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THE EFFECTIVENESS OF PROBLEM SOLVING MODEL WITH TATIGA CARDS TO THE LEARNING MOTIVATION AND INDEPENDENCE OF STUDENTS FOCUSING ON THE MATERIALS OF ANIMALS' TISSUE

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Abstract

The aims of the research are to determine the effectiveness of problem solving model with Media Tatiga Card to improve learning motivation and independence of animal tissue material students. The research method used is experiment with Nonequivalent Control Group Design. Sampling was done by cluster random sampling, with each experimental class and control class. Data were collected using documentation method, observation sheet, questionnaire and test. The results showed that the average score of learning motivation and independence of the experimental class students of each aspect into the category very well. Result of gain test analysis of cognitive learning outcomes of students in experimental class = 0.48 in the medium category, in control class of gain test result = 0.28 in the low category. The result of test analysis of difference of two mean to the value of learning motivation obtained Pcount = 12.35, and test of difference of two average value of independence obtained Pcount = 12,43 with Ptable = 1,96. While the results of t test analysis of student learning outcomes show t count = 4.13 and t table = 1.67. It was concluded that the problem solving learning model with the media of Tatiga Card is effective to improve the motivation of learning and independence of the students of grade VII SMP N 10 Magelang, Which is seen from the average score of learning motivation and independence of the experimental class students of each aspect in the category is very good, there are significant differences in learning motivation, student independence and learning outcomes between the experimental class and the control class.

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INTRODUCTION

Education plays significant roles in helping students to obtain knowledge and skills to help them achieve learning objective. Therefore, science learning is taught based on students' daily life (Parmin *et al.,* 2016). Integrated science is a group of concept, principles, law, and theories made from creative and systematic process through inquiry which is continued with empirical process of observation to unveil the secret of the nature. The demand of School-based Curriculum in Indonesia is to make students more active in learning. Through learning science, students can obtain knowledge, skills, and behavior needed to know surrounding environment as well as to solve the problems.

Learning achievement does not stopon the skills. It comes from behavior (Ningrum, 2015). Learning will happen if students are actively involved in obtaining experiences that allows them to discover the concept. Teachers should build a learning environment that students should be involved in the teaching and learning process. Based on Istifarini (2012) learning is an active process in building students' knowledge. It runs well if students plays important roles in learning process.

Based on the observation in SMP Negeri 10 Magelang, it is known that the used curriculum is School-based curriculum. The science learning process is still dominated by teachers. It stimulates the ability to share opinion. Teacher should stimulate them with question that they will answer it with their own opinion. In other problem, most students submit their exercises lately. Even, some of them do not submit it if the teachers do not ask them. From this observation, it seems that the confidence, responsibility, and initiative of the students have not been shown by students, that they still have low independence.

Students' learning outcome is still low. From the mid-term test of science of 159 students, only 50 students passed the passing grade of 75. This low results of the students are influenced by several factors, one of them is learning process. During the process, when teachers explain the materials, students do not pay full attention to them. They are still passive and not enthusiast to follow the learning process which is indicated from only some of them who are brave to ask questions to teacher if they have any difficulties. Similarly, only some students who are brave to share their opinion when teachers ask them. When the students do discussion, only some of group members who are involved. It shows that students have low interest to science.

Students' low interest to science show that they have low learning motivation. Besides, in terms of exercises, students only wait teachers' direction to do the exercises. Not all students summarize the materials which was given by the teachers. From these problems, students' learning motivation is proven low.

The learning material of animals tissue in VII grade of SMP N 10 Magelang is usually given with discussion without practicum or direct observation to the tissue through microscopes. Since, the preparation of the preserved tissue does not exist in the school; thereby, a media is needed to support this learning process. Suparmi (2013) states that students always have difficulties in understanding the materials which is given by teachers conventionally, yet the information is abstract or not real and only limited as words.

Based on the background, the problems of science learning at schools are students' low motivation and independence of learning. Therefore, the researcher intended to use a learning model which can involve students' independence and learning motivation. The model is problem solving. It is a model which puts forward the process of solving problems by showing students the best way to think and to know is not only from the book. Karatas & Baki (2013) state that problem solving can improve students' skills in handling problems.

Problem solving can make students more active and be involved in the learning process, since it demands students to solve problems. They shall be active and independent to find information of theory which is related to the problems with minimum dependency to teachers. According to Halim (2016) Problem Solving must begin from the steps of focusing to the problems, describing problems, planning solution, managing plan, and evaluating answers.

