



The Effect of Discovery Learning on Science Learning Achievements for Elementary School Students

Sodikul, Amin^{1*}, Murtono², Achmad, Hilal Madjdi³, Sekar, Dwi Ardianti⁴ & Gung, Yeu Tzeh⁵

^{1,2,3,4}Muria Kudus University, Central Java 59327, INDONESIA

⁵Tokyo University of Marine Science and Technology, Tokyo 108-8477, JAPAN

*Corresponding author Email: sekar.dwi.ardianti@umk.ac.id

Received 06 September 2021; Accepted 18 October 2021; Available online 03 November 2021

Abstract: Learning achievement is an indicator of the quality and quantity of knowledge that students have mastered. Student learning achievement can be achieved if there is a synergy between teachers, students, and the learning system that makes learning outcomes maximally achieved. Teachers are still dominant in learning and student dependence on teachers must be reduced. This study aims to analyze the effect of science learning using the Discovery Learning model on science learning achievement in class V elementary school in the Jatisono, Demak Regency, Indonesia. This study employed experimental research with data collection techniques through tests, observation, and documentation. The study population were 6 schools with 140 student data with a sample of fifth-grade students. The result revealed that there is an effect of the discovery learning model as evidenced by the proven $t_{count} > t_{table}$ ($2.957 > 2.0106$). There is a difference in the influence of the discovery learning and inquiry learning model which is proven by the value of $t_{count} > t$ ($4.666 > 2, 0117$). Based on the research, the teacher is suggested to improve the quality and use the appropriate discovery learning model so that the quality of student learning increases.

Keywords: Discovery learning, learning achievement

1. Introduction

The learning process carried out by many educators today tends to achieve curriculum targets, emphasizes memorizing concepts rather than understanding, students are not trained to find knowledge, are not trained to find concepts (Mohamed Nawastheen, 2021). As a result, students forget the material being taught faster. This can be seen from the learning activities in the classroom which are always dominated by teachers. These problems have an impact on the low achievement of student learning outcomes. This learning problem also occurs in the Jatisono Cluster Schools, Mranggen District, Demak Regency, in carrying out the science learning process is still centered on the teacher, the method used is centered on the lecture and discussion method so that students tend to be passive. Efforts to realize a learning process that develops scientific concepts, the Discovery Learning model can be applied to determine the level of student achievement in learning. According to Lestari, Suroso, & Suharini (2020) student learning activities in the discovery learning model have a strong relationship with student learning achievement. The advantage of Discovery Learning is that it helps students to improve and enhance cognitive skills and processes. This condition wants to change teaching and learning activities from teacher-oriented to student-oriented (Kemdikbud, 2014; Gung et al., 2009; Kondo et al., 2007) when rigid teaching models are abused by rigid learners, it will only lead to inevitable destructive collisions. Fortunately, the teaching method has a high degree of flexibility and, therefore, is also quite adaptive (Joyce & Calhoun, 2009). There are three main characteristics of discovery learning, namely: (1) exploring and solving problems to create, combine and generalize knowledge; (2) student-centered; (3) activities to combine new knowledge and existing knowledge. In the Discovery Learning method, teaching materials are not presented in the final form, students are required to carry out various activities to collect information, compare, categorize, analyze, integrate, reorganize materials and make conclusions (Kemdikbud, 2014).

A study conducted by Rosarina, Sudin, & Sujana (2016) on the application of the Discovery Learning Model to Improve Student Learning Outcomes in Material Change of Forms concluded that applying the discovery learning model is an alternative to improve student learning outcomes, especially in material changes in objects. This increase is seen in the percentage of completeness of each cycle. Students who were declared complete in cycle I based on the test results were 7 students (26.92%), cycle II became 17 students (65.38%), and cycle III 23 students (88.46%). In this study, it can be concluded that the application of the Discovery learning model can improve student achievement.

Istiana, Saputro, & Sukardjo (2015) findings concluded that the application of the Discovery Learning model can increase student activity and learning achievement in the buffer solution material. In the first cycle, the percentage of student learning activity achievement was 37% which then increased in the second cycle to 77.78%. The increase in learning achievement seen from the cognitive aspect in the first cycle reached 63% and increased in the second cycle to 81%, from the affective aspect the percentage of completeness for the first cycle was 89% and increased in the second cycle to 92.6%. Meanwhile, learning achievement in the psychomotor aspect was only carried out in the first cycle and gave a completeness result of 81.48. Supriyanto (2014) reported the results of research in learning increased activity and learning outcomes in class VIB Public Elementary School number 2 Tanggul Wetan by using the application of Discovery Learning.

