LITERATURE REVIEW: THE EFFECT OF PROJECT BASED LEARNING LEARNING MODELS ON STUDENT LEARNING OUTCOMES IN SCIENCE LEARNING

Putri, I.P[1 a)], Sari, M.P[2]
[1,2]Department of Science Education, Universitas Negeri Padang

[a)]E-mail : indahpreselia23@gmail.com

ABSTRACT

This study aims to figure out the effect of the Project Based Learning model on learning outcomes of students in science learning. This research is motivated by a lot of research on the effect of project based learning on student learning outcomes. This research is an ex post facto research with descriptive data analysis. The population in this study were all articles originating from indexed journals related to the effect of project based learning on student learning outcomes. The sample used was 8 Scopus indexed articles and SINTA accredited. Based on the results of the analysis of the articles conducted, it was found that the project based learning model had a positive influence on learning outcomes seen from the cognitive, affective, and psychomotor domains in the form of increasing student creativity and junior high school student science skills in science learning.

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Keywords: Project based learning, cognitive, affective, and psychomotor learning outcomes.

INTRODUCTION

The 21st century is a century that has seen many advances in the aspects of science and technology. In the past, science and technology were still considered not too important, but today these two aspects are one of the important aspects of supporting human life. Education in the 21st century aims to build students' intelligence abilities so that they are able to solve problems around them in learning.

Related to learning, the 21st century demands changes in students' learning, namely; (1) changing learning from teacher-centered learning to student-centered learning; (2) changing from learning to memorize concepts to learning to discover and build their own concepts; (3) changing

from individual learning to cooperative group learning (Maula, 2014).

Science as one of the subjects in junior high schools that requires scientific process skills has scientific work characteristics obtained from the ability to think and solve problems. Risnaini *et al.*, (2016) said that in essence science consists of three parts, namely attitudes, scientific processes, and scientific products. This means that science does not only consist of knowledge that must be memorized, but there are also active activities or processes that use the mind in studying natural phenomena.

Science learning provides opportunities for students to develop critical and creative thinking skills, and develop students' science communication skills (Anjarsari, 2013). Creative thinking skills are needed in science learning because creative thinking is seen as the ability to see various possible solutions to various problems, and is a form of thinking that until now still lacks attention in education.

One of the factors contributing to the lack of success in science learning is that students tend to be bored with the lecture method. At this time the learning methods and models used were still unable to activate students, teachers still lectured a lot on learning materials that should make students active and innovative. In science learning, there is material that involves students such as practicum, but in reality the teacher delivers the material using the lecture method so that students will get bored easily. Therefore, learning methods and models are needed that can foster students' understanding and skills.

Project-based learning model is a learning model that can be used. Project-based learning or project based learning is a student centered learning model that involves students in problem-solving activities and other meaningful tasks. (Sari, Hidayat and Kusairi, 2018). Project based learning can encourage increased student activity in groups and the creation of a meaningful learning process (Rais, 2010). The active students in the learning process will increase students' understanding in the learning process.

Based on the results of interviews conducted with science teachers at SMP N 16 Padang, the project based learning model has not been fully implemented. Teachers use lecture methods and conventional learning models in learning materials that should be able to activate students and involve student activities directly. In addition, students 'creative thinking skills have not been fully trained and the teacher also does not make a special assessment of students' creative thinking skills. Therefore, factors that affect the learning process arise, namely the methods and learning models used are less varied, and students' enthusiasm in learning is low.

Research on the effect of the project based learning model has been carried out by Nopita Sitompul (2020) with the title of implementing the project based learning (PjBL) learning model on science learning outcomes of junior high school students which is able to improve student learning outcomes on environmental pollution material, this is based on the completeness of student scores of 69%. Other research by Tatag Yuli Eko Siswono, Sugi Hartono (2018) which discusses the effectiveness of project-based learning in statistical learning, explains that there is an increase in statistical learning outcomes on student learning outcomes.

The large amount of research that has been done before regarding the effect of project based learning is a reason for

researchers to conduct research in the form of literature analysis.

PURPOSE

The purpose of this study was to figure out whether the project based learning model had an effect on student learning outcomes in science learning through literature study research.

RESEARCH QUESTION

Based on the problems that have been described, the formulation of the problem in this study is as follows: "How does the use of a project based learning model affect student learning outcomes in science learning?"