A medium which can be used for supporting this learning process is Tatiga card. It helps students to see the structure of animal tissue. This medium is also useful for attracting students' interest, since it si made with inserting the

elements of game. Thus, the students can be more joyful and interested to learn. Beside improving students' learning motivation, the use of media in the larning process also train students' independence. Taufiq *et al.* (2014) states that students'joy in learning will positively impact their curiosity. Finally, it improves their learning activity, especially in reasoning and independence to learn.

Rehman (2013) states that motivation is a key factor of students in all school level. Learning motivation can beseen from some indicators, which are showing interest, being persistent in doing tasks, tenacious in facing problem, pleased to find and solve problems, and defending arguments (Sardiman, 2011: 83). Meanwhile, independent is the behavior of not being dependent to others. Students' independence can be seen in some indicators, including confidence, discipline, responsibility, self-control, careful, and serious in analyzing learning materials (Nahdliyati, 2016).

This research is intended to explain the effectiveness of problem solving skills using Tatiga cards to improve students' learning motivation and independence in the material of animal tissue. This article is hoped to be able to add some knowledge related to problem solving and Tatiga cards based on this research's objective.

METHODS

This research is an experimental research with Quasi Experiment design. The design of quasi experiment of this research was Nonequivalent Control Group Design (Sugiyono, 2015).

Table 1. Nonequivalent Control Group Design

Experiment	0_1	X	0_2
Control	0_3	Y	0_4

Notes:
X: Problem solving learning with Tatiga cards
Y: Learning with discussion and slide show
0_1: Pretest of experiment class
0_2: Posttest of experiment class
0_3: Pretest of control class
0_4: Posttest of control class

The population of this research is all students in VII grade of SMP Negeri 10 Magelang academic year 2016/2017. The sampling in this research was cluster random sampling based on the consideration of science teacher that both classes had the same ability from the initial homogeneity test. VII D was the experiment class which got the treatment using problem solving and Tatiga cards and VII E was the control class which got discussion and slide show of power point. The dependent variable in this research was students' learning motivation and independence.

The method of data collection in this research included: test, observation, and documentation. The analysis of data in this research used normality test of pretest and posttest. The students' learning motivation and independence is reflected from the observation in each meeting. The questionnaire was given to know students' responses in using Tatiga cards with problem solving technique and its effects to students' learning motivation and independence on the materials of animal tissue.

RESULTS AND DISCUSSION

This result of this research includes the students' motivation and independence as well as their cognitive result. The average score of the observation to students' learning motivation and independence in meeting 0 to meeting 2 in the VII D (experiment class) and VII E (control class) which can be seen in Table 2 and 3.

Table 2. The average score of motivation in each indicator

Indicators	Control Class		Experiment Class	
	Mean	Criteria	Mean	Criteria
Discover and solve problems	5.03	Good	6.2	Very Good
Able to maintain arguments	4.21	Good	6	Very Good
Showing interest to subject	4.83	Good	6.8	Very Good
Persistent	4.31	Very Good	4.5	Very Good
Tenacious in facing problems	4.72	Good	6.5	Very Good

Based on Table 2, students' motivation in the control class is in good criterion in 4 indicators and very good in 1 indicator. It is different to

control class, the experiment class has very good motivation categories to all indicators. It can be concluded that experiment class is better than the control class.

The increasing score of students' motivation can be seen in Figure 1 to 5.

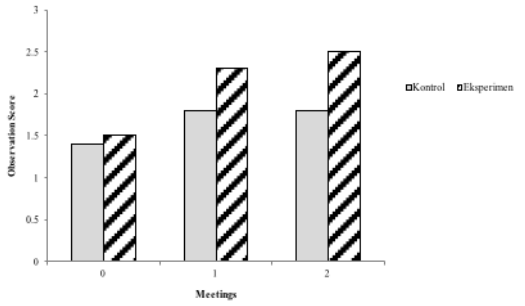

Figure 1. Score of Students' Motivation of Learning to the Indicator of pleased to discover and solve problems

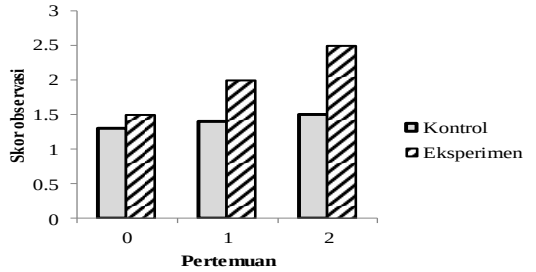

Figure 2. Score of Students' Motivation of Learning to the Indicator of defending argument

