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The Positive Impact of Problem Based Learning Model Toward Students' Science Knowledge Competence

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ABSTRAK

Penelitian ini dilaksanakan dengan tujuan untuk mengetahui perbedaan yang signifikan antara kompetensi pengetahuan IPA pada kelompok siswa yang dibelajarkan menggunakan model *project base learning* dengan kelompok siswa yang dibelajarkan secara konvensional pada siswa kelas V SD. Penelitian ini merupakan eksperimen semu dengan desain penelitian menggunakan *non-equivalent control group design* adalah. Populasi penelitian ini berjumlah 7 kelas terdiri atas 183 siswa. Teknik sampling yang digunakan dalam penelitian ini adalah *quota sampling* dengan menentukan sejak awal sampel yang akan digunakan sesuai kuota yang diinginkan, kemudian dilakukan pengundian untuk menentukan kelas eksperimen dan kelas kontrol. Tes objektif pilihan ganda biasa sebanyak 36 soal yang sudah divalidasi digunakan untuk memperoleh data kompetensi IPA siswa. Nilai rata-rata kelas eksperimen yaitu 84,98 termasuk dalam kriteria tinggi, lebih besar dari rata-rata kelas kontrol yaitu 79,77 termasuk kriteria tinggi. Hasil analisis uji-t menunjukan $t_{hitung} > t_{tabel}$ yaitu 2, 591 > 2,000 pada taraf signifikansi 5% dan dk = 84, sehingga hipotesis observasi (Ho) ditolak dan hipotesis alternative (Ha) diterima yang menyatakan terdapat perbedaan signifikan. Dengan demikian, dapat disimpulkan Model *Project Based Learning* berpengaruh terhadap kompetensi pengetahuan IPA siswa kelas V SD

ABSTRACT

This study conducted to find out the significant differences between the science knowledge competencies of the group of students who taught using the project-based learning model and the groups of students who were taught conventionally in the fifth grade. This research is a quasi-experimental research design using a nonequivalent control group design. The population of this study consist of 7 classes consisting of 183 students. The sampling technique used in this study was quota sampling by determining from the beginning the sample to be used according to the desired quota, then drawing to determine the experimental class and the control class so that the fifth grade SD No. 2 Blahkiuh with 40 students as a group of experimental class and fifth grade of elementary school No. 2 Sangeh with 44 students as the control class group. The usual 36 multiple-choice objective tests that have validated used to obtain student science competency data. Grade V grade average SD No. 2 Blahkiuh as an experimental class that is 84.98 included in the high criteria, greater than the average grade V SD No. 2 Sangeh as a control class that is 79.77 including high criteria. The results of the t-test analysis showed tcount> ttable ie 2, 591> 2,000 at the 5% significance level and dk = 84, so that the observation hypothesis (Ho) was rejected and the alternative hypothesis (Ha) was accepted stating there were significant differences. Thus, it can be concluded that the Project-Based Learning Model affects the science competency of the fifth grade

1. Introduction

One way to improve the quality of human resources is through an effort called education. Education aims to increase knowledge, insight and experience to determine life goals to have a broad view of a better

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future (Cahyadi et al., 2019). In implementing education, guidelines or references are needed so that education can run well. The guidelines used are called the curriculum. The curriculum is a set of programs designed by an educational institution. It will be applied to educational units at certain levels to guide providing subject matter to educational institutions (Saifiana & Purnomo, 2017). The 2013 curriculum is an example of adapting the curriculum to the development of Indonesian society today. This curriculum is an improvement from the previous curriculum, the Education Unit Level Curriculum (KTSP). This curriculum is expected to cover the shortcomings of the KTSP curriculum.

The 2013 curriculum with a scientific approach emphasizes students to develop knowledge, skills and creativity independently. The 2013 curriculum has a student-centred learning system (student-centred learning). Students are required to solve given problems and be able to think critically to build their knowledge. The subjects that can hone the ability of these students in science subjects. Science lessons have a very important role in developing technology and human life (Trisnani et al., 2015). Natural Science learning is obtained from observations and experiments arranged systematically about natural phenomena (Samatowa, 2016). According to (Hartini, 2017), Natural Science is a knowledge obtained through experiments or research to explain certain events or symptoms. IPA is essentially a product, process and attitude. The essence of science as a product includes various facts and concepts the essence of science as a process, observation and experimentation.

