

The Effect of Scientific Approach Applied on Scientific Literacy to Student Competency at Class VIII Junior High School 12 Padang

Rina Fitriani¹, Zulyusri², Syamsurizal³

¹Mahasiswa Magister Pendidikan Biologi FMIPA UNP

²Dosen Magister Pendidikan Biologi FMIPA UNP

³Dosen Magister Pendidikan Biologi FMIPA UNP

e-mail: rinafitriani275@yahoo.com



Abstract - Based on low students competent on biology topics, the teacher used one of learning approach suggested in Curriculum of 2013 as the scientific approach. However, the scientific approach applied on schooling at VIII class, but the students learning competence is still not optimal. It still below the standard value 75. The purposes of this study were to determine the effect of scientific approach applied on scientific literacy competency of student in science. This study was quasi experimental research; study population was student of class VIII Junior High School 12 Padang academic year 2017/2018. Sampling taken by randomize sampling technique and obtained class VIII.8 as experimental class and class VIII.3 as control class. Instruments were paper pencil test and observation sheets. Data analyses were t-test and Mann Whitney U test. There was a significant effect of scientific approach applied on scientific literacy competency of students' cognitive, affective, and psychomotor where it was better than the result of control. The cognitive competency score in experimental class was 83.03 with 31 students completed and 2 students incomplete the learning, while the control class was 78.64 with 25 students completed and 8 students incomplete. The affective competency score in experimental class was 81.88 in good category while in control class the score was 70.65 in moderate category. The psychomotor competency score in experimental class was 76.76 in good category while in control class the average score was 74.72 in moderate category.

Keywords - Effect, Scientific Approach; Scientific Literacy; Learning Competence.

I. INTRODUCTION

Curriculum of 2013 is developed from Curriculum of Unit Level Education and has been comply with curriculum dimensions which are plan and arrangement on objectives, content, and lesson materials and methods in learning activities. According to Alawiyah (2013), curriculum of 2013 focuses more on the learning process, which is an educational process that emphasizes personal experience through observing, questioning, reasoning, and trying to improve students' creativity, and the need to direct learning at priorities of attitude, knowledge, and skill.

Curriculum of 2013 uses scientific literacy. Scientific literacy is a key learning outcome in education for student. Therefore, scientific literacy is a basic need for a person to survive and compete in the era of globalization, while the

scientific approach is intended to provide understanding to students in knowing, understanding various materials using a scientific approach where information can come from anywhere, anytime, depending on teacher's information (Daryanto, 2014).

Scientific approach and scientific literacy will facilitate students in learning process, while scientific approach will require students to involve the skills of science process in constructing concepts, laws or principles, and to involve potential cognitive processes in stimulating intellectual development, and scientific literacy informs how to teach the content. Scientific literacy is important therefore the evaluation of various aspects related to scientific literacy continuous. The United Nation agency as Organization for Economic Cooperation and Development (OECD) has been implementing Program for International Student Assessment

(PISA). PISA is an international study to assess learning outcomes and skills on 15-year-olds student around the world. Student score in Indonesia on PISA 2009 based on OECD was 383 out of 501 and on PISA 2012 the score was 383 which were ranked 64 from 65 participant countries. This low score of Indonesian students' achievement is reflecting the learning achievement.

The fact that author obtained from field observation and interview on April 16th 2017 with biology teacher at SMPN 12 Padang showed that they used one of the suggested approaches in Curriculum of 2013 that is scientific approach. However, the application of scientific approach in schools especially class VIII IPA on student learning competence is still not optimal. This can be seen from student's score is still below standard value 75 (Table 1).

Table 1. The Results of Student Mid-Semester on class VIII Junior High School 12 Padang academic year 2017/2018.

Class	Total Student	Average Score of Semester I
VIII.1	34	58.03
VIII.2	34	70.70
VIII.3	33	64.33
VIII.4	34	61.19
VIII.5	34	59.77
VIII.6	35	49.43
VIII.7	35	53.18
VIII.8	33	64.24
Average		60.10

Data Source: Book of learning score for class VIII SMPN 12 Padang

Student's activity in group work and catechize is still low, where some students prefer to stay calm and less participation in group discussion, not expressing opinion and prefer to work alone so that student's learning competency is not reaching an optimal level. Students are still struggle to solve problems and when discussing few students can solve problems that are asked by teacher or from other students. Students are also afraid to ask questions and to express their opinions, fearing that the questions and opinions are wrong. Student's activity in learning process is needed in order to improve students' learning competence and cannot be separated from the role of teachers. Usman (2010) revealed that a teacher has a very important role in determining the quality and quantity of teaching that is carried out in the learning process.

