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Investigating The Influence of The Project Based Learning Model on Students Creative Thinking During Digestive System Learning

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Abstract

This research investigates the effect of the Project Based Learning (PjBL) model on students' creative thinking during the digestive system learning at SMAS Brigjend Katamso II. This type of research is a quasi-experiment with a non-equivalent control group design. The population of this study was all XI students at SMAS Brigjend Katamso II, which consisted of 4 classes with a total of 135 students. The research sample using the Cluster Random Sampling technique consisted of two classes: Science 2 with 34 students as the experimental class and Science 3 with 34 students as the control class. The research instrument used was a description test consisting of 4 questions to measure students' creative thinking abilities. This research hypothesis was carried out using the T-test with normal and homogeneous conditions. The results of the post-test analysis of the T test obtained tcount 4.34 and ttable 1.69, thus showing the hypothesis test results that tcount > ttable where Ha was accepted and Ho was rejected. So, there is the influence of the project based learning model on the ability to think creatively about the digestive system material for class XI SMA/MA students.

Introduction

The ability to think creatively is one of the abilities that is necessary for educational progress in the 21st century. Creative Thinking can be defined as thinking logically and divergently to produce something new (Liswati, 2018). Creative Thinking is thinking that can produce many diverse ideas and unusual possibilities (Munandar, 2020). In line with that, Creative Thinking is also characterized by thinking about many possibilities, seeing things from different angles, and generating new ideas (Treffinger, 2002). Creative Thinking also means that Students' Creative Thinking abilities can be realized if there is encouragement within the individual (intrinsic motivation) or encouragement from the environment (extrinsic motivation) (Darwanto, 2019). This can be developed through effective learning, which stimulates students to develop creative thinking abilities.

Learning is the interaction process between students and educators and learning resources in a learning environment (Suardi, 2018). A maximum learning application is needed to create a good learning environment so that there is interaction between teachers and students. As is known, Biology is a subject that requires a lot of memorization, so in class learning, students tend to take notes and listen to the teacher (Indayana et al., 2020).

Based on observations carried out at SMAS Brigjend Katamso II Medan, it was found that the learning process needed to have been carried out better. During the learning process, students appear passive and feel bored. After observing, some students could answer simple questions the teacher gave regarding

related material by expressing and developing new ideas that were varied and different from others. Still, they responded to questions only focusing on the books each student owned.

This happens because teachers more often use conventional learning methods, such as lectures and discussions. Thus, students have difficulty expressing and developing the ideas they have. Apart from that, the learning delivered by the teacher does not attract students' interest. Biology is an interesting (exact) subject because it studies living creatures and their lives. Many biological materials cannot be visualized directly or are abstract and require certain media for unusual ideas (Adrianto, et al, 2020). The human digestive system material studies physiology and taxonomy, especially the body, so many students need help understanding it. Susanto (2016) revealed that many students still have difficulty explaining the function of the organs in the digestive system.

The results of interviews with biology teachers at SMAS Brigjend Katamso II Medan found that teachers have never used a learning model that can measure and test students' thinking abilities properly. The teacher only provides conventional learning without helping students develop their creative thinking abilities. Creative learning must start by creating a learning atmosphere and environment that triggers student creativity (Sani, 2019). Therefore, based on these problems, improving the development of students' creative thinking abilities and the learning process carried out by class XI students at SMAS Brigjend Katamso 2 Medan is necessary.

The research results show students' low creative thinking abilities require problem solving. The solution to this problem is the project-based learning model (PjBL), which aims to enable students to express new ideas and concepts in the form of projects resulting from the learning process and increase student creativity. Thinking ability is being able to make students understand the material being studied.

PjBL is a learning model which in the implementation process involves students actively in carrying out learning activities in the classroom and outside the classroom to produce products in the form of media, objects, writing or tools as a form of project that has been carried out by the students (Nyihana, 2020). The PjBL learning model requires students to learn to produce work (Saputro, 2020), therefore from this learning experience it is hoped that students will be able to improve students' skills in problem solving and improve students' creative thinking and cooperation in group work. The project-based learning model (Project Based Learning) is a learning model which in the implementation process involves students actively in carrying out learning activities in the classroom and outside the classroom based on procedures in the learning syntax to produce products in the form of media, objects, writing. as well as tools as a form of project produced (Nyihana, 2020).