2. Research Methods

This research is experimental quantitative research as it aims to test directly the effect of a variable on other variables and to test the hypothesis of a causal relationship of a variable. The research design carried out was a pre-test and post-test control group design. The population in this study were students of class V Public Elementary School in the Jatisono Cluster, Mranggen Demak District, 2019/2020 academic year. The research sample was the students of Public Elementary School number number 1 Kangkung as the experimental class and Public Elementary School number 1 Kebonbatur as the control class. The choice of sampling in this study is the Purpose sampling technique. The independent variable in the form of treatment is the use of the Discovery Learning learning model. The dependent variable is in the form of student science learning outcomes. The research instrument was a test. The data collection techniques used were observation and written tests. Data analysis includes instrument test (validity and reliability test) data description, prerequisite analysis test (normality and homogeneity test) hypothesis testing using t-test and N-gain test.

2.1.1 Test Analysis Technique

Data analysis includes instrument test (validity and reliability test) data description, analysis prerequisite test (normality and homogeneity test) hypothesis test using t-test and N gain test. After normal and homogeneous data, testing, in this study, the hypothesis testing uses SPSS software version 23 with the Independent Sample Test or t-test which aims to test the average difference between the two groups and to test the effect of the independent variable on the dependent variable. The steps are as follows Riadi (2016), 1) input data into the data view; 2) analyze; 3) compartments; 4) independent sample T-test.

3. Results and Discussion

Based on the analysis conducted by the researcher, the results of the pretest and posttest showed the data on the results of activities before and after learning activities in the control class and the experimental class using the test.

3.1 Control Class with Conventional Learning

Control class with conventional learning with a sample size of 24 students. the mean is 41.4. a maximum value of 68.8, a minimum value of 12.5, and a standard deviation of 12.7. The mean post-test value is 62.7, the maximum value is 87.5, the minimum value is 37.5 and the standard deviation is 11.43096. The normality test obtained the sig value of the control class was 0.070. The sig value of the control class is 0.085 because the sig value for all classes is > 0.05 . So, all data are normally distributed. The average gain value is 33.2527, the N-gain value of 0.33 means that the conventional class has increased learning outcomes in the moderate category because $0.7 > g \geq 0.3$. The N-Gain% value is 33.25 which is interpreted as saying that conventional learning is not effectively used to improve science learning achievement in the theme of life events in fifth-grade elementary school students.

3.2 Class with Discovery Learning

Class with discovery learning the number of samples there are 26 students with a mean of 46.9, a maximum value of 93.8, and a minimum value of 18.8 Standard deviations of 18.31104. The mean post-test value is 62.7, the maximum value is 87.5, the minimum value is 37.5 and the standard deviation is 11.43096. The normality test obtained a value of 0.59. The discovery learning sig value is 0, 53. The value of sig = 0.05. because the sig value for all classes > 0.05 . So all

data are normally distributed. $t_{\text{count}} = 2.957$ while $t_{\text{table}} =$ with $df = 48 = 2.0106$ then $2.957 > 2.0106$ Because $t_{\text{count}} > t_{\text{table}}$, then hypothesis 1 is accepted.

This means that there is an effect of the Discovery Learning (X1) learning model on learning achievement in Elementary School Class V (Y) students in the Jatisono Cluster, Mranggen District, Demak Regency. The average gain value is 45.4110, then the N-gain value is 0.45. This means that the experimental class 1 with Discovery Learning has increased learning outcomes in the moderate category because $0.7 > g \geq 0.3$. The N-Gain% value is 45 which is interpreted as saying that Discovery Learning is less effective in improving science learning achievement in the themes of life events in fifth-grade elementary school students. The results showed that the discovery learning class mean value for the posttest score was 70.9, and in the conventional class the mean value was. This average value shows that there is a difference in the average between the conventional class and the discovery learning class. This shows that the students' ability to understand science material with the theme of events in life is easier to accept when learning discovery learning models are compared to conventional ones.

This result is in Bruner's opinion in Kemdikbud (2014), that Discovery Learning can be interpreted as learning that occurs when students are not presented with the subject matter in the final form but are required to organize themselves. In the learning process, Bruner emphasizes the active participation of each student and is familiar with different abilities. To support the learning process, an environment is needed to facilitate students' curiosity at the exploration stage. This is what makes students understand more about science material because students are actively involved in finding what they think they don't understand.

Based on the results of the t-test on hypothesis 1, there is an effect of the Discovery Learning model on science learning achievement material events in life in elementary students. The implementation is that the teacher must improve the quality of learning by using the discovery learning model. To facilitate a good and creative learning process, it must be based on the manipulation of learning materials according to the level of cognitive development of students. Manipulation of learning materials aims to facilitate students' ability to think (represent what is understood) according to their level of development. According to Bruner's environment is a support for the teaching and learning process. This environment is called the Discovery Learning Environment, which is an environment where students can explore, discoveries that are not yet known or understandings that are similar to what is already known. This kind of environment is intended so that students in the learning process can run well and be more creative.