Based on interviews on April 16th 2017 at Junior High School 12 Padang with some students, one of contributors on this problem was less preparation of students before learning process. The initial knowledge of students was scanty, because they were unwilling to read the subject matter at home and to look for other relevant sources to material to be learned in school. Lack of student's preparation and activeness in learning was resulting in poor learning outcome. Research on proficiency profile of students' scientific literacy through scientific learning has been done by Asyhari (2015) where result showed that scientific study can improve students' literacy skill on competency and knowledge aspects. This research is purposes to find out the effect of scientific approach based on scientific literacy on science learning competency for student at class VIII SMPN 12 Padang.

II. RESEARCH METHOD

The type of this study was quasi experimental research. Study design was used static group comparison: a number of subjects drawn from a particular population grouped into two groups, i.e. experimental and control groups (Table 3).

Table 3. Research Design

Sample Class	Treatment	Posttest
Experimental Class (A ₁)	X ₁	T
Control Class (A ₂)	Y	T

Information:

X1: The treated sample or learning class using a scientifically literacy science-based Approach

Y: learning using a scientific approach only

T: Final Testing

Data Analysis

Normality test

Normality test used in this study was Kolmogorov Smirnov test with statistic hypothesis as follows:

H0: the data follows a normal distribution

H1: the data does not follow normal distribution

In this study normality test was conducted by SPSS software. Testing criterion was accepted H0 if sig score > real level ($\alpha = 0.05$) and rejected H0 if otherwise.

Homogeneity Test

This test was conducted by Levene test with statistical hypothesis as follows.

$$H_0: \sigma_1^2 = \sigma_2^2$$

$$H_1: \sigma_1^2 \neq \sigma_2^2$$

In this study, homogeneity test of variance was conducted by SPSS software. Testing criterion was accepted H_0 if sig score $>$ real level ($\alpha = 0.05$) and rejected H_0 if otherwise.

Hypothesis Test

First Hypothesis Testing

The statistical test for the first hypothesis is t test. Testing criteria is if sig. score $>$ 0.05 then H_0 is accepted and H_1 is rejected, otherwise sig score $<$ 0.05 then H_1 is accepted and H_0 is rejected.

Second and Third Hypothesis Testing

The statistical test used for the second and third hypothesis is Man Whitney U test. The criterion of this hypothesis testing is that if the significance score obtained is greater than 0.05 then H_0 is accepted, and if the significance score obtained is less than 0.05 then H_1 is accepted.

In summary, the learning in experimental class follows these steps:

1. Introduction

Teacher explains learning objectives and divides students into groups, distributes student worksheet and teacher explains general concept of learning materials.

2. Core activities

Observing

- a. Divide students into 5 groups.
- b. Convey information about activities to be performed

Asking question

- c. Based on data obtained from Observing the organs in plants, each student is given the opportunity to ask question that they want to be answered.

Trying

- d. Students do activities in group
- e. Students discuss to fill control graphic of paired-thinking. Learning activities are thinking about an important question or issue, working in pairs, and sharing the discussion results (Scientific literacy).

Reasoning

- f. Students analyze the observation and formulate conclusions that resulting in

Trying

- g. Students discuss to fill control graphic of initial knowledge activation. Learning activities are exploring initial knowledge to understand nonfiction texts (Literacy Science)

Communicating

- h. Presenting conclusions in group discussions

3. Closing activities

Each one of group member is asked to present the results. Teacher clarifies and gives reinforcement to the answers that raised by students and finally teacher guides the students to conclude the subject matter.

III. STUDY FINDING

1. Description of Cognitive Data

Data of cognitive competency in this study was obtained through the final written test with multiple choice questions that given to experimental class and control class at the end of learning process meeting. Data of student's cognitive learning competence was presented in Table 4.