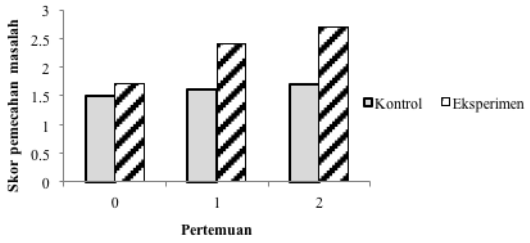

Figure 3. Score of Students' Motivation of Learning to the Indicator of showing interest to subject

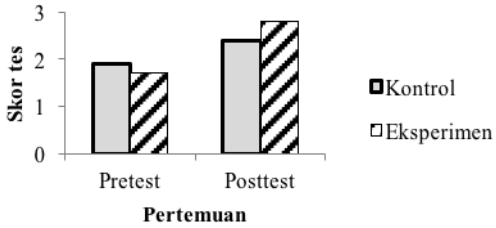

Figure 4. Score of Students' Motivation of Learning to the Indicator of persistence

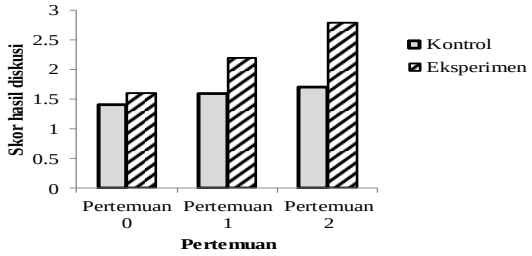

Figure 5. Score of Students' Motivation of Learning to the Indicator of tenacious in facing problems

Based on the score of the students in 5 indicators, students show highest in their interest to subject. This indicator is seen from students' ability in solving problem. The more problems solved by students, the higher the interest which is shown by the students. Based on the learning, Figure 3 shows that students in the experiment class is better in the improvement of motivation than the control class.

In the initial meeting, the motivation of students both class were low, due to absence of treatment. In the first meeting, after the treatment, the control class had increased after the treatment of discussion and slide show. However, these media did not make them enthusiastic to follow the learning process, since it seemed conventional. Only some students like the this conventional treatment.

The use of slide show demanded the students to pay attention on the materials, since all materials were not completely written in the slides. The slides are only given points of the materials. It makes the students not interested to the learning, resulting difficulties to answer questions in discussion sheets.

Meanwhile, the experiment class had significant improvement since the first meeting, since the use of problem solving demanded the students to solve the problems themselves. They find the information themselves using the medium of Tatiga card, that it makes them able to comprehend the material of animal tissue. The obtained information will be used to solve problems. The use of the card could also improve students' interest and enthusiasm.

The second meeting of this indicator in the control class did not get the improvement of score with the same result on the first and second meeting. Meanwhile, the experiment class had slight improvement which shows that they can

solve problems and acquainted to do that. The increasing score of learning motivation in the experiment class was better than the control class.

The use of slideshow and discussion made students only obtained the information based on the teachers and discussion. If the information is only from one center, students wil not be enthusiastic and bored during the learning.

The indicator of being persistent had the lowest score. It is seen from the pretest and posttest score. The students' score can be seen in Figure 4. Both experiment and control classes are in very good category. Before given the pretest, the control group had higher score with slight difference. However, the experiment class led after the treatment.

Students' test on the experiment class was higher, meaning that the improvement of the class was more significant to control class. It shows that the students' materials with problem solving and Tatiga card is better than the control class. It is because the experiment class only used problem solving to ask students solving their problems which is assisted with Tatiga card.

By the involvement of all students, the learning process ran well. The result supported Estiani *et al*. (2015) that the use of card can help students in understanding the materials.

Table 3. The average score of students' independence in for each indicator

Indicators	Control Class		Experiment Class	
	Mean	Criteria	Mean	Criteria
Confidence	4.5	Good	6	Very Good
Discipline	4.7	Good	6.7	Very Good
Responsible	7.5	Very Good	8.9	Very Good
Self-control	5.7	Good	7	Very Good
Accuracy in analyzing the materials	6.2	Very Good	8.5	Very Good

Based on Table 3, it shows that students' independence in control class obtained good score in 3 indicators and 2 very good scores. Ub the experiment class, all indicators were very good. From the data, it can be concluded that experiment class is better than control class.The improvement of students' independence can be seen in the following Figures.

