



Effect of Problem Solving Learning Model on Students Achievement

Insar Damopolii¹, Jan Hendriek Nunaki², Gatot Supriyadi³

^{1,2,3}Department of Biology Education, University of Papua

ARTICLE INFO

Article history:

Received 19
Desember 2017
Received in revised
form
6 Januari 2018
Accepted 12
Februari 2018
Available online 20
Februari 2018

Keywords:

*Learning model,
problem solving,
students achievement*

ABSTRACT

This research aims to determine the difference in students achievement that used problem solving learning model and conventional learning model. The type of research was quasi experimental. The research was conducted at SMP N 11 Manokwari. The sampling technique used purposive sampling. A number of the sample the control group of 31 students and the experimental group of 30 students. Data analysis used independent t-test at significant level 0,05 with help of SPSS 22 for Windows program. The results showed that there was a difference in the student achievement ($P = 0,000 < 0.05$), where the N-Gain value of experimental group was 0.4 and the control group was 0.3. The conclusion, there is a difference in the improvement of students achievement, where the students who learn by using the problem solving learning model higher the improvement of students achievement compared to the students who learn by using the conventional learning model.

Copyright © Universitas Pendidikan Ganेशha. All rights reserved.

1. Introduction

Learning is an activity that a person undertakes to make changes to himself through training or experiences, where the training adds insight or knowledge, changes in attitude, and skills, so that with such changes will be able to be used in solving a problem and adapt to the environment. Humans do learning activities in various ways according to circumstances. When a person has done learning attitudes than in him will happen changes that are a statement of learning acts, this change is called the student's achievement. The changes that occur in the learning process include cognitive changes (knowledge), affective (sense), and psychomotor (behavior). Students achievement in accordance with objectives and specific areas can be measured or known by conducting research or evaluation that shows how far a capability has been achieved.

Biology science is not just a collection of facts and concepts because in biology there are also various processes and values that can be developed and applied in everyday life. Learning is a series of activities designed to be developed and managed creatively, dynamically, by applying a multi-approach to create an atmosphere and a conducive learning process for students (Prastyawan, 2011: p. 171). Biology learning should be able to sustain the intellectual pleasure and satisfaction of its students to explore concepts, thus creating effective learning.

The effectiveness of learning undertaken by learners in schools is not solely determined by the degree of ownership of potential learners concerned but also the environment, especially professional educators there is a tendency that pleasantness, warmth, brotherhood, not scary, and the like, are seen by some as educators the good one. Professional educators are required to have more characteristics than those aspects, such as the ability to master learning materials, learners' skills, and evaluation of learners. Thus the professionalism of the educator is the totality of personality embodies that is displayed so as to encourage learners to learn effectively.

Corresponding author.

E-mail addresses: i.damopolii@unipa.ac.id (Insar Damopolii)

Learning model acts as a way to create teaching and learning process, so that grow various students learning activities. In this interaction, the teacher acts as a driver or mentor, while the students move as a recipient or guided. Interaction process will work well if learners are more active than teachers. According to Firli et.al (2017: p 1), Modern teaching has been shifting its focus from teacher-centered learning to student-centered learning. In order for students to be able to complete a good understanding of biology in accordance with the purpose of learning, then the teacher should be more careful in choosing a model of learning model in accordance with the characteristics of these students. According to Prastyawan (2011: p. 180-181) that the effective learning model is a learning model that has a theoretical basis that is humanistic, flexible, adaptive, oriented contemporary, has a simple learning syntax, easy to do, can achieve the desired goals and learning outcomes

Based on the observation in group VIII SMP Negeri 11 Manokwari, found some obstacles in the process of learning biology that is the learning model used or applied by the teacher just in the form of lectures and discussions cause students less active, in the learning process so that students look joking with friends, Material, this is one of the weaknesses of the conventional learning model, because the conventional learning model will make students quickly bored and less focus on the contents of the material. Students rarely ask or express opinions at the time of learning because the conventional learning model has been used to place students only as listeners.