The Discovery Learning model provides an opportunity for students to work together in groups to solve problems given by the teacher. So that this model can stimulate the enthusiasm of students in solving problems and make the classroom atmosphere more conducive to students who take part in learning with the Discovery Learning model, especially during discussion activities and students begin to have the awareness to provide opportunities for their less able friends to join in discussion activities, even to represent the group presenting the results of the discussion. As Hanafiah & Suhana (2009) argue that the Discovery Learning model builds commitment (commitment building) among students to learn, which is manifested by involvement, sincerity, and loyalty to finding and finding something in the learning process.

The results of this study are in accordance with the research conducted by Istiana et al. (2015) and Gung et al. (2009) with the results of study it can be concluded that the application of the Discovery Learning model can increase student activity and learning achievement on the material of the buffer solution. The results of this study are in accordance with the results of Istiana's research. Namely, the application of the Discovery Learning model influences student learning outcomes. Another supporting research is Rosarina, Sudin, & Sujana (2016). With the title "Application of discovery learning models to improve student learning outcomes in material changes in the form of objects. Based on the findings and discussion, it can be recommended that applying the discovery learning model is an alternative to improve student learning outcomes

According Istiana et al. (2015), in his research entitled "Application of Discovery Learning Model to Increase Activities and Learning Achievement in the subject of buffer solutions in class XI Public Senior High School number 1 student in the academic year 2013/2014. The results of the study concluded that the application of the Discovery Learning model could increase student activity and achievement in the buffer solution material.

The results of the N-Gain test state that based on these data, the results of the gain calculation for the Discovery Learning class obtained an N-Gain value of 45. which is interpreted to mean that the Discovery Learning model is less effective in improving student science learning outcomes in the material of events in life. N-Gain for the control class of 33 with ineffective shifting. This means that conventional learning in the control class is not effectively used to improve. improve student learning outcomes in science subject matter events in life. Learning innovation must be implemented by the teacher to bring change and enlightenment for students to achieve their dreams and a better future, for example by applying the discovery learning model. The implementation of the discovery learning model can be used as a starting point to change the old paradigm in learning, namely teacher-centered learning (teacher center) to student-centered learning. So, the discovery learning model in mathematics learning is expected to be able to bring better enlightenment and change, especially for students.

Based on the N Gain test, it shows that the discovery learning model is more effectively used to improve science learning outcomes for students in life events than conventional learning. This is because the 2013 Curriculum is "a curriculum that enhances teacher-centered learning patterns into student-centered learning patterns, one-way learning

patterns becomes interactive and passive learning patterns become active learning seeking" (in Permendikbud No. 65 of 2013). In this case, the teacher only acts as a guide and facilitator for students to be able to develop their potential optimally. One learning model that can develop the role of the teacher as a guide and facilitator to develop student potential is the discovery learning model.

In discovery learning, students are encouraged to learn on their own independently, as expressed by Ilahi (2012: 30). Discovery learning is not much different from inquiry learning, but in discovery learning, the problems faced by students are a kind of problem engineered by the teacher, so that students do not have to exert all their thoughts and skills to get the findings in the problem through the research process (Ministry of Education and Culture, 2013). A good learning model is a learning model that can guide students in active learning so that optimal learning objectives can be achieved. Therefore, innovation is needed in mathematics learning (Oktora, 2015). According to Suryana (2017) states that discovery is a learning process that focuses on the intellectual mentality of students in solving various problems faced, to find a concept or generalization that can be applied in the field.

Discovery learning is a type of learning where students build their knowledge by conducting an experiment and discovering a principle from the results of the experiment". "Discovery learning is a component of educational practice which includes teaching methods that promote active learning, process-oriented, self-directed and reflective. Thus, Discovery learning seeks to build student enthusiasm for learning, increase the active role of students, assign students to be responsible for facing and solving various learning problems independently and collaboratively with peers, and at times involve the guidance of their teachers.

Based on the results of research and discussion of Discovery learning, it can be concluded that Discovery learning can improve student learning outcomes in science and material events in life and is more effective than conventional learning. This means that hypothesis 1 states that there is an effect of the Discovery Learning (X1) learning model on learning achievement in Elementary School Class V (Y) students in the Jatisono Cluster, Mranggen District, Dema Regency is proven.