METHOD

This research used ex post facto method with descriptive data analysis. This descriptive data analysis consisted of three stages, namely the stage of data reduction, data presentation, and drawing conclusions. Data reduction is done to sort the data in order to make it easier to obtain the data needed according to the criteria of the researcher. The data analyzed comes from articles that have been selected according to the criteria and conditions that are in accordance with what is needed. The article criteria used in this study were articles about the effect of project based learning on student learning outcomes in science learning. The population of this research is all reputable and indexed acticles related to the project based learning model. The sample used 8 articles indexed by Scopus and accredited by SINTA.

RESULT AND DISCUSSION

Figure 1 shows the percentage increase in the influence of the project based

learning model. The article that had the highest percentage increase was article A7 at 15.1%.

Figure 1. Diagram of the percentage increase in the use of project based learning
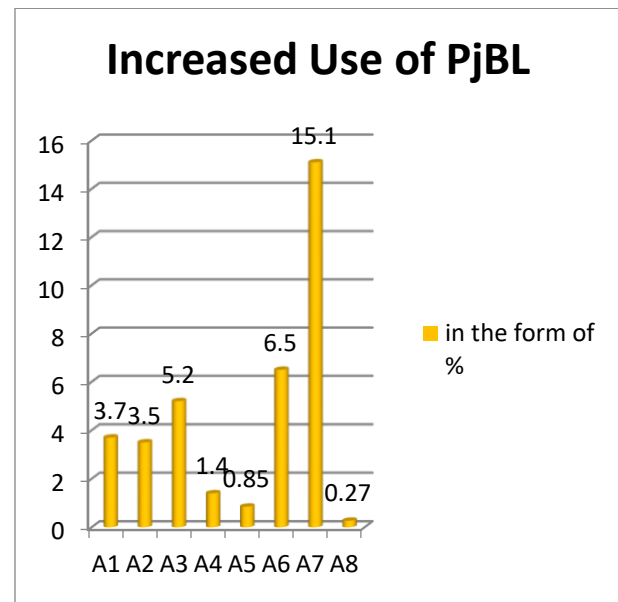
Article A7 examines the impact of utilizing project based learning media with respect to material grouping of living things on understudy learning results and mentalities. The expansion in article A7 encountered a critical contrast in the mean of the experiment class and trial class. The experiment of the trial class was 72.73 and the control class normal was 42.50. This critical contrast is on the grounds that the project based learning model has the bit of leeway that the learning cycle turns out to be more enjoyable with this project based learning model, understudies become more dynamic, and understudy inspiration increments (Daryanto, 2014).

The article whose increase is in second place based on Figure 1 is article A6. Article A6 shows that students who use the project based learning model have a higher average score than students who use conventional learning models. The average

obtained by students in the experimental class and control class was 76 and 63. The results of the increase that occurred in the experimental class were due to the use of a project-based learning model that emphasized the learning process rather than the product. Besides, according to Sitiatava (2013) The project based learning model also takes place systematically and can create new learning that reflects the environment where students are and learn.

Article A3 discusses the effect of project based learning on the human excretion system material on student learning outcomes. The increase in article A3 was 5.2%. This is based on the comparison between the class average score of 78.71 and the control class 68.28. Student learning outcomes on the excretion system material become high due to the discussion process, so that students become more interested and not bored because they only listen to the explanation of the material from the teacher. Learning excretion material with a project based learning model in the learning process allows students to work independently in groups so that the knowledge gained is deeper (Siti Nurbaiti, Nugroho Edi Kartijono, 2016).

Similar improvements occurred in articles A1 and A2. A1 articles experienced an increase of 3.7% while A2 articles were 3.5%. However, articles A1 and A2 discuss different independent variables. Article A1 has an independent variable, namely the STEM integrated project based learning model. The increase that occurred in article A1 was based on the average experimental class reaching 65.57 and the control class reaching 58.00. In article A2, it discusses the effect of the project-based learning model on students' science process skills. The average value obtained in the science process skills of the experimental class students was 50.51 and the control class was 35.15.

A4 articles increased by 1.4%. Student learning outcomes in article A4 have increased based on the experimental class average of 77.68 and the control class average of 74.77. This is due to the teaching system with active learning. The active learning model is one of the most developed learning models today, because the active learning model can create certain conditions that motivate and cause students to be active in learning (Djamarah, 2010). Another article that goes along with article A4 is article A5. Article A5 discusses the effect of project based learning on creative thinking skills in static fluid material. A5 articles have an increase of 0.85%. The last article is article A8. In article A8 there is no significant increase. Based on Figure 1, the increase in article A8 is only 0.27%.