In the learning process in schools, teachers tend to do lesson-centered learning or only active teachers and passive students, with a general learning model. The current learning concept has to change from teacher-centered learning to student-centered learning (Baransano et.al, 2017: p. 274). Whereas in the matter of addictive substances and psychotropic substances is the material that refers to the students' understanding of the addictive and psychotropic topic and the danger of these substances. For that the selection of less precise learning model will affect the students' understanding, thus affecting student achievement. One of the selections of the right learning model is the learning model that makes the active student, more understanding the material and can express his opinion. The role of teachers in the context of the educational environment is very important in determining the quality and quantity of teaching that it does. Therefore, teachers can think as early as possible and make careful planning in improving learning opportunities for their students and improve the quality of teaching.

The problem solving learning model is one of the teaching models used by teachers in the learning process activities. This model can stimulate students in thinking that starts from looking for data until formulating conclusions so that students can take meaning from learning activities (Shoimin, 2014: p. 136). According to Djamarah & Zain (2010: p. 91-92), the problem solving method is not just a method of teaching, but also is another method begins by looking for data to draw conclusions. Problem solving learning model helps teachers to improve student achievement. According to Prastyawan (2011: p. 181) that learning model that can be applied to the field of study should be coherently packed with the nature of the education. According to Fajriah et.al (2017: p. 90), learning activities that involve learners actively in learning and adjust the learning materials presented with the learning experience of learners can foster motivation to learn within the students, because they feel that the subject matter presented has direct benefits in person in life. Meanwhile, according to Çaliskan & Selcuk (2010: p. 1936) educators, academicians or teachers must introduce model problem solving to students learning.

The problem solving learning model has an effect on the student's achievement and is effectively used in the teaching and learning process in the classroom. Research has done by Yasin et.al (2012: p. 64) found that the problem solving learning model is a learning model that can be applied experiential and meaningful teaching and learning (T & L) as it is a strategy that is applied exponentially and is student-centric. Gök & Silay (2010: p. 16-17) found that the using a problem solving strategies that improve student achievement, increase their interest in a subject, and change student attitudes toward learning. Ristiasari et.al (2012: p. 35) the existence of problems (problems) given will invite students more active in learning, understanding the contents of learning, challenging students' thinking skills to overcome the problems it faces, find solutions that solve (problems). Fajriah et.al (2017: p. 93) problem solving learning model is expected to be an alternative for teachers to develop meaningful learning process, so as to improve learning student achievement of learners.

Teaching is not determined by the taste of the teacher, but it is determined by the students themselves. To learn what students are from topics to learn, how to learn them, not just the deciding teachers but also the students. Students have the opportunity to learn according to their own style. Thus the role of the teacher changes from the role of the source of learning to the role of facilitator, meaning more teachers as the ones who help the students to learn. According to Sutarmi & Suarjana (2017: p. 80), the problem solving method gives students the opportunity to work with their peers, interact socially, and

share new ideas in a group like a peer tutor, where a student tells a friend who has not understood or is less able to receive lessons. With the use of problem solving learning model, the teacher only acts as a facilitator and students who are actively involved in constructing their knowledge. Thus it can be said that the problem solving learning model is a model of learning that involves students directly and train students to face various problems and seek solving problems both individually and in groups.