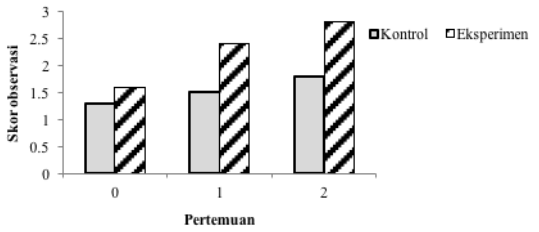

Figure 6. The score of students' independence to the indicator of confidence

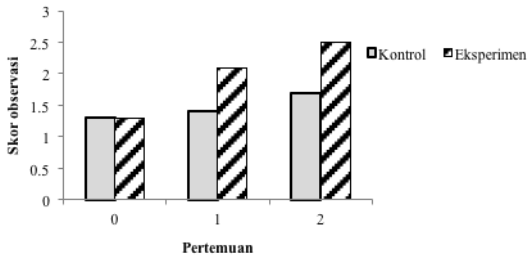

Figure 7. The score of students' independence to the indicator of discipline

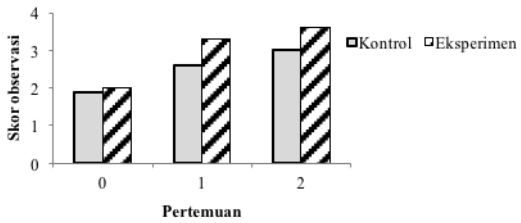

Figure 8. The score of students' independence to the indicator of responsibility

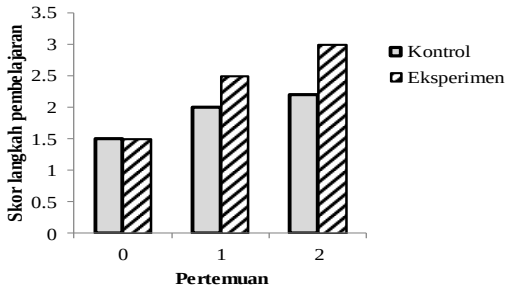

Figure 9. The score of students' independence to the indicator of self-control

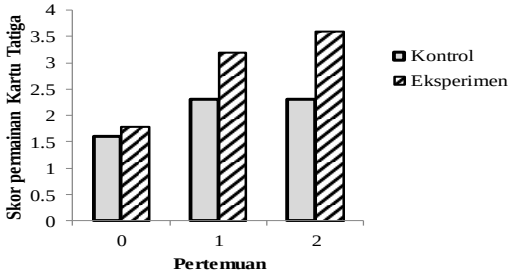

Figure 10. The score of students' independence to the indicator of accuracy in analyzing the materials

Based on the score of students' independence from 5 indicators, the indicator of analyzing the materials got the highest score. The scoring of this indicator is based on Figure 10, that the experiment class got better score than control class. Based on the score of students' independence in each meeting, students obtained low and relatively similar score. After the treatment in the first and second meeting, the class performed a significant improvement, while the control class did not show an improvement. The accuracy of analyzing the materials can be seen from the students after playing Tatiga cards. Since the cards are the source of information, the students in the experiment class seemed easy to arrange the card well. All of them participated well in discussion and playing of the card until it is finished.

It is different to control class, since students' involvement and cooperation is minimum, making them tend to have difficulty of determining the source of information. It caused students' independence in the indicator lesser than the experiment class.

The indicator of self-control obtained the lowest score comparing to other indicators. The indicator of self-control in Figure 9 was scored based on the procedures of learning process, the activity of Tatiga games, the ability to solve problems, and the ability to answer questions. Based on students' independence before and after the meeting, they got equal and relatively low score.

The first and second meeting after the treatment showed an improvement of independence to self-control, while the control class improved with less significant score. The self-control of the experiment class was seen from the ability to complete the card games, that students are able to solve problems correctly. Meanwhile, students are able to answer all questions in the discussion sheet, showing that they are serious to follow the learning. Since, the class actually has independent trait which is not dependent to teachers.

It is different to control class, since in grou discussion, not all students work together. Therefore, most of them cannot solve all tasks well. The high score of independence in all aspects shows that the treatment of this research can build students' independence. It involves students to be actively involved in discovering information and solving problems.