Table 1. The effect of project based learning model on learning outcomes (cognitive)

Article Label	Hypothesis Testing
A1	Uji t α (sig . 0,026 <(α) 0,05),
A3	Uji t, t_{hitung} > t $_{tabel}$. 4,46>2,04
A4	Uji t, t_{hitung} (1,818) > t $_{tabel}$ (t1−α) (1,67)
A5	Uji t, (0.000<0.05)
A6	Uji t, t_{hitung} = 13,49 > t_{tabel} = 1,672)
A7	Uji t, t (1, 21) = 17.706 pada p <0.05
A8	Uji t,0.265>0.263

In table 1, it very well may be seen the effect of utilizing a venture put project based learning model with respect to understudy learning results. The theory test in article A1 shows that the t-test α (sig 0.026 <(α) 0.05) is in Ho's dismissal, so it very well may be deciphered that there is a huge distinction in

expanding understudies' logical proficiency in the parts of information and fitness. Article A1 aims to describe project based learning that is integrated with science, technology, engineering and mathematics (STEM), to improve students' scientific literacy.

The learning results of the intellectual parts of understudies in the A3 article have expanded dependent on understudy fulfillment subsequent to utilizing the venture based getting the hang of learning model arriving at 81% with a normal estimation of 78.71. The t test results show t count> t table (4.46> 2.04), this implies that there is a critical contrast between the test class and the control class, while the n-acquire test brings about the exploratory class are at the high standards arriving at 32%, at the control class just arrived at 12.5%. Hence the expansion in understudy learning results when learning the human discharge framework material in the trial class is superior to the control class. Similar research has also been conducted by Indah Susilowati, Retno Sri Iswari, (2013), where the results of his research show that there is a positive effect of using a project based learning model on student learning outcomes of the human digestive system.

The improvement of learning outcomes with the project based learning model in the excretion system material is because in the project based learning model, the human excretion system material is applied using the LKS guide, students are given the freedom to search for and obtain the information needed to complete project assignments. Student worksheets (LKS) are one of the learning media in the form of printed media which aims to activate students, stimulate learning activities and is also a variation of teaching so students do not become bored.

The result of hypothesis testing in article A4 is tcount> ttable (1.818> 1.67),

which means that tcount is in the receiving area Ha. This shows that there is a significant influence between learning carried out in the experimental class and learning in the control class. Article A4, besides looking at learning outcomes, also looks at students' creative abilities. Student creativity in this article has increased by 54%. Learning physics using a project based learning model increases the percentage increase in student creativity when compared to using conventional learning models. The project-based learning model has advantages such as increasing problem-solving abilities from various sources that describe a project-based learning environment making students more active and successful in solving complex problems (Daryanto, 2014).

Another article that accompanies article A4 is article A5. Article A5 examines the impact of undertaking put together learning with respect to innovative intuition abilities in static liquid material. The increment and accomplishment of markers of basic reasoning abilities, in view of the postest esteem estimated utilizing the d-impact size esteem got by 0.85 and N-gain of 0.44. The aftereffects of the d-impact size esteem show that task put together learning has an impact with respect to understudies' inventive speculation abilities with the strength of the distinction among posttest and pretest scores in the standards is very solid (moderate impact). The combined t test results got an importance estimation of 0.000. The importance esteem is under 0.05 (0.000 <0.05) so Ho is dismissed, so it tends to be inferred that there is a critical distinction in the normal estimation of understudies' innovative speculation abilities when mastering.

Article A6 looks at learning outcomes in the cognitive aspects (table 4.1). Article A6 discusses the effectiveness of the project based learning model on students' creative thinking skills on the subject of heat. The

results of increasing the ability to think creatively can be shown by the results of the gain test carried out, the n-gain value is 0.6 for the experimental class and the control class is 0.4. Through the results of data analysis to see creative abilities carried out by using a two-sample t test, the results obtained tcount = 29.46> ttable = 1.672. In line with article A6, the results of hypothesis testing in article A7 show that t (1.21) = 17.706 at p <0.05. based on these results confirms that there are significant differences between the two classes. The use of project based learning models can improve student learning outcomes. This is in line with research conducted by Widyaningrum (2012) which states that learning with projects affects the activities and learning outcomes of SMA 1 Parakan Temanggung students, where the average student learning outcomes are 93.5% and classical completeness is 100%.