2. Method

The research conducted at SMP Negeri 11 Manokwari. The population in this research is the students of class VIII SMP Negeri 11 Manokwari consisting of 6 class that the total number of students is 237 people. The sample in the study was taken from class VIII C as many as 31 students as the control group and class VIII D as many as 30 students as the experimental group. Sampling using purposive sampling technique. The type of research is quasi experimental. The research design is as follows:

O1	X ₁	O2
O3	C	O4

Annotation:

1. O1 and O3 are pretests
2. O2 and O4 are posttests
3. X₁ is an experimental group using the problem solving learning model
4. C is a control group using the conventional learning model

The technique of collecting data using observation and test. The normality test used is the Shapiro Wilk test, on the basis of decision-making: If the probability is (Sig) > 0.05 then H₀ is received, which means normal data distribution. If (Sig) < 0.05 then H₀ is rejected, which means abnormal data distribution. Homogeneity tests use Levene's Test of Equality of Error Variances, on a baseline basis, if the probability is (Sig) > 0.05 then H₀ is received / the data has the same variant. If the probability is (Sig) < 0.05 then H₀ is rejected / the data has an unequal variant. Data analysis using parametric analysis with independent sample t-test at significant level 0,05. The t-test is used to see the difference of gain learning data by using SPSS 22 for Windows program. To calculate the gain using the following formula:

$$N - \text{Gain} = \frac{\text{Posttest Score} - \text{Pretest Score}}{\text{Maximum Score} - \text{Pretest Score}}$$

Table 1. Criteria of N-gain

N-gain Value	Level
≥ 0,7	High
0,7 > N-gain ≥ 0,3	Medium
< 0,3	Low

3. Result

Data of the research results are descriptions data of student achievement (Posttest), the difference of N-Gain value between experimental group and control group. The results of the analysis are as follows:

Table 2. Percentage of Student Achievement in Experimental Group

Value	Category	frequency	P (f/N*100) (%)
80 - 100	Very Good	9	30,00
70 - 79	Good	10	33,33

60 - 69	Enough	9	30,00
40 - 59	Less	1	3,33
0 - 39	Very Less	1	3,33
N = 30			100,00

Based on the data in Table 2, it shows that students' achievement in the experimental group is categorized enough - very good reach 93.33% of the total students. This shows that the students' achievement in the experimental group gets a very good category.

Tabel 3. Percentage of Student Achievement in Control Group

Value	Category	frequency	P (f/N*100) (%)
80 - 100	Very Good	5	16,13
70 - 79	Good	13	41,94
60 - 69	Enough	6	19,35
40 - 59	Less	7	22,58
0 - 39	Very Less	0	0,00
N = 31			100,00

Based on the data in Table 3, it shows that students' achievement in the control group is categorized enough - very good reach 77.42% of the total students. This shows that the students' achievement in the control group gets a good category, but lower than the student achievement in the experimental group. The difference of student achievement between experimental group and control group as many as 15.91%. Comparison of experimental group and control group learning results is illustrated in the following graph:

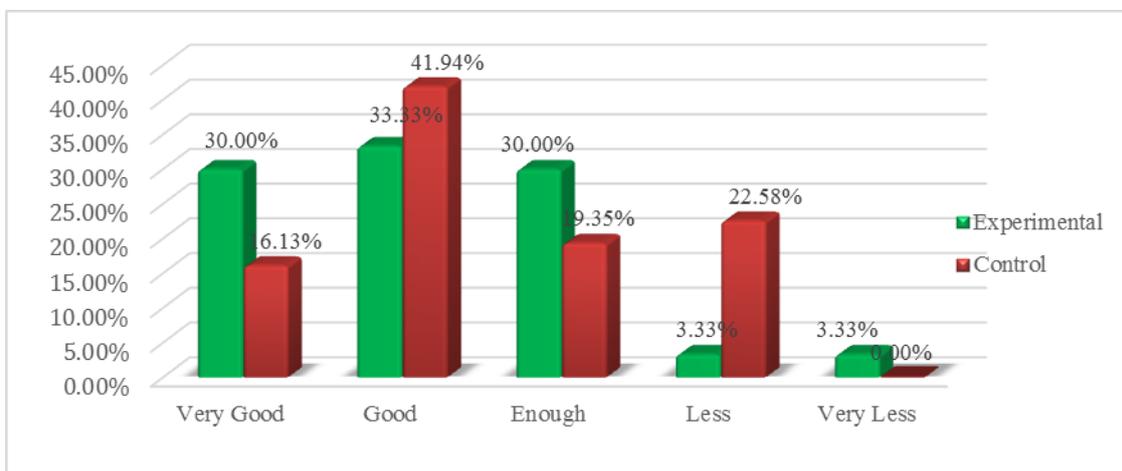


Figure 1. Graph of Comparison of Percentage of Student Achievement in Experimental Group and Control Group