Table 4. Normality and Homogeneity Test on Experimental and Control Classes in Cognitive

Num	Parameter	Treatment		Explanation
		Experi mental	Control	
1.	Average	83.03	78.64	Experimenta l $>$ Control
2.	Total Student	33	33	-
3.	Normality Test (P)	0.065	0.089	Normal
4.	Homogeneit y test	0.687		Homogeny

Based on Table 4 it can be seen that the average learning competence of students in experimental class is higher than control class where the average score of experimental class is 83.03 and control class is 78.64. The highest score in experimental class is 91.67 while in control class is 93.33. The lowest score in experimental class is 71.67 while in control class is 60.00. In normality test, the two sample classes are normally distributed, and for the homogeneity test both sample classes are homogeneous.

From study data, it is found out that in experimental class student who complete biology learning is 93.94% and student incomplete is 6.06% or from 33 students, 31 students complete biology learning and 2 students incomplete the learning. In control class student who complete biology learning is 75.76% and student incomplete is 24.24% or from 33 students, 25 students complete biological learning and 8 students incomplete the learning.

2. Description of Affective Data

Study data on affective aspect was obtained through observations made by biology and author friends as

observers by using affective assessment of students form during learning process. Data analysis on affective aspect was conducted by nonparametric test which was Mann Whitney U. Study data of affective competence was presented in Table 5.

Table 5. Average Score, Maximum Score, and Minimal Score of Affective Competency in Experimental Class and Control Class.

Class	N	Average	X _{max}	X _{min}
Experimental	33	81.88	89.00	75.00
Control	33	70.65	83.50	63.00

Based on Table 5 it can be seen the total score of affective aspect of students assessed by observation sheet by observer where average score in experimental class using scientific-literacy approach is higher than control class with scientific approach only.

The highest score of affective aspect in experimental class is 91.67, while in control class is 88.33. The lowest grade of affective aspect in experimental class is 65.00, while in control class is 52.50.

3. Description of Psychomotor Data

Psychomotor data was obtained through observation after the learning process. Psychomotor data was divided into several parts where final score was the average score. The observations were performed by a biology teacher and a friend as observer using psychomotor student appraisal form (Table 6).

Table 6. The Scores of Psychomotor Competency in Experimental and Control Classes.

Class	N	Average	X _{max}	X _{min}
Experimental	33	76.76	84.17	71.67
Control	33	74.72	82.50	70.00

Based on Table 6, it can be seen that the average score in experimental class using scientific-literacy approach is higher than average score in control class with scientific approach only. The highest score of psychomotor aspect in experimental class is 84.17; in control class is 82.50. The lowest score of psychomotor aspect in experimental class is 71.67, while the control class is 70.00.

4. Analysis Requirement

Requirement test of analysis was performed before hypothesis testing. The first test was normality test by Kolmogorov Smirnov and homogeneity test of variance by Levene test. If data is normally distributed and

homogeneous then the hypothesis testing was performed by t test.

Normality test on cognitive competence score was performed on the average score of basic competency test [3.4] and basic competency [3.5] of experimental class and control class, while for affective and psychomotor competences it was performed on average observation score during six times meeting. Normality test was conducted by Kolmogorov Smirnov test with SPSS software. The test criterion is H_0 accepted if $\text{sig} > \text{level}$ ($\alpha = 0.05$). The full details can be seen in Appendix 25 Page 260. The results of this normality test can be seen in Table 7.

Table 7. Normality Test Results on Student's Cognitive Competency Aspect

Class	Student's Cognitive Competency	
Experimental	Sig	Explanation
Control	0.065	Normal
	0.089	Normal

a. Homogeneity of Variance Test

Homogeneity test on final test score of basic competence for experimental and control class was used Levene test with SPSS software. Testing criteria is H_0 accepted if $\text{sig} > \text{level}$ ($\alpha = 0.05$) and H_0 is rejected otherwise (Table 8).

Table 8. Homogeneity Test Results on Student Learning Competence

Class	Student's Cognitive Competency	
Experimental	Sig	Explanation
Control	0.687	Homogen Variance
Class		

Based on Table 8 shows that learning competence of students in cognitive aspect has sig 0.687 so it can be concluded that data is homogeneous.