Meanwhile, science's essence as an attitude is an action based on an attitude of science, such as curiosity and science (Sayekti & Kinasih, 2018). The purpose of science learning is not just understanding concepts and principles. Students also need to have the ability to do something using the concepts and principles themselves (Andinii et al., 2016). In elementary schools, science learning emphasizes providing direct experience to develop students' potential to understand science's processes and concepts and explore the natural surroundings (Fitria, 2017). This statement is supported by a statement (Laksono, 2018) that learning activities will be more meaningful if students experience what they are learning, knowing it so that students can understand science more deeply and be remembered from this experience a long time. The science learning process's success can be seen from the students' understanding of the material provided.

Students' understanding of science subjects cannot be separated from the role of a teacher. Teachers need to understand the essence of learning. The teacher must be able to design the learning process to be more attractive to students to learn. To develop knowledge, skills and creativity, teachers need to create a classroom atmosphere and learning situations that allow students to learn to solve problems and some experiments that use students' concepts or ideas. Therefore, in the learning process involving models, materials, methods, props and so on must also change towards renewal (innovation) (Khanifah, 2019). As facilitators and motivators, teachers should provide direction and opportunities for students to work together to build solidarity and togetherness in school learning activities (Pratiwi et al., 2018). Direct student involvement in the learning process also makes the learning process active and student understanding better. The way that can be done is by giving students time to solve existing problems with their knowledge or discuss with peers.

But in reality, through observation, it is known that many elementary schools have not implemented innovative learning using attractive models, strategies, methods and teaching aids. Based on experience when implementing PPL Real, the problem that arises is that the learning process is only carried out in one direction or teacher-center, the teacher-center learning process. The learning process becomes saturated and unattractive to students; sometimes, students become very passive when the learning process takes place. Presentation of science learning by the teacher is only in the form of lectures. Students must memorize learning material without providing opportunities for students to develop problem-solving skills and creative thinking in the learning process. The accuracy of the assessment techniques in science learning is also less accurate. The teacher only assesses the students' abilities with the scores obtained by the students through a test. The test used is an objective and subjective written test. Students try to memorize the learning material to answer the test given so that students' understanding of the material is only limited to memorizing and is temporary in their memory. Therefore, it results in a low level of student activity and a low level of student understanding of learning. It impacts learning outcomes, as for some students still score below the Minimum Completeness Criteria (KKM), 65. This statement is also supported by research conducted (Andinii et al., 2016) that learning science objectives are not successful; thus, the students' learning outcomes are still below average. Another research, by (Cahyadi et al., 2019) that in the content of science learning, students who have not completed student scores are still below KKM so that student learning outcomes cannot be said to be successful. In line with the research conducted (Umi, 2015) that from the results of student learning the presentation of learning completeness that reaches the KKM is still very low for the content of science learning. When conducting interviews with students, in the learning process students are only given

learning material orally or in writing and are not assisted by teaching aids or learning media that can help students understand the concept of learning science. The concept of students is still abstract and unclear. Teachers and schools can provide teaching aids or learning media, but students can make learning tools or media independently or in groups. Learning science or science can develop students' creative thinking to find out concepts, create their products, or learn media creatively. Teachers who play a role in the learning process and interact directly with students should instil creative thinking habits (Ardianti et al., 2017).

The teacher's skill is then needed to choose a learning model that can emphasize science learning by memorizing the material and implementing the material into work or product. Learning models are steps or methods as systematic learning guidelines applied by the teacher, to determine learning tools that support learning activities to achieve the desired competencies and teaching and learning activities run well (Nurfitriyanti, 2016). As explained by (Fajrina et al., 2018), students can improve their ability to think creatively optimally by choosing an appropriate learning model.

In applying the learning model, the teacher can do this by guiding students through observation activities, concept formation, responding, analyzing, comparing and providing the necessary considerations) (Fitri et al., 2018). One of them is by applying a project-based learning model with a scientific approach. (Lukman et al., 2015) stated that project-based learning is a student-center learning model, and during learning activities, students can be responsible for groups and obtain scientific knowledge. In line with (Afriana et al., 2016) project-based learning is a learning model that provides meaningful learning experiences for students. Student learning experiences are obtained from concepts built on the products produced in the project-based learning process. The project-based learning model is contextual learning and uses environmental problems in constructing students' knowledge and learning skills (Hayati et al., 2016). Agree with (Muamar et al., 2017) this model can create an activity or atmosphere that is cooperative and communicative. Students are allowed to construct their knowledge in the learning process. But project activities carried out by students are still under guidance by the teacher, especially for students who have abilities below average (Surya et al., 2018). By using this model, students are trained to have the ability to design, create and display products to solve real-world problems.