Table 4. Description of Student Achievement (Posttest)

Varian	Control	Experimental
N	31	30
Mean	67,26	70,67
Deviation Standard	12,44	12,51
Minimum	40,00	30,00

Maximum	95,00	85,00
Maximum score	100	100

Based on the data in Table 4 shows that the mean of student achievement is different. The mean student achievement of the experimental group that was learned with the problem solving learning model was higher than the mean of the student achievement in the control group that was learning by the conventional learning model. The average comparison of student achievement is illustrated in the following graph:

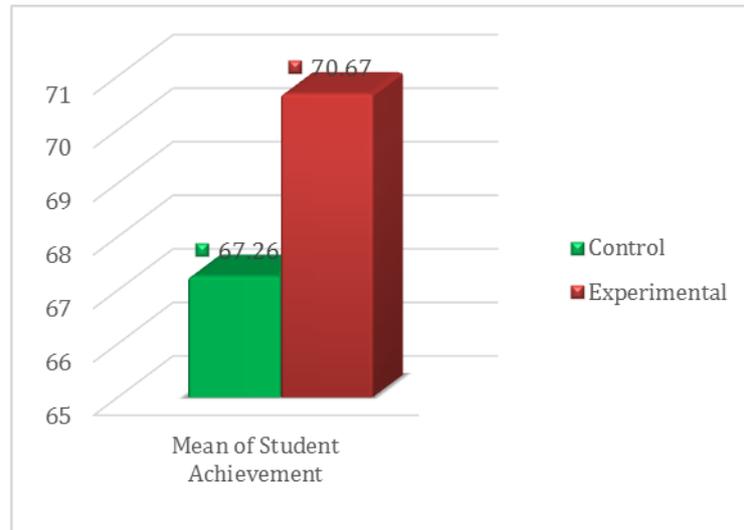


Figure 2. Graph of Comparison of Student Achievement (posttest)

Table 5. N - Gain of Experimental and Control Group

Group	N-gain	Level
Control	0,3	Medium
Experimental	0,4	Medium

Based on the data in Table 5 shows that the N-gain value of the control and experimental group is medium, but the N-gain of the experimental group is higher than the control group N-gain value. The comparison of the N-Gain value of student achievement is illustrated in the following graph:

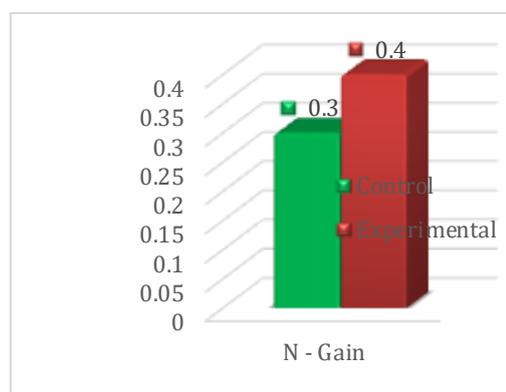


Figure 3. Graph of Comparison of N - Gain

Table 6. Normality Test Result Data

Gain	Statistic	df	Sig.
Control	0,950	31	0,170
Experimental	0,968	30	0,455

Based on the data in Table 6. The sig value is greater than α 0.05, it is said that the gain data of control group and the experimental group are normally.

Table 7. Homogeneity Test Result Data

	Levene Statistic	df1	df2	Sig.
Based on Mean	0,243	1	59	0,624

Based on the data in Table 7, the sig value on based on mean is greater than α 0.05, it is said that the control group gain data and the experimental group are homogeneous.