5. Hypothesis Testing

Table 9. Hypothesis Calculation Result

Hypothesis	Class	Sig	A	Conclusion
First Hypothesis	Experimental	0.000	0.05	H_0 rejected
	Control			
Second Hypothesis	Experimental	0.000	0.05	H_0 rejected
	Control			
Third Hypothesis	Experimental	0.020	0.05	H_0 rejected
	Control			

a. First Hypothesis

This hypothesis test is performed to find out cognitive competency of students who follow biology class with scientific-literacy approach where it gives a better result than student's cognitive competency by scientific approach only. Because of data is normally distributed and has homogeneous variance hypothesis test is by t test. The results of this hypothesis test calculation can be seen in Table 9.

Calculation result in Table 8 shows that students' cognitive learning competency has Sig score of 0.000 with level of confidence ($\alpha = 0.05$). This means that score of Sig < 0.05 then H_0 is rejected. Thus it can be concluded that there is a significant effect of scientific-literacy approach to cognitive competency of students in experimental class.

b. Second Hypothesis

Hypothesis test is used to determine affective competency of students who study with scientific-literacy learning approach where it gives better result than class with scientific approach only.

Data of affective competency has characteristic that is the result does not has fraction number (nominal data), then directly analyzed using non parametric statistic test that is Mann Whitney U test. The result showed sig. < 0.05 (i.e. 0.000). Thus, it can be concluded that there is a significant effect of scientific-literacy approach to affective learning competence of students and student's affective learning competence who study with scientific-literacy learning approach where it gives better result than class with scientific approach only.

c. Third Hypothesis

This hypothesis test is used to find out psychomotor competency of students study with scientific-literacy learning approach where it gives better result than class with scientific approach only.

Similar to second hypothesis, data of psychomotor competency has characteristic that is the result does not nominal data, then directly analyzed using non parametric statistic test that is Mann Whitney U test. The result shows calculation result where sig. < 0.05 (i.e. 0.020). Thus, it can be concluded that there is a significant effect of scientific-literacy approach to psychomotor learning competence of students and student's affective learning competence who study with scientific-literacy learning approach where it gives better result than class with scientific approach only.

IV. DISCUSSION

1. Achievement of Learning Competency in Cognitive Aspect

Study results show that cognitive learning competence of students can be increased using scientific-literacy approach in the form of group discussion. Scientific approach based on scientific literacy can give effect to cognitive competency of students, in which it is obtained the average learning outcome score of experimental class is 83.03 and control class is 78.64. From these scores, it is appear that the score of both sample classes is different.

Based on data analysis, experimental class that applying scientific-literacy approach has higher score than control class that using scientific approach only, because scientific approach will facilitate students in learning process where it require students to use their skills of scientific process in constructing concepts, laws or principles, and to use potential cognitive processes in stimulating intellectual development, particularly high-order thinking and scientific literacy demands student to teach the content. According to Asyhari (2015) study finding on scientific literacy approach can improve students' literacy skills in aspect of knowledge.

The learning process of scientific-literacy approach is supported by student's sheet which is one of the self-administered exercises that can be used to attract students to be more critical and understand the concept. In student's sheet of experimental class, it is given to each student in the form of group discussion; student's sheet is used in accordance with scientific-literacy approach by using scientific literacy instruments.

In the student's sheet of control class, it is using student's sheet scientific approach. Student's sheet used by experimental class contains authentic issue and question related to learning materials and facilitates students in group discussions and cooperation with each group, and makes students more active in learning.

Scientific-literacy approach can enable students to actively observe, ask, organize graphic, activate initial knowledge, collect information, analyze data, organize paired-sharing graphic, and communicate. In observing stage, students can cultivate curiosity, and it is very significant, because student can find fact that there is a relationship between object observed with learning materials. In addition, observing activity is the process of sensing process. According to Rochintaniawati (2014), students can build a conceptual understanding of what is seen and experienced. Direct observation and experience

enable students to construct meaningful understanding, sensual, physical, and intellectual learning as an active learning process.

The next stage, students are asking question related to the observation. Questioning activities can improve the ability to formulate question to form critical thinking. Critical thinking is intended to get student become more capable to think about the main issues to be formulated in order to obtain additional information about what is observed. In addition, questioning can develop the creativity and curiosity of students. According to Fauziah study (2016), questioning activity stimulates the critical thinking ability of students. In the other hand, Kenengsih study (2013), this activity can develop a scientific way of thinking, develop creativity in solving problems.