Besides problem solving, the use of Tatiga card can improve students' independence in finding information and answers of questions by playing Tatiga card with their group without significant support of their teacher. It is in accordance with Muhson (2005), that the use of problem solving can improve college students' active role and independence. By the existence of independence, students will easily understand the materials, since they build it themselves.

The result of students' cognitive result was also measured with test. Before the teaching process, there was a pretest done to students to know their initial status. The result of the pretest can be seen in Table 4.

Table 4. The pretest score of experiment and control class

Data	Class	Maximum Score	Minimum Score	Mean
Pretest Score	Experiment	65.00	45.00	57
	Control	70.00	45.00	54

Pretest was done to both classes before the treatment to measure their initial understanding. Table 4 shows that the students in the experiment class had higher average score than control class with the mean of 57 and 54 respectively. The last meeting included that provision of posttest to with multiple choice questions. The posttest score consisted of 20 items. The result of the posttest score of the control class (VII E) and experiment class (VII D) can be seen in Table 5.

Table 5. Posttest score of Experiment and Control Class.

No	Class	Highest Score	Lowest Score	Mean Score
1	Control	85	60	69.5
2	Experiment	90	60	76.6

The normality test of the posttest to both classes can be seen in Table 6.

Table 6. The normality test of students' posttest

Data	Class	x^2_{count}	x^2_{table}	Criteria
Posttest Score	Experiment	2.58	11.07	Normal
	Control	3.63	11.07	Normal

The normality of posttest data was counted and obtained the data in Table 6. The experiment class obtained the x^2_{count} of 2.58, while the x^2_{table} was 11.07; since, $x^2_{count} < x^2_{table}$ can conclude that the posttest score of the experiment class was normal. The score of x^2_{count} for the control class was 3.63 while the x^2_{table} was 11.07. Since $x^2_{count} < x^2_{table}$, it can be concluded that the control class also had normal distribution. The test used parametric statistics.

The improvement of students' learning outcome was measure after the use of problem solving and Tatiga using N-gain. The gain test obtained that students in control class were in low category of 0.28 while the experiment class were in the medium criteria of 0.48. It can be concluded that there is a significant difference where the average posttest score of experiment class was higher than the control class.

The result of students' cognitive test using problem solving and Tatiga was better than the control class which used slideshow. The result supported the research of Faqihi (2015) which states that students' success should not only rely on face-to-face meeting, but learning independence. The solving of problems make students think critically in all problems related to daily life events.

By the provision of a problem, it can make students do not only depend on teachers, but also find information for themselves to solve. Beside problem solving, there was also Tatiga game which made students more independent through finding information to solve problems themselves. They play the game which containes the material of animal tissue until it is completed. It can be said that the obtaining of information can help students in solving problems. The ability of students in the experiment class was better to control class influenced the students' cognitive results.

The high learning outcome is not only influenced by students' independence, but also other factors. The result of the learning in the experiment class was higher to control class was also related to higher motivation of students. From the analysis, the score of students' motivation was higher than the control class also showed that the learning motivation of the experiment class was higher than the control class. In the experiment class, the high motivation of learning also showed high cognitive results, since students which have high learning motivation must try and work seriously to solve problems.

In contrary, students who had low motivation, ignorance, hopeless, and not focused had difficulties in learning. The activity of solving problems are related to daily life problems which eases the students' cognitive understanding. The learning using Tatiga game also improve students' motivation that they had higher sporit to try and learn to solve problems.

The increasing score of students' independence and motivation assigned that the use of problem solving-based learning and Tatiga card can improve students' learning motivation. It is supported by Suhendri (2011), that the learning method of problem solving can stimulate students' learning motivation and independence. The improvement of students' learning motivation in the experiment class showed that there is an influence to students' cognitive result. This is the same to Hamdu (2011) that learning motivation influences students' learning achievement. Likewise, Arisca (2016) shows that there is a significant influence to students' independence at school to the subject of science. In Suhendri (2011), students who had high independence will get higher result than the low ones.

This research is also not separated from the obstacles during the learning process. The obstacles of the researcher were the time management. The minimum ability to allocate the time made the learning process less focus in the discussion. Later, it made all questions of discussion sheets were not explored by the students of the control class. Besides, the division of students into groups make the students not enjoying the learning process. Therefore, the process of discussion did not run smoothly.

In the initial meeting of experiment class, the students were given the rules of playing Tatiga card. Many students were confused to the rules of playing the card. However, in the next meeting, the students played it well with no questions.