Prerequisite test results show that the data gain is normally distributed and homogeneous, so the hypothesis test using parametric analysis with independent sample t-test. The result data analysis with t-test is presented in Table 8.

Table 8. Results of Hypothesis Testing Analysis

	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	59	0,000	-50,591	3,226

Based on the data in Table 8, it is found that the value of sig. $0.000 < \alpha = 0,05$, this indicates that there is a significant difference between the student achievement of the student in learning with the problem solving learning model and student learns in learning with the conventional learning model.

Differences in students Achievement are influenced by several factors, one of which is the use of learning models. A control group uses conventional learning where teachers are more active than students. Lack of interaction between students and teachers, teachers are more lecturing, making students more bored and less understanding of the material submitted by the teacher, so it will have an impact on student achievement. While in the experimental group, using problem solving learning model. Aisya *et.al* (2017: p. 173) states that the problem solving learning model provides an opportunity for students to think critically and organize creative ideas in order to solve the problem.

The results obtained in line with the research that has been done by Gök & Silay (2010: p. 17) found that the problem solving strategies are more effective on cooperative learning than traditional teaching, research Yasin *et.al* (2012: p. 76) who found that the implementation of problem solving strategies improving students achievement and research of Fajriah *et.al* (2017: p. 93) who found that there are significant differences in the students achievement of learners who are taught by applying problem solving learning model with learners who are taught conventional learning model. Implementation of learning by using problem solving learning model requires students to solve problems given by teachers. Problems are given by teachers in the form of problems related to the material addictive substances and psychotropic substances. Issues raised in the form of learning cases of the dangers of smoking, alcoholism, the use of amphetamines, alcohol, shabu-shabu, marijuana, and others.

According to Tabrani (2008: p. 5) the advantages of problem solving method is when students solve problems allow connecting teaching with daily life, because the issues raised in learning activities bias taken from daily life, or from what happened, where the method it is able to train learners to think systematically and connect it with other problems. According to Aisya *et.al* (2017: p. 176) in integrated learning problem solving students are trained to find out information and material as deep as the activity

of reading individually then students will be grouped in an effort to solve the problem and according to Suprijono (2010: p. 70) students trying to learn to seek in solving problem by developing the ability to analyze and manage information. The use of problem solving learning model in the experimental group uses problems related to the daily life of the students observed in the surrounding environment. Examples of problems given are the dangers of drinking alcohol and smoking. Associated with the life of the people around who often drink alcohol, students are able to connect between the processes that often occur in the environment with the problems given by teachers. It appears that students are able to provide solutions to the problems provided by teachers.

Toll (2017: p. 20) that problem solving model to understand the problem well first before taking the right decision to solve the problem. Students are required to think critically, students play an active role in the learning process and creatively trying to find solutions to the problems posed, interact with friends and teachers. Exchange ideas so that insight and thinking power develop. And in the next stage students are required to discuss the group to exchange ideas in generating some ideas of problems that have been given by the teacher, at this stage students are able to develop ideas, insights, and creativity that makes them active in the learning process. This is in line with the advantages of problem solving models that exist in the literature where students are able to solve problems realistically and think and act creatively. According to Damopolii et. al (2015: p. 197) suggests that problem solving skills are very important for students and their future.

According to Riastini & Mustika (2017: p. 190) through problem solving students can gain a meaningful learning experience that grows as an impact of students involved in connecting the lesson concepts learned to solve a problem. In the research that has been done by using problem solving learning model in students of SMP N 11 Manokwari have a higher influence than on conventional learning model. The results of this study are in line with the research that has been done by Dogru (2008: p. 16) who found that students who were taught by learning problem solving students achievement better than students who were taught by traditional/conventional learning.