The third activity in scientific-based scientific literacy approach is to collect information. The stage of collecting information requires students to provide temporary answers to problem formulation. In addition to initial knowledge, in collecting information student also uses references from material available on student books, internet or textbooks to gather information. This activity can also sharpen high-level thinking skills, respect opinions of others and sharpen the skills of students' learning process. According to Sani (2014), the information gathering can sharpen the skills of science process and it supported by Kenengsih (2013), that gathering information can sharpen the high-order thinking skills of students in the learning process. The fourth activity on the scientific approach is to analyze data. Analyzing data is to determine a temporary answer that is deemed to be received in accordance with data or information obtained on the basis of data collection.

Analyzing data also means developing rational thinking skills. That is, the true answer not only based on the argument, but must be supported by data that found and can be justified. In this activity, students are collecting data through experimental activities with work procedures that have been given to prove the hypothesis. According to Sani (2014), data analysis activities include the process of collecting data and digging information from various sources, so it can improve the science skills of students.

The fifth activity of scientific literacy approach is communicating. At this stage students should be able to make the relationship between experimental data, data analysis and hypotheses that have been made. Most students have been able to draw conclusions from the experiment. Drawing conclusions is a process of describing the findings that obtained based on results of hypothesis testing.

According to Maasawet (2011), an important stage of communicating is linking various guides and facts with the knowledge that already possessed to make a prediction of the final result, as Daryanto (2014), communicating activities can develop systematic thinking skills, express opinions briefly and clearly, and develop good and correct language skills, supported by Kenengsih study (2013), communicating activities can increase students' thinking ability.

Scientific-literacy approach can improve students' cognitive competence ability, as the scientific approach guides students to solve complex problems through ideas, performs data collection activities carefully, meticulous data analysis to generate conclusions in conceptualizing knowledge, so that scientific approach can increase students' learning outcomes. Science learning competence of students at class VIII.8 Junior High School 12 Padang in cognitive aspect that had been given the final test, from average score of 83.03 in experimental class and in control class 78.64, showed that the application of scientific-literacy approach given better score to cognitive competence in science learning than score from control class that applied scientific approach only. This proves that there are differences in student's biology competency who are taught with scientific literacy approach and students who are taught by scientific approach only. Which are students who are taught by using scientific-literacy approach can improve the cognitive competence compared to scientific approach only.

The better score in experimental class compared to control class is due to the treatment given to the two sample classes, which is requires active students in learning process. Riyanto (2010) explains that the scientific approach in learning plays an active role in constructing student ability through active involvement in learning process, in accordance with the constructivist view that ability is built into one's thinking.

Lower cognitive competence in control class is also caused by students have a problem to understand the material that conveyed by teacher, students are less involved in learning process so that biology learning is boring because in learning process students only listen to teacher all the time. Dian and Dwi (2015) explain that knowledge will be more abstract if the message is only delivered through verbal words. As the result, students only understand knowledge in the form of a word without understanding the meaning contained in it. Difference in average scores and difference between the highest and lowest score obtained in two sample classes can be a

reference that learning with scientific-literacy approach can improve student's competency on knowledge aspect because problem solving is a good technique to better understands the content of the lesson.

2. Achievement of Learning Competence in Affective Aspect

Observation result that conducted by observer on student's affective competency found that student's affective competency in experimental class is significantly better than student's affective competence in control class. Student's affective competency in experimental class as a whole is in good criteria. Students in experimental class mostly are willing to listen to the teacher's explanation seriously, perform the individual task well, not cheating, cooperate in group discussions properly, be responsible for group assignments provided by the teacher, confident to present discussion result in front of the class, ask or answer questions and responding to other friends who argue and not mutually imputing friends, and active in proposing opinions based on appropriate arguments. Student's affective competence in control class overall is in moderate criteria. Most students take the opportunity that available to perform but lack interest to read, so when teacher instruct them to ask or answer questions, students confused, scared, unconfident, students choose silent or reasoned students already understand what has been explained by the teacher, when the teacher asked questions, or silent.