This has been proven by many studies that discuss the influence of the PjBL learning model on creative thinking abilities, such as the Influence of the Project Based Learning (PjBL) Learning Model on Students' Creative Thinking Ability on Ecosystem Material (Wike et al., 2022), Classification of Living Creatures (Nita & Irwandi, 2021), Biotechnology (Widyantini et al., 2023). However, there is still little research regarding the influence of the PjBL learning model on students' creative thinking abilities on digestive system material. Therefore, it is necessary to research the influence of the PjBL learning model on students' creative thinking abilities on the subject of the human digestive system.

Methods

The method used in this research is a quasi-experimental method. The research was carried out by dividing two classes, namely the experimental class and the control class. Project-based (PJBL) learning is applied in the experimental class, learning as usual is conventional learning is applied in the control class. The research design used is nonequvalent control group design, namely research that applies different learning models to two classes.

Sampling in this research used a Probability Sampling technique in the form of Cluster Random Sampling. This technique is used to determine two classes that will be used as an experimental group and a control group. From classes XI IPA 1, XI IPA 2, XI IPA 3, and XI IPA 4, class XI IPA 2 was selected as the Experimental class and class Control XI IPA 3. This research was conducted at SMAS Brigjend Katamso II Medan which is located at Jl. Marelan Raya Ps. II No. 19, Rengas Island District. Medan Marelan

The instruments used in this research were sheet observation interviews and written tests. Observations and interviews in this research were carried out directly with the research objects and subjects all students of class XI Science at SMAS Brigjend Katamso 2 Medan. This research uses 2 activity assessments, the first uses an observation sheet to obtain data about student activities during direct learning. Filling in the observation sheet is done using a check list.

Table 1. Measured Aspect and Indicators of Critical Thinking Skills

No	Aspects to be Measured	Indicators
1	Fluency (Fluent Thinking)	a. Produce lots of relevant ideas/answers b. Smooth flow of thoughts
2	Flexibility (Flexible Thinking)	a. Produce uniform ideas b. Able to change methods or approaches c. Different directions of thought
3	Originality (Original thinking)	a. Gives answers that are unusual, different from the others, that are rarely given by many people
4	Elaboration (Detailed Thinking)	a. Developing, adding, enriching an idea b. Detailing the details c. Expanding an idea

(Source: Munandar, 2020)

The written test is structured in the form of a description with 10 questions covering material on the digestive system. This test is used to measure students' creative thinking skills in both experimental and control classes using 4 measured aspects as shown in Table 1. The form of test given is an initial test (pre-test) and a final test (Posttest).

Creative thinking ability test data is obtained, processed, and analyzed to answer problem questions and research hypotheses. The data analysis used is the t-test to determine the significant difference between the two averages of students' creative thinking in studying Biology between the experimental and control groups. Before testing the hypothesis, the analysis prerequisite tests are first carried out, namely the normality test and homogeneity test. Initially, the data was analyzed to determine normality. If it is known that the data is normal, a homogeneity test is carried out.

Results and Discussion

Pretest and Posttest Score Results

The results of the data obtained on students' creative thinking abilities digestive system material using a model Project Based Learning (PjBL) can be seen in Figure 1.

