisted of 12 question items related to reaction rate material which were adjusted to the indicators of creative thinking ability being measured.

To see the percentage of pretest scores for creative thinking ability for each indicator in the experimental class and control class, you can see the diagram below:

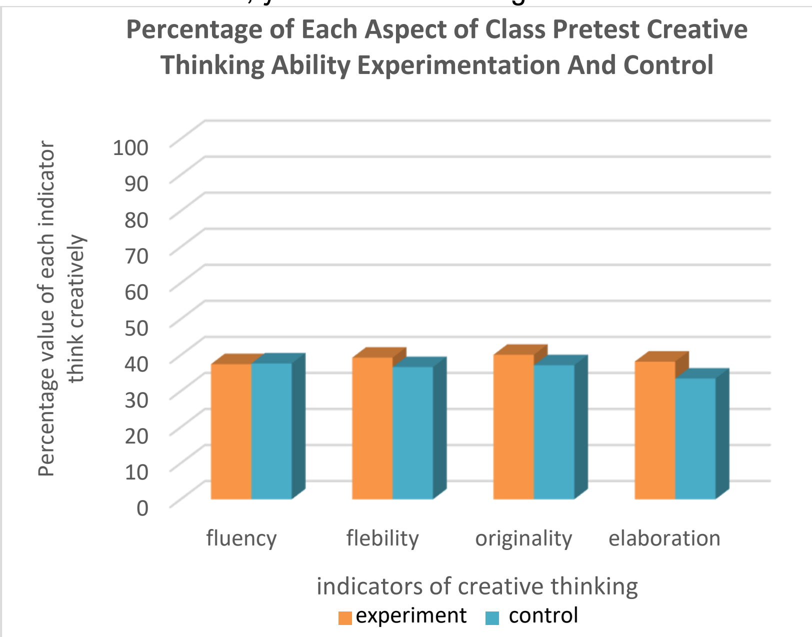

Figure 1. Bar diagram of pretest percentage results for each indicator of students' creative thinking abilities

Figure 1 shows a bar chart of the percentage of pretest scores for the experimental and control classes for each indicator of students' creative thinking abilities. It is known that the percentage of students' creative thinking ability pretest results on the fluency indicator obtained an average score of 37.5 in the experimental class and 37.7 in the control class. The flexibility indicator obtained an average score of 39.3 in the experimental class and 36.7 in the control class. Indiakor Originality obtained an average score of 40.1 in the experimental class and 37.2 in the control class. The elaboration indicator obtained an average score of 38.2 in the experimental class and 33.5 in the control class.

After being given treatment with a project-based learning model with the help of animated videos. The percentage of post-test scores for students' creative thinking abilities increased. In the experimental class, the percentage of posttest scores for students' creative thinking abilities can be seen in Figure 2.