Scientific-literacy approach can build teamwork and social skills. Students are expected to understand their role in the group, accept the views of others, give comprehension even for people who may not enjoy the study. It shows that the application of scientific-literacy approach can maximize the affective competence of students. Scientific approach provide different atmosphere in learning process, because it requires each student to be responsible, demanding the student to think critically in response to every statement that related to the learning process so that students are required to ask and give feedback from each friend's opinion. According to Nurtanto (2015), character education creates habituation properly, so students become aware what is right and wrong (cognitive), capable to feel (affective) good score and able to do it (psychomotor) ". Scientific-literacy approach can improve skills and attitudes of students.

Increased affective competence is due to the learning process using a scientific approach so that students are accustomed to behave in accordance with the attitude of scientists that is honest, discipline, responsibility, meticulous, cooperate, creative in learning process

activities. Learning with a scientific approach brings students directly involved in the learning process. So the scientific approach can increased the affective competency of students in the learning process activities to be better. Based on Shadiq (2006), attitude refers to the tendency of a person to the response that associated with the likes or dislikes of a given object. This is supported by Edward and Loveridge (2011), scientific approach can improve the attitude of scientists in the learning process, and supported by Daryanto (2014) opinion that the scientific approach can develop meticulous attitude, systematic thinking, analytical thinking, and responsible. According to Fauziah (2016), the scientific approach can sharpen scientific attitude, so it increase student's affective. Based on the explanation, it can be concluded that the affective competence of students that follow scientific-literacy approach classroom is better than students' affective competence in only-scientific approach classroom.

3. Achievement of Learning Competence in Psychomotor

The result of observation on student's psychomotor competence that conducted by observer obtained data where psychomotor competence of student 'sin experimental class is significantly better than psychomotor competence in control class. Student's psychomotor competency in experimental class as a whole is in good criteria.

Psychomotor competency of student in control class as a whole is in moderate criteria. It shows that the application of scientific-literacy approach can maximize psychomotor competence of students in learning process because it can motivated students during learning process and increase student's curiosity so that students are interested to conduct direct investigation. The scientific approach can also stimulate students to be active, because it provides students directly to experimental, and cooperate.

Psychomotor competence cannot be separated from the cognitive and affective competence that obtained after application of scientific approach. Wahyuningsih, et al., (2011), reveals that the psychomotor learning outcomes relate to skill or ability to act after students receive a particular learning experience. This is an advanced stage of affective learning. Scientific approach can facilitate students to conducting an investigation which is a continuation of results verification in problem solving. So that student will gain direct experience from the learning that increases the students' learning competence in psychomotor aspect.

The relationship between knowledge and practice is inseparable; students are actively working in accordance to

the tasks and authentic activities, focus on constructing knowledge and apply it in skill. In accordance with study finding by Nurtanto and Sofyan (2015), scientific approach facilitates students to do inquiry, the relationship between theory and practice in the environment seems to work actively in accordance with authentic tasks and activities. The focus is to construct knowledge and apply it in skills.

V. CONCLUSION

Based on study finding, it can be concluded as follows.

1. There is a significant effect on the application of scientific-literacy approach in improving student's biology learning competencies in cognitive aspect and student's cognitive competence on biology learning with scientific-based science-literacy approach is significantly better than cognitive competence of students in classroom with scientific approach only.
2. There is a significant effect on the application of scientific-literacy approach in improving student's biology learning competencies in affective aspect and student's affective competence on biology learning with scientific-based science-literacy approach is significantly better than cognitive competence of students in classroom with scientific approach only.
3. There is a significant effect on the application of scientific-literacy approach in improving student's biology learning competencies in psychomotor aspect and student's psychomotor competence on biology learning with scientific-based science-literacy approach is significantly better than cognitive competence of students in classroom with scientific approach only.