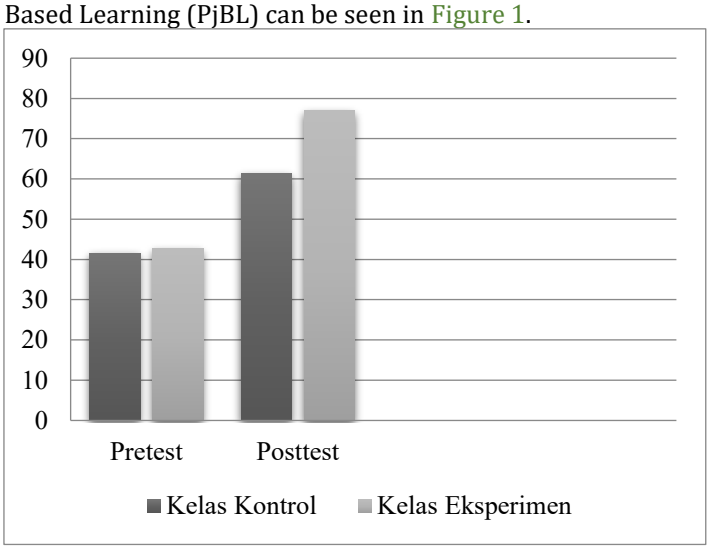

Figure 1. Comparison graph of average pretest and posttest scores

Figure 1 shows the average pretest score for the experimental class is 42.6471 and posttest 77.0221. Based on these results, it can be seen that there has been an increase in students' creative thinking abilities in using the PjBL learning model. Furthermore, the control class showed an average pretest score for the experimental class of 41.5441 and posttest 61.3971. Based on these results, it can be seen that there is an increase in the creative thinking abilities of students who use the conventional learning model, but it is not too high compared to the average results in the experimental class that uses the PjBL learning model. Based on the analysis of research results, the average posttest score for creative thinking abilities of students who used the PjBL learning model (experimental class) was 77.0221 higher than the average posttest score for creative thinking abilities of students who used conventional learning (control class) was 77.0221.

a. Normality test

The normality test is carried out to find out whether the data is normally distributed. This test was carried out using the Liliefors test. The results of data analysis using the normality test can be seen as follows:

Experimental Class

Table 2. Experimental Class Normality Test Results

Experimental Class	Lcount	L_{table}	Index	Interpretation
Pretest	0,1149	0,1519	$L_{Count} < L_{table}$	Normal Distribution
Posttest	0,1281	0,1519	$L_{Count} < L_{table}$	Normal Distribution

Based on Table 2, the results of the experimental class normality test showed that the data was normally distributed, the pretest obtained with Lcount 0.1149 and Ltable 0.1519, then the posttest value was obtained with Lcount 0.1281 and Ltable 0.1519; so it can be concluded that Lcount < Ltable and the data is said to be normally distributed.

Control Class

The results of the normality test calculation for the control class showed that the data had a normal distribution (Table 3). The pretest obtained with Lcount 0.1027 and Ltable 0.1519, then the posttest value was obtained with Lcount 0.1229 and Ltable 0.1519. so it can be concluded that Lcount < Ltable and the data is said to be normally distributed**.**

Table 3. Control Class Normality Test Results

Experimental Class	Lcount	L_{table}	Index	Interpretation
Pretest	0,1027	0,1519	$L_{Count} < L_{table}$	Normal Distribution
Posttest	0,1229	0,1519	$L_{Count} < L_{table}$	Normal Distribution

b. Homogeneity Test

To test the homogeneity of variance in two sample groups, the F test can be done. The results of data analysis using the homogeneity test can be seen in Table 4.

Table 4. Results of Homogeneity of Experimental Class and Control Class

Test Type	F_{Count}	F_{table}	Index	Interpretation
Pretest Exsperimental *Pretest* Control	1,0352	1,7878	$F_{Count} < F_{table}$	Homogeneous
Posttest Esperimental *Posttest* Control	1,0954	1,7878	$F_{Count} < F_{table}$	Homogeneous

Based on Table 4, it shows that the results of the homogeneity test analysis of the experimental class pretest and control class pretest obtained Fcount 1.0352 and Ftable 1.7878, so Fcount < Ftable. This is in accordance with the homogeneity test provisions that the data is homogeneously distributed. Meanwhile, the results of the homogeneity test of posttest for the experimental class and posttest for the control class, Fcount was 1.0352 and Ftable 1.7878, so Fcount < Ftable. This is in accordance with the homogeneity test provisions that the data is also homogeneously distributed.

c. Hypothesis testing

Hypothesis testing was carried out with the aim of seeing the correlation between research variables, namely, whether there is an influence between the use of the project based learning model on students' creative thinking abilities. In this hypothesis test, the two independent sample T test is used if the data is normally distributed and homogeneous. The results of data analysis using hypothesis testing can be seen in Table 5.