The project-based learning model is a learning model that can help students understand science or science learning material. (Wijanarko et al., 2017) suggest that the PPA model's implication is by developing science process skills that students carry out through scientific activities to solve problems by creating products to maximize student learning outcomes. The project-based learning model can create an interesting and fun learning atmosphere so that learning objectives can be adequately achieved. The project-based learning model can be applied to the science learning process because it allows students to think creatively by creating products in overcoming real-world problems by utilizing the environment around them. This PjBL learning model can help students find new concepts, new experiences, and improve student learning outcomes and creativity in solving problems (Surya et al., 2018).

The description above shows that the learning model in students' learning process is important for the teacher to improve students' understanding of learning, especially in science. However, to find out how far this learning model can optimize the competence of students' understanding of learning, thus a study entitled "The Influence of Project-Based Learning Learning Models on Science Knowledge Competencies of 5th Grade Students of SD Gugus 1 Abiansemal Badung Academic Year 2019/2020".

2. Method

This research's type of research is experimental research, quasi-experimental research (Quasi-Experimental Design). This design cannot control external variables that can affect the research implementation process (Sugiyono, 2017). In this study, researchers used to control and experimental class group. The experimental class group applied a project-based learning model, while the control group was given conventional learning or daily learning used by the teacher. At the beginning of the study, both groups were given a pre-test to determine the two groups' equivalence. And at the end of the study, the two groups were given a final test or post-test to compare the results.

This study population were all fifth-grade students of SD Gugus I Abiansemal Badung for the 2019/2020 academic year, which consisted of 7 classes in 7 elementary schools. The population of this study was 183 students. The sampling technique used is Quota sampling or quota sampling. Quota sampling is a research sample selection technique that determines the sample from the start and not randomizes it (Sugiyono, 2017). Determining the sample from the start, because the number of students in each class in the population has too much difference. Therefore, the researcher determined the number of students in one class ≥30. In this study, the classes that meet the requirements to be sampled are the fifth

grade SD No 2 Sangeh and the fifth grade SD No 2 Blahkiuh with the number of students in each class, 44 and 40 students.

The method used in data collection is the test method. The test method is a way of obtaining data from a group of students to produce a score (Agung, 2014). The test method used is an ordinary multiple-choice test. The multiple-choice test explains an incomplete understanding and selecting one of the possible answers that have been provided to complete it (Arikunto. Suharsimi, 2018). To determine the feasibility of the instrument, the content validity test, the difference power, the difficulty level and the reliability test were carried out on 40 questions of competency in science knowledge Of the 40 questions, 36 valid questions can be given to each sample group to determine the ability of competency in science knowledge. This research used descriptive statistical analysis and inferential statistical analysis. Descriptive statistics describe the study results in the form of the mean, standard deviation and variance of the experimental and control group data, respectively.

Meanwhile, inferential statistics are used to test the proposed hypothesis using the polled variance t-test. Before the inferential statistical analysis is carried out, a prerequisite test is conducted first, the normality test of the data using the Kolmogorof-Smirnov with the maximum score criteria | Fr- Fs | ≤ Kolmogorov-Smirnov table score. The data is normally distributed, for the homogeneity test with the F test (fisher) with Fcount Ftable criteria, and the two data are homogeneous.

3. Result and Discussion

Research results are in the form of data descriptions. The post-test data on the competency of the science knowledge of students who took the project-based learning model were obtained in the study. Group of students who took conventional learning. Posttest data in the experimental group and the control group are presented in table 1.

Table 01. Post-test data of science knowledge competence experimental group and control group

Statistic	Experiment Group	Control Group
n	40	44
Mean	84,98	79,77
Standard Deviation	6,431	6,088
Variance	41,358	37,06
Minimum Score	75	69
Maximum Score	97	88

Based on the table 1, the post-test results obtained 79.77 in the control class and an average score of 84.98 in the experimental class. The data obtained were then analyzed using inferential statistics, normality test, homogeneity test, and hypothesis testing. Normality test using the Kolmogorov-Smirnov technique with a significance level of 5%, with the criteria if the maximum score | Fr - Fs | ≤ Kolmogorov-Smirnov table score, then H0 is accepted and the data is normally distributed and vice versa. The normality test results of the experimental group obtained the score of | Ft-Fs | The maximum ≤ the score of the Kolmogorov-Smirnov table is 0.114 <0.215 which means that the science knowledge competency data of the experimental class group is normally distributed. The normality test results for the control group obtained the score of | Ft-Fs | maximum ≤ the Kolmogorov-Smirnov table score, 0.103 <0.205, which means that the science knowledge competency data of the control class group is normally distributed. The experimental group and the control group used the Fhiser Test (F) to determine the homogeneity of science knowledge competency data variance. According to the calculation, it is obtained that Fcount <Ftable is 1.067. The score of Ftable with dk numerator n1 - 1 = (40-1 = 39) and dk denominator n2 - 1 = (44 - 1 = 43) with a significance level of 5% is 1.73 so that the ratio F_{count} <F_{table} is 1, 067 <1, 73 which means that the two groups have homogeneous variances.