REFERENCES

- [1] Alawiyah, F. 2013. "Dampak Implementasi Kurikulum 2013 terhadap Guru". *InfoSingkat*, 5 (19): 9-12.
- [2] Asyhari, A. 2015. Profil Peningkatan kemaampuan Literasi Sains siswa melalui pembelajaran saintifik. Vol 4, No 2 (2015).
- [3] Dahar, R.W. 1996. Teori-Teori Belajar, Jakarta: Erlangga.
- [4] Daryanto. 2013. *Pendekatan Pembelajaran Saintifik Kurikulum 2013*. Jakarta: Gava Media.
- [5] DwiAristya Putra, Pramudya dan Sudarti. 2015. "Pengembangan Sistem E-Learning untuk Meningkatkan Keterampilan Berpikir Kritis Mahasiswa Pendidikan Fisika". *Jurnal Fisika Indonesia*, 55 (19): 45-48.
- [6] Edwards, K dan Loveridge, J. 2011. "Looking Into Early Childhood Teacher Support Of Children's Scientific Learning". *Jurnal Victoria Universitas Australia of Early Childhood*.
- [7] Fauziah, N. 2016. "Pengembangan Penuntun Praktikum Biologi Umum Berbasis Pendekatan Saintifik Untuk Mahasiswa". *Tesis* tidak diterbitkan. Padang: Program Pascasarjana UNP.
- [8] Fauziah. R., Abdullah. A.G. dan Hakim. D.L. 2013. "Pembelajaran Saintifik Elektronika Dasar Berorientasi Pembelajaran Berbasis Masalah". *Jurnal Innotec*. 9(2): 165-178.
- [9] Hosnan, M. 2014. *Pendekatan Saintifik dan Kontekstual Dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia.
- [10] Kenengsih, S. 2013. "Pengembangan Penuntun Praktikum Mikrobiologi Berorientasi Inkuiri Terbimbing Untuk Mahasiswa STKIP PGRI Sumbar Padang". *Tesis* tidak diterbitkan. Padang: Program Pascasarjana UNP.
- [11] Maasawet, T. 2011. "Meningkatkan Kemampuan Kerjasama Belajar Biologi Melalui Penerapan Strategi Inkuiri Terbimbing Pada Siswa Kelas VII Negeri VI Kota Samarinda Tahun Pelajaran 2010/2011". *Jurnal Bioedukasi* 2 (1). Kalimantan Timur FKIP Universitas Mulawarman.
- [12] Marjan, J. 2014. "Pengaruh Pembelajaran Pendekatan Saintifik Terhadap Hasil Belajar Biologi dan Keterampilan Proses Sains Siswa MA Mu'allimat NW Pancor Selong Kabupaten Lombok Timur Nusa Tenggara Barat". *Jurnal Program Studi IPA* (4).
- [13] Masratika. 2016. "Pengembangan LKS Berbasis Pendekatan Saintifik Pada Standar Kompetensi Memahami Berbagai Sistem Pada Manusia Untuk SMP Kelas VIII". *Tesis* tidak diterbitkan. Padang: Program Pascasarjana UNP.
- [14] Muchtar, S. 2004. *Pengembangan Berpikir dan Nilai dalam Pendidikan*. Bandung: Gelar Pustaka Mandiri.
- [15] Nurtanto, Muhammad dan Herminarto Sofyan. 2015. "Implementasi Problem-Based Learning Untuk Meningkatkan Hasil Belajar Kognitif, Psikomotor, Dan Efektif Siswa Di SMK". *Jurnal Pendidikan Vokasi*, 5 (3): 352-364.
- [16] 2013. *Pengembangan dan Implementasi Kurikulum 2013*. Bandung: PT Remaja Rosdakarya.
- [17] Rochintaniawati, D. 2014. "Pembelajaran IPA dengan Menggunakan Pendekatan Saintifik dala Kurikulum 2013". *Jurnal Prosiding Seminar Nasional Pendidikan MIPA 2014 ISBN 978-602-19877-2-8*.

- [18] Sani, R.A. 2014. *Pembelajaran Saintifik Untuk Implementasi Kurikulum 2013*. Jakarta: Bumi Aksara.
- [19] Shadiq, F. 2006. *Cara Guru Memanfaatkan Faktor Sikap dalam Pembelajaran Matematika*. (online) (https://fadjarp3gfiles.wordpress.com/2008/12/8afektiflimas_pdf diakses 10 Desember 2016).
- [20] Silberman, M. L. 1996. *Active learning: 101 Strategies to Teach any Subject*. Massachusetts: Alyn & Bacon.
- [21] Usman M. U. 2010. *Menjadi Guru Profesional*. Bandung: Rosdakarya
- [22] Wahyuningsih, Danik, Harlita, dan Joko Ariyanto. 2011. "Pengaruh Strategi Pembelajaran Aktif Mind Maps Terhadap Hasil Belajar Biologi Siswa Kelas XI IPA SMA Negeri 2 Karanganyar". *Jurnal Pendidikan Biologi*, 3 (2): 1-8.