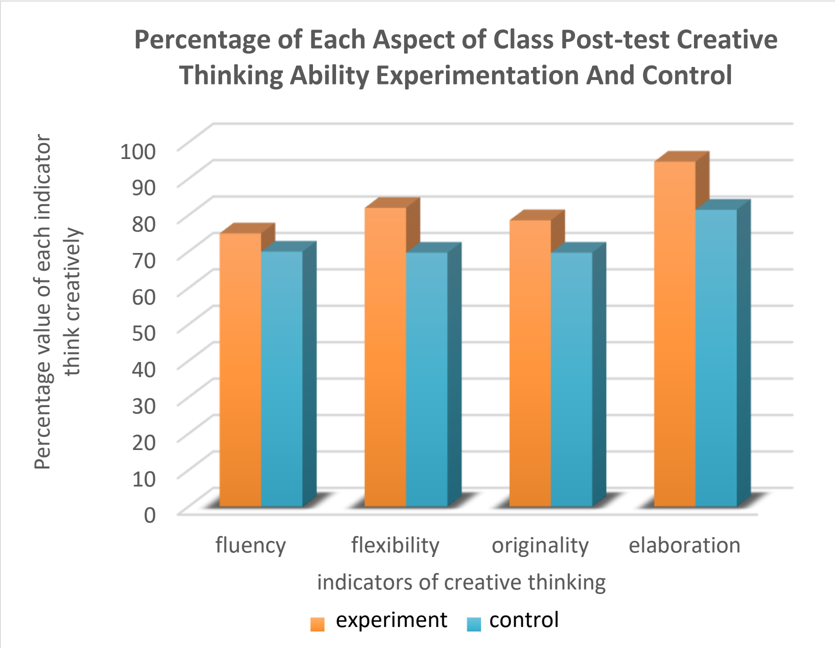

Figure 2 Bar diagram of posttest percentage results for each indicator of students' creative thinking abilities

Based on Figure 2, it can be seen that there is a significant increase in the bar diagram of the percentage value for each indicator of students' creative thinking abilities in the posttest for the experimental class and control class. Where the fluency indicator obtained an average score of 75 in the experimental class and 70 in the control class. The flexibility indicator obtained an average score of 82 in the experimental class and 69.7 in the control class. On the Originality Indicator, the average score was 78.6 in the experimental class and 69.7 in the control class. And, the Elaboration Indicator averaged a score of 94.7 in the experimental class and 81.5 in the control class

Based on the results of the pretest and posttest to obtain the results of creative thinking abilities, the posttest scores for the experimental class that used the PjBL learning model experienced a more significant increase compared to the control class that used the conventional learning model, this indicates that the application of the PjBL model influenced students' creative thinking abilities in the material. reaction rate. The following graph of the results of the creative thinking ability of the control and experimental classes can be seen in Figure 3. The creative thinking ability scores analyzed are the scores of the two classes obtained from the test results given after the end of the treatment for both classes. In Figure 3, it can be seen that the average result of creative thinking ability in the experimental class was 83.06, higher than the control class, namely 73.11. After that, a right-sided t test was carried out with a significance level = 0.05, resulting in a t count of 8.706 and a t table of 1.668.

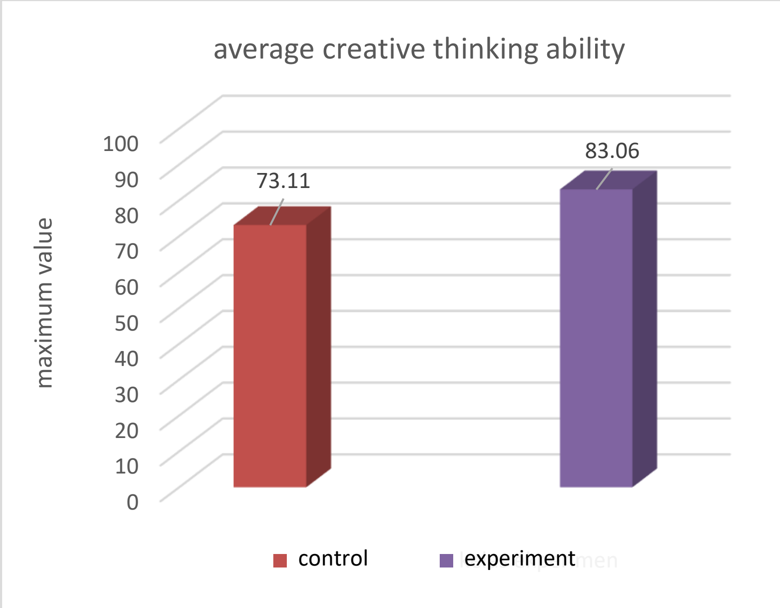

Figure 3. Average graph of students' creative thinking abilities

The Project Based Learning (PjBL) learning model is assisted by animated videos by investigating directly so that the results obtained will last a long time in memory (Asni et al. 2020). The high scores of experimental class students who were given the Project Based Learning learning model were because students were allowed to think for themselves, be active, and help each other to improve their learning outcomes. Students become more active in learning because learning is student-centered (Asni et al. 2020). Students are allowed to discover and collect basic concepts through practical activities so that students can formulate answers based on the problems given and prove them through experimental activities carried out.