The hypothesis tested in this study was that there was no difference in the competence of scientific knowledge of the group of students who were taught using the project-based learning model and the students who were taught conventionally at fifth-grade elementary school students in Gugus I Abiansemal Badung in the 2019/2020 school year. The effect of the project-based learning model on the fifth-grade students' science knowledge competencies.

Based on the t-test analysis results carried out, the results of t_{count} = 2.591 while t_{table} = 2,000 at the 5% significance level with dk = n1 83. Thus the score of t = 2.591> t table = 2,000 then (H0) is rejected and the alternative hypothesis (Ha) which states that there is a significant difference in the competence of

science knowledge between groups of students who are taught using a project-based learning model, and groups that are taught using conventional learning in the fifth grade of SD Gugus I Abiansemal Badung for the 2019/2020 academic year. The differences that exist can be seen from the differences in the two groups' descriptive statistical analysis results. Descriptively, the average X1 = 84.98 is more than the average competency of the science knowledge of the control group students X2 = 79.77. Based on the findings, it is known that the ability of the two groups, the experimental class group and the control class group is equivalent. The experimental class group was given treatment to apply the project-based learning model experiencing differences in scientific knowledge competence with the control class group. The science competence of the experimental class was higher than the control class. The difference in knowledge competence in the two-class groups is due to the experimental class group's treatment using a project-based learning model, especially in science learning content.

Science learning, according to Sayekti (2018) is not limited to mastering concepts. More than that, students are expected to link the concepts learned with their application in life and develop their scientific attitudes by understanding nature. Science learning is expected to encourage students in the discovery process to develop process skills and students' scientific attitudes (Fatimah et al., 2016). In the science learning process students are allowed to find facts and concepts from the material through observations and experiments to prove and draw conclusions from an object and write down the state of a process (Sari & Jusar, 2017). Science subjects in SD have complex thinking skills in science that must be taught to students, and one of them is creative thinking skills (Adi Sifa Muhammad, 2018). The right learning model with the characteristics of science subjects is project-based. This model aims to develop students' intellectual and social skills so that students are required to acquire knowledge and skills under teacher supervision actively.

The learning process using a project-based learning model runs interactively and is conducive. The project-based learning model provides opportunities for students to build their knowledge and trains students to be active and creative in following the learning process. The project-based learning model requires students to observe the surrounding environment to produce a product for learning in everyday life. According to the research results (SARI, 2018), the application of the project-based learning model positively impacts student learning creativity. According to (Kristiani et al., 2018), the results show an increase in student learning outcomes completed and those that have not been completed. This learning model can help students understand the material, especially the content of science material, on Heat and Transfer's theme to be more effective. Thus, learning becomes more understandable, enjoyable and has a good effect on students' science knowledge competency. Umi, (2015) states that applying the scientific approach through the project-based learning model can improve skill and learning outcomes of fourth-grade students of SD Negeri Sewora Wonosegoro. Kumala Dewi et al., (2018) states that the project-based learning model based on the outdoor study affects science learning outcomes of fifth-grade students of SD Gugus II Mengwi Badung in the 2016/2017 academic year.

Based on the explanation above, it can be concluded that the project-based learning model influences the competency of the science knowledge of fifth-grade elementary school students in Gugus I Abiansemal Badung for the 2019/2020 academic year.

4. Conclusion

Based on the results of the research obtained and the discussion that has been presented, it is concluded that there is a significant effect of the project base learning learning model on the science competence of fifth grade elementary school students in Gugus I Abiansemal Badung for the 2019/2020 academic year. Based on these conclusions, several suggestions can be made to address the findings and studies in this study to the following related parties. It is recommended that teachers provide input in compiling interesting and varied learning by using a project-based learning model to optimize student competency knowledge. The principal can be used as a reference in developing various kinds of learning processes in the classroom by providing adequate facilities and a variety of training for teachers who support the learning process and the application of learning models. And it is suggested to other researchers to use this research results as a reference for further research.

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