In the learning process using problem solving students are given problems with regard to the material learned in the form of students worksheets, where the ways of solving and the steps are designed so that students think more easily to find the right and quick solution pattern. This result makes students become motivated to be more active in solving problems provided by teachers. Ristiasari et.al (2012: p. 38-39) in his research found that the problem solving learning model requires active students in thinking more critical in solving problems so as to help students in achieving good learning outcomes compared to students who are given a model of lecture and discussion only. On learning by using problem solving learning model to make students motivated to learn compared with students who learning with conventional learning model, so that student learning outcomes are learning with problem solving learning model better. The research result of the Damopolii (2018: p. 5) concludes that there is a relationship of learning motivation with the result of the biology of junior high school students.

Apart from all that, researchers also get obstacles based on observations in the learning process include: Students still find barriers in finding the idea of problems and in solving problems, this is due to lack of learning resources, so students are quite difficult in finding information, so researchers should be correct guiding students to find problem ideas and problem solving. As well as the lack of problem solving that requires a longer allocation. And the last obstacle of environmental factors, many students who complain because the environment around his group is still a lot of students from other groups is noisy so disturb their concentration in finding ideas and solve problems.

Thus in the application of learning model problem solving students discuss more and cooperate with the group compared with listening to material explanations from teachers. Students are actively involved in the process of discussing, exchanging opinions and ideas they have among group members to find solutions to the issues they discuss. According Djamarah and Zain (2010: p. 92) problem solving method is the use of methods in learning activities by training students to face various problems whether it is personal or individual problems or group problems to solve itself or together and And according to Raehanah et.al (2016: p. 76) in problem solving requires students work together to solve problems in the group. In short, learning is social interaction, engagement with others opens opportunities for students to evaluate and improve their understanding as they meet other people's thoughts and as they participate in the search for shared understandings. Hands-on activities provide students with opportunities to engage

in exploration and make meaningful conclusions (Thomas, 1999; Zhou et al., 2013). according to Aido (2016) PBL is an effective way for to teach chemistry so as to improve students' critical thinking and problem solving skills.

4. Conclusions and Recommendations

The conclusion of this research is problem solving learning model can improve students achievement in biology subject. The Problem solving learning model is better in improving students achievement compared with the conventional learning model that is often used by teachers in teaching and learning process.