Science Process Skills

To measure students' science process skills, namely with an observation sheet. by observing during the learning process, precisely during the practicum. The following is an illustration of the results of students' science process skills in the experimental class, which can be seen in Figure 4.

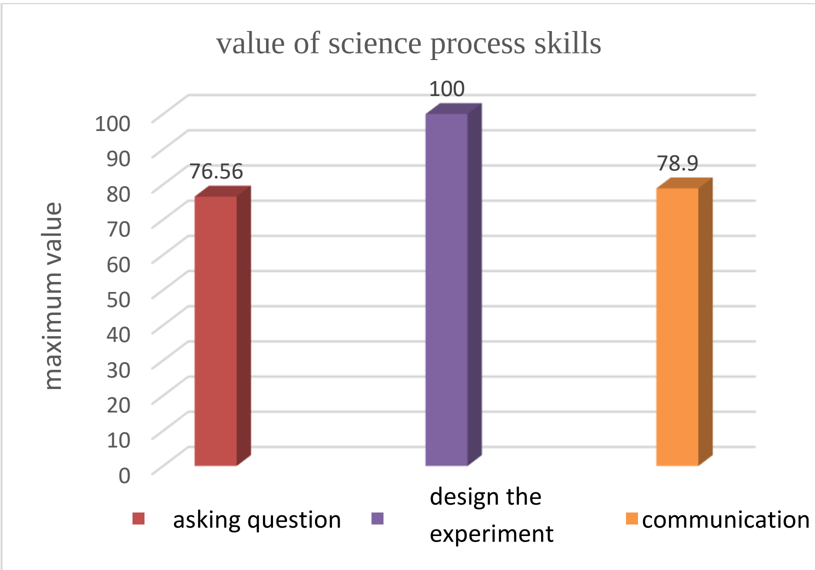

Figure 4. Average value of science process ability per aspect

From Figure 4, the average result of science process skills in the experimental class is 85 in the very good category. The high average value of students' science process skills in the experimental class is because students are given the opportunity to gain direct learning experience, as well as train students in solving problems and making decisions. Students are allowed to work together in groups so that it is easy to collaborate during practicum which can provide benefits to students' science process skills (Juniar et al. 2020). If you look at the picture, the aspect of asking questions gets an average score of 76.56. In the aspect of designing experiments, the score was 100. Meanwhile, in the communication aspect, the score was 78.9. The results of this research are also reinforced by Emda (2017) who said that conducting experiments or practicums can increase learning motivation and encourage curiosity, thus encouraging students to seek knowledge through exploration. The chemistry learning process using the Project Based Learning learning model is feasible because it can build students' abilities in aspects of science process skills (Juwita, 2022)

Correlation of Creative Thinking Ability and Scientific Process Ability

To find out the relationship between students' creative thinking abilities and students' science process skills using the Project Based Learning learning model assisted by animated videos using a correlation test, which means there is a relationship between creative thinking abilities and science process skills using the Project Based Learning learning model assisted by animated videos in the material. Reaction rate. The results of the correlation coefficient values in the experimental class can be seen in Table 3 below.

Table 3. Correlation Coefficient Value of Creative Thinking Ability with Science Process Skills

	Creative thinking ability	Science process skills	Criteria
Average	83	85	-
correlation coefficient	0,611		height

Based on Table 3, in the experimental class, the results obtained from the data to measure the correlation coefficient obtained a value of 0.661 in the high category (Nuryadi et al, 2017). This is confirmed by research (Manu et al, 2018) that the relationship between science process skills and learning outcomes is influenced by the Project Based Learning learning model because students in the learning process work independently so that the science process skills that exist in students can develop their potential.

Conclusion

The conclusion obtained in this research is: There is an influence of the Project Based Learning (PjBL) model assisted by animated videos on students' creative thinking abilities in reaction rate material with t count > t table obtained at 8,706 > 1,668. There is a correlation between creative thinking abilities and students' science process skills who use the Project Based Learning (PjBL) model assisted by animated videos on reaction rate material with a calculated r of 0.611 (high correlation)

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