Article A8 states that there is no significant effect on improving student academic achievement. Even so, the average value obtained by the experimental class is higher than the control class average. The average value in the experimental class was 16.00 while the control class was 14.25. Based on the t-test conducted, it shows (986> 05) which means that it is in the acceptance of the null hypothesis, it means that there is no significant difference in the use of project based learning learning models on student academic achievement.

The absence of this significant effect in article A8 is due to several factors such as students unable to adapt to the project based learning model, project based learning is not the right model to be used for students who do not like challenges in their learning, students' fear of failing in an assignment. so that it can affect learning and learning outcomes, the material regarding the topic of the structure and nature of the material is not attractive to students, students are in a rural environment with insufficient research resources and equipment needed, then the communication problem of this research is carried out in rural schools, group members who live in different locations have communication difficulties.

Table 2. The effect of project based learning model on learning outcomes (affective)

Article Label	Hypothesis Testing	Affective Aspects
A1	-	Attitude
A7	The F test is: (35, 4), <2.64	Attitude

Article A1, to see how students 'attitudes towards the STEM integrated project based learning model were given an attitude scale questionnaire which was used to determine the response of students' scientific attitudes to PjBL STEM learning on the topic of air pollution. Scientific attitudes that are important in learning include: being brave and courteous in asking questions and arguing curiously, caring for the environment, willing to cooperate and being creative and innovative. Student response questionnaires are given after the STEM-integrated PjBL has been completed. The student response questionnaire on the topic of air pollution was divided into four indicators, namely fun and more motivating students by applying the PjBL model, helping to understand the concept of building creativity, and awareness to save the environment. The results of the student response questionnaire stated that all of the students' attitudes were positive and were in the agree category. This is in line with what was stated Ekohariadi, & Salim (2010) The level of students' attitudes towards science is positively influenced by the work desired by students, class learning activities, and the amount of time spent learning science.

Article A7 based on the F-Test on student attitudes shows F: 3.94 (35.4) <2.64

which means it leads to rejection of the null hypothesis so it can be interpreted that project based learning has an effect on student attitudes to be positive. According to Heri Purwanto, (2004) student attitudes are divided into 2, namely positive and negative attitudes. Positive attitudes, namely the tendency for action to approach, like, and expect certain objects, while negative attitudes, namely the tendency to stay away, avoid, hate, and dislike certain objects.

Table 3. The effect of project based learning model on learning outcomes (psychomotor)

Article Label	Hypothesis Testing
A2	Uji ANAKOVA $0{,}003 < 0{,}05$
A6	Uji t ($t_{hitung} = 13{,}49$) $> (t_{tabel} = 1{,}672$)

Article A2 based on the results of ANAKOVA analysis shows that the learning model has a significant effect on students' science process skills with an F count of 9.554 with a significance value of 0.003 <0.05. Therefore, H0 which reads no difference in science process skills between students in different classes is rejected. Then the research hypothesis which says there are differences in science process skills between students in different classes is accepted. That is, there is an effect of learning treatment on the achievement of students' science process skills.

The results of the research in article A2 are supported by research Mulyani L, (2014) who concluded that project based learning can improve overall science process skills and have the same level of process skills before learning. Project based learning has a better effect on science process skills. The results of these science process skills indicate that project based learning has certain characteristics in the learning process, where these characteristics affect students' science process skills.

In addition to article A2 which discusses students' science process skills, article A6 also discusses this. The results of the t test to see science process skills are (t = 13.49)> (t table = 1.672). Based on the results of hypothesis testing, it can be seen that there is an effect of the application of the project based learning model on students' science process skills and creative thinking abilities compared to the application of conventional learning models. This can be interpreted as a project based learning model that emphasizes the project-based learning process which is able to improve and develop science process skills and students' creative thinking abilities. This is in line with research conducted by Hesti (2017) which states that the project based learning model is a learning model that can improve students' creative thinking skills in building concepts with an average student's creative ability of 86.39.

CONCLUSION

Based on the results and discussions, it was concluded that the project based learning model had a significant influence on student learning outcomes, both in cognitive, affective and psychomotor aspects.

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