References

- Aidoo, Benjamin. 2016. Effect of Problem-Based Learning on Students' Achievement in Chemistry. *Journal of Education and Practice*, Vol.7, No.33
- Aisya, N., Corebima, A. D., & Mahanal, S. (2017). Hubungan antara Pretest dengan Posttest Keterampilan Berpikir Berpikir Siswa SMA pada Pembelajaran Biologi Kelas X Melalui Model Pembelajaran RQA Dipadu CPS Di Kota Malang. *Prosiding Seminar Nasional Pendidikan Sains 2017 & Rakor PPI Jawa Tengah dengan Sekjen PPI* (pp. 172-177). Surakarta: Universitas Sebelas Maret. Retrieved from <http://jurnal.fkip.uns.ac.id/index.php/snps/article/view/11410>
- Baransano, A. Y., Yohanita, A. M., & Damopolii, I. (2017). Penerapan Model Pembelajaran Picture and Picture untuk Meningkatkan Hasil Belajar Biologi Siswa Kelas XI IPA SMA YABT Manokwari. *Prosiding Seminar Nasional MIPA II Tahun 2017* (pp. 273-280). Manokwari: Sinar Grafika.
- Çalışkan, S., & Selçuk, G. S. (2010). Pre-service Teachers' Use of Self-regulation Strategies in Physics Problem Solving: Effects of gender and academic achievement. *International Journal of the Physical Sciences*, 5(12), 1926-1938.
- Damopolii, I. (2018). Hubungan Motivasi Belajar dengan Hasil Belajar Biologi Siswa Di SMP 21 Rendani Manokwari. *Seminar Nasional dan Kongres HPPBI* (pp. 1-5). Mataram: <https://osf.io/4twg2>.
- Damopolii, I., Hasan, A., & Kandowangko, N. (2015). Pengaruh Strategi Pembelajaran Inkuiri Bebas Dimodifikasi dan Kemampuan Memecahkan Masalah terhadap Keterampilan Proses Sains Mahasiswa Pada Praktikum Fisiologi Tumbuhan. *Pancaran Pendidikan*, 4(3), 191-200.
- Djamarah, S. B., & Zain, A. (2010). *Strategi Belajar Mengajar*. Jakarta: Rineka Cipta.
- Dogru, M. (2008). The Application of Problem Solving Method on Science Teacher Trainees on The Solution of the Environmental Problems. *Journal of Environmental & Science Education*, 3(1), 9-18.
- Fajriah, F., Rahmatan, H., & Halim, A. (2017). Dampak Model Pembelajaran Problem solving terhadap Motivasi dan Hasil Belajar Peserta Didik Di SMP. *Jurnal Pendidikan Sains Indonesia*, 5(2), 87-94.
- Firli, A., Rismayani, A., Sitorus, P. M. T., & Manuel, B. (2017). Implementing Mixed Method of Peer Teaching and Problem Solving on Undergraduate Students. *Journal of Education Research and Evaluation*, 1(1), 1-5.
- Gök, T., & Silay, İ. (2010). The Effects of Problem Solving Strategies on Students' Achievement, Attitude and Motivation. *Lat. Am. J. Phys. Educ.*, 4(1), 7-21.
- Prastyawan. (2011). Inovasi Kurikulum dan Pembelajaran. *Al-HIKMAH*, 1(2), 170-181.
- Raehanah, R., Mulyani, S., & Saputro, S. (2016). Efektivitas Model Pembelajaran Problem Solving Tipe Search Solve Create and Share (SSCS) dan Kooperatif Problem Solving (CPS) Ditinjau dari Kemampuan Matematis terhadap Prestasi Belajar. *J. Pijar MIPA*, XI(2), 75-80.
- Riastini, P. N., & Mustika, I. K. (2017). Pengaruh Model Polya terhadap Kemampuan Memecahkan Masalah Matematika Siswa Kelas V SD. *International Journal of Elementary Education*, 1(3), 189-196.

- Ristiasari, T., Priyono, B., & Sukaesih, S. (2012). Model Pembelajaran Problem Solving dengan Mind Mapping terhadap Kemampuan Berpikir Kritis Siswa. *Unnes Journal of Biology Education, 1*(3), 34-41.
- Shoimin, A. (2014). *68 Model Pembelajaran Inovatif dalam Kurikulum 2013*. Yogyakarta: Ar-Ruzz Media.
- Suprijono, A. (2010). *Cooperative Learning Teori dan Aplikasi PAIKEM*. Yogyakarta: Pustaka Belajar.
- Sutarmi, K., & Suarjana, I. M. (2017). Peningkatan Hasil Belajar Siswa Menggunakan Metode Problem Solving dalam Pembelajaran. *Jurnal Ilmiah Sekolah Dasar, 1*(2), 75-82.
- Tabrani, R. (2008). *Cara Pembelajaran Matematika Seri I*. Semarang: PT Bengawan Ilmu.
- Toll, C. A. (2017). A Problem-Solving Model for Literacy Coaching Practice. *The Reading Teacher, 70*(4), 413-421.
- Yasin, R. M., Halim, L., & Ishar, A. (2012). Effects of Problem-solving Strategies in the Teaching and Learning of Engineering Drawing Subject. *Asian Social Science, 8*(16), 65-79.
- Zhou, Q., Huang, Q., & Tian, H. (2013). Developing Students' Critical Thinking Skills by Task- Based Learning in Chemistry Experiment Teaching. *Creative Education, 4*(12), 40. Retrieved from <http://www.scirp.org/journal/PaperInformation.aspx?PaperID=41520>