4. Conclusion

In this study, it can be concluded that between the Discovery learning model and the conventional learning model is learning that has been able to improve the science learning achievement of grade 5 students. However, the learning model that most influences the science learning achievement of grade 5 students is the Discovery learning model. Testing the class influence hypothesis on the Discovery learning model with classes using conventional learning. Based on the results of the research and discussion, it can be concluded that there is an influence of the Discovery Learning model on science learning achievement in the themes of life events in elementary school students of Class V in the Jatisono Cluster, Mranggen District, Demak Regency. as evidenced by proven $t_{count} > t_{table}$ ($2.957 > 2.0106$) and the N-gain value in the medium category and the interpretation is less effective. This is because discovery learning is a learning process that focuses on the mental intellectual of children students in solving various problems faced, to find a concept or generalization that can be applied in the field.

The suggestion given by the author is that the teacher should use a discovery learning model to improve science learning achievement in the theme of life events because discovery learning is effective for building and rediscovering ideas and concepts in solving various problems at hand.

References

- Gung, A. Y. T., Kondo, H., Aoki, T., & Hirono, I. (2009). Growth differentiation factor 15, a novel acute phase response gene in Japanese flounder, *Paralichthys olivaceus*. *Fish & shellfish immunology*, 26(2), 230-234.
- Hanafiah, N., & Suhana, C. (2009). Konsep strategi pembelajaran. Bandung: Refika Aditama.
- Istiana, G. A., Saputro, A. N. C., & Sukardjo, D. J. (2015). Penerapan Model Pembelajaran Discovery Learning untuk Meningkatkan Aktivitas dan Prestasi belajar pokok bahasan larutan penyangga pada siswa kelas xi ipa Semester II sma negeri 1 ngemplak Tahun pelajaran 2013/2014. *Jurnal Pendidikan Kimia*, 4(2), 65-73.
- Joyce, B., & Calhoun, E. (2009). Three sides of teaching: styles, models, and diversity. *In International handbook of research on teachers and teaching* (pp. 645-652). Springer, Boston, MA.
- Kemdikbud, B. P. (2014). Building the Student Character Through The Academic Service. Authentic Assessment for improving Teaching Quality, 451.
- Kondo, H., Tzeh, A. G. Y., Hirono, I., & Aoki, T. (2007). Identification of a novel C-type lectin gene in Japanese flounder, *Paralichthys olivaceus*. *Fish & shellfish immunology*, 23(5), 1089-1094.
- Lestari, D. A., Suroso, S., & Suharini, E. (2020). Hubungan Aktivitas Belajar Siswa Pada Model Pembelajaran Discovery Learning Terhadap Prestasi Belajar Mata Pelajaran Geografi Di SMA Negeri 73 Jakarta. *Edu Geography*, 8(1), 18-23.

- Ministry of Education and Culture. (2013). Implementation of Curriculum Teacher Training Material 2013 SD Class IV.
- Mohamed Nawastheen, F. (2021). Sri Lankan teachers' concerns towards implementation of curriculum reforms in the competency based curriculum reforms. *Muallim Journal of Social Sciences and Humanities*, 5(1), 1-18. <https://doi.org/10.33306/mjssh/107>
- Mubarok, C., & Sulistyono, E. (2014). Penerapan model pembelajaran discovery learning terhadap hasil belajar siswa kelas x tav pada standar kompetensi melakukan instalasi sound system di smk negeri 2 surabaya. *Jurnal Pendidikan Teknik Elektro*, 3(2).
- Oktora, S. R. (2015). Penerapan Model Discovery Learning Berbasis Assessment for Learning (AfL) dalam Pembelajaran Matematika Ditinjau dari Optimisme Siswa Kelas XI SMK Negeri 1 Banyudono (*Doctoral dissertation, Universitas Muhammadiyah Surakarta*).
- Permendikbud, R. I. (2013). No. 65 Tahun 2013 tentang Standar Proses Pendidikan Dasar dan Menengah. Kementerian Pendidikan dan Kebudayaan Republik Indonesia.
- Riadi, A. (2016). Problem-based learning meningkatkan higher-order thinking skills siswa kelas VIII SMPN 1 Daha Utara dan SMPN 2 Daha Utara. *Math Didactic: Jurnal Pendidikan Matematika*, 2(3), 154-163.
- Suryana, M. F. (2018). Upaya Meningkatkan Prestasi Belajar Materi Bangun Segiempat Melalui Model Discovery Learning pada Siswa Kelas VII C SMP Negeri 3 Teras Kabupaten Boyolali Semester Genap Tahun Pelajaran 2017/2018. *Jurnal VARIDIKA*, 30(1), 47-61.
- Rosarina, G., Sudin, A., & Sujana, A. (2016). Penerapan model discovery learning untuk meningkatkan hasil belajar siswa pada materi perubahan wujud benda. *Jurnal Pena Ilmiah*, 1(1).