CONCLUSION

Based on the research and analysis of data, it can be concluded that the model of problem solving with Tatiga card was effective to improve students' learning motivation and independence to VII graders of SMP Negeri 10 Magelang. It

was seen from students' score of independence and learning motivation. There was a significant difference to the experiment and control class.

Based on the result of the research, the proposed suggestion is problem solving with Tatiga card can be used as a reference for the subject of natural science to improve students' science motivation and independence along with being a reference to do other research using the respective model and medium.

REFERENCES

Estiani, W., A. Widiyatmoko & Sarwi. (2015). Pengembangan Media Permainan Kartu Uno Untuk Meningkatkan Pemahaman Konsep dan Karakter Siswa Kelas VIII Tema Optik. *Unnes Science Educational Journal*, 4(1): 711-719.

Faqihi, Budiyono,& D. R. S. Saputro**. (**2015). Eksperimentasi Model Pembelajaran *Problem Based Learning* (PBL) dan Kooperatif Tipe *Group Investigation* (GI) Pada Materi Peluang Ditinjau Dari Kemandirian Belajar Siswa. *Jurnal Elektronik Pembelajaran Matematika,* 3(10) 1048-1056 .

Halim, A., Yusrizal., Susanna, & Tarmizi. (2016). An Analysis Of Students' Skill In Applying The Problem Solving Strategy To The Physics Problem Settlement In Facing AEC As Global Competition. *Jurnal Pendidikan IPA Indonesia,* 5(1): 1-5.

Hamdu, G. & L. Agustina. 2011. Pengaruh Motivasi Belajar Siswa Terhadap Prestasi Belajar IPA Di Sekolah Dasar. *Jurnal Penelitian Pendidikan,* 12(1): 81-86.

Istifarini, R., S.H. Bintari, & N.K.T. Martuti. (2012). Pembelajaran Materi Virus Menggunakan Media Kartu Bergambar di SMA Negeri 2 Wonosobo. *Unnes Journal Biology Education,* 1(2): 25-31.

Karatas, I. & A. Baki. (2013). The Effect of Learning Environments Based on Problem Solving on Students' Achievements of Problem Solving. *International Electronic Journal of Elementary Education*, 5(3): 249-268.

Muhson, A. (2005). Penerapan Metode *Problem Solving* dalam Pembelajaran Statistika Lanjut. *Jurnal Ekonomi & Pendidikan,* 2(3): 84-99.

Nahdliyati, R. (2016). Efektivitas Pendekatan Saintifik Model Project Based Learning Tema Ekosistem untuk Menumbuhkan Kemandirian Belajar Siswa SMP. *Unnes Science Education Journal*, 5(2): 1213-1220.

Ningrum, M.N. & Parmin. (2015). Penggunaan Alat Peraga IPA *Integrated Board* dengan Perpaduan *Hands-on* dan *Minds-on* Pada Tema Cahaya dan Optik Untuk Siswa SMP. *Unnes Science Education Journal,* 4(1): 728-738.

Parmin., Sajidan., Ashadi., Sutikno., & Y. Maretta. (2016). Preparing Prospective Teachers in Integrated Science and Local Wisdom through Practicing Open Inquiry. *Journal of Turkish Science Education,* 13(2): 3-14

Rehman, A. & H. Kamal. (2013). The Impact Of Motivation On Learning Of Secondary School Students In Karachi: An Analytical Study. *Educational Research International,* 2(2): 139-147.

Sardiman. 2011. Interaksi dan Motivasi Belajar Mengajar. Jakarta: PT Raja Grafindo Persada.

Sugiyono. 2014. *Statistika untuk Penelitian.* Bandung: Alfabeta

Suhendri, H. & T. Mardalena. (2011). Pengaruh Metode Pembelajaran *Problem Solving* Terhadap Hasil Belajar Matematika Ditinjau dari Kemandirian Belajar. *Jurnal Formatif,* 3(2): 105-114.

Suparmi, A., Yulianto, & A. Widiyatmoko. (2013). Pengembangan Media Pembelajaran IPA Education Card Berbasis Sains-Edutainment Tema Energi Kelas VIII. *Unnes Science Education Journal,* 2(1): 196-202.

Taufiq, M., N.R. Dewi, & A. Widiyatmoko. (2014). Pengembangan Media Pembelajaran IPA Terpadu Berkarakter Peduli Lingkungan Tema "Konservasi" Berpendekatan *Science-Edutainment*. *Jurnal Pendidikan IPA Indonesia,* 3(2): 140-145.