Table 5. Hypothesis Test Results for Experimental Class and Control Class

Class	Mark	T_{count}	t_{table}	Conclusion
Exsperimental	*Posttest*	4,34	1,69	H_a accepted
Control				H_o rejected

Table 5 shows the results of the hypothesis test that tcount > ttable so that Ha is accepted and Ho is rejected. So this states that there is an influence of the project based learning model on the ability to think creatively on the digestive system material of class XI SMA/MA students. It can be seen from the percentage of data that there is an increase in students' creative thinking abilities. The improvement can be seen from

the average value of students' creative thinking abilities which is different and increases between the control and experimental classes. By implementing the PjBL model through making projects, students are involved in analyzing problems, then carrying out exploration, gathering information, interpretation and assessment in working on projects related to the problems being studied. In contrast to the application of conventional learning which is teacher-centered and only carries out ordinary discussions, it will tend to make students passive and find it difficult to develop ideas from problems that arise. So the difference in the values obtained is also quite significant (Nurul et al., 2023).

This is proven by the results of research that has been carried out that shows the average score obtained by students for each indicator. The elaboration (detailing) indicator had the highest score in the experimental class with a percentage score of 83.1%. Meanwhile, in the control class, the percentage value was 70.6%. The high level of achievement of this ability can be seen from the students' detailed answers, the ideas conveyed in detail, and their ability to answer specifically problem solving questions. Siswono (2011) said that if the indicator of creative thinking ability is given a value weight, then the elaboration indicator occupies the highest position, because in the elaboration aspect students always try to develop an idea or product from what already exists and try to add or even go into more detail in order to become more interesting than before.

The flexibility indicator had the lowest score with the percentage of scores obtained in the pretest experimental class being 37.5% and posttest 70.6%. Meanwhile, in the control class, the percentage of pretest scores was 36.7% and posttest 53.7%. The low achievement of this ability reflects the students' weak ability to see or consider things from various points of view, Judging from the students' answers, they only focus on one side in responding to a problem. A person's limited perspective on something can hinder the various possibilities that can occur (Firdaus et al., 2018).

From the results of this research, PJBL learning has a significant contribution to students' creative thinking abilities. This is in line with the statement of Adinugraha (2018) that the PjBL model can improve learning outcomes, motivation and encourage students to be creative and independent in producing products, provide students with experience to build their own knowledge and increase students' ability to communicate products Involving students in problem-solving investigations and other meaningful task activities, provides students with the opportunity to work autonomously to construct their own knowledge, and reach the peak of producing real products (Istarani, 2021). Apart from that, the advantages of the Project Based Learning learning model are that students are able to solve problems and express new ideas. According to Tamimu et al. (2021), this learning model can increase students' motivation, collaborative skills, problem-solving abilities and activeness.

The PjBL learning model according to Abidin (2016) starts from the teacher designs a project description, determines the project's learning goals, prepares media and various learning resources, and prepares learning conditions. The learning syntax of this model consist of six phases. On the first phase, students identify the problem and formulate the problem in the form of a question. The second phase is to prepare a project plan that will be implemented collaboratively between teachers and students. Students collaboratively start designing the project they will create, determine the project work schedule, and carry out other preparatory activities. In the third stage, students carry out initial research activities as an important step to produce the product to be developed. In the fourth stage, students begin to create initial products according to the plans and results of the research they have carried out. In phase 5, namely measuring, assessing and improving the product; students look back at the initial product created, look for weaknesses, and improve the product. Next, in stage 6, students finalize the product and publication. Once it is confirmed that it meets expectations, the product is published. After the project, at this stage the teacher assesses, provides reinforcement, input and suggestions for improvements to the products that the students have produced (Nyihana, 2020).

Conclusions and Recommendations

The results of the t test obtained tcount 4.34 and ttable 1.69, thus showing the results of the hypothesis test that tcount > ttable where Ha is accepted and Ho is rejected. It can be concluded that there is an influence of the project based learning model on the ability to think creatively in class XI SMA/MA students' digestive system material. This research requires quite a long time to implement because in this research students participated in making the project, so that for further research we can minimize the shortcomings in this research. It is also hoped that further research can use other biological materials.

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