

# *Need Analysis to Develop of Biology Practical Guide Based on Science Process Skills for Student of Senior High School Grade XI*

Rima Sylvia

Student of Master Degree Program of Biology Education, Universitas Negeri Padang  
Jl. Prof. Dr. Hamka Air Tawar Barat Padang - 25131, Indonesia

[rimasyvia@gmail.com](mailto:rimasyvia@gmail.com)

Azwir Anhar

Lecturer of Biology Department, Universitas Negeri Padang  
Jl. Prof. Dr. Hamka Air Tawar Barat Padang - 25131, Indonesia

Ramadhan Sumarmin

Lecturer of Biology Department, Universitas Negeri Padang  
Jl. Prof. Dr. Hamka Air Tawar Barat Padang - 25131, Indonesia

[ramadhan\\_unp@yahoo.com](mailto:ramadhan_unp@yahoo.com)



**Abstract** - Application of Curriculum 2013 aims to improve students' mindset through learning. Biology learning involves three dimensions as scientific attitude, process and product. In fact, biology learning tends to pay more attention at product than scientific process. Biology learning should take into account at scientific process, in which the students should be able to build their own knowledge actively through series of activities of meaningful learning process. One of way to achieve scientific process is by applying Science Process Skills (SPS) as the students' SPS can be increased during learning. Learning process would never separate from teaching material; one of them is practical guide. Thus, the researcher did descriptive research to see the need to develop of biology practical guide based SPS for students of Senior High School. From the analysis of data that has been done can be expressed the results of this preliminary research are: First, the practical guidance used in the school is still in the form of student worksheet, text books, or worksheet separate activities that their validity, practicality, and effectiveness are not being examined yet. Second, the practical guide used in the school does not apply a certain learning approach as students' SPS don't developed maximally. Third, learning takes more priority product s rather than the s of the science process. Fourth, students' competence of in developing SPS in learning has not been trained. Fifth, practical guide does not appropriate with the contents standard in the Curriculum 2013 and sixth, the biological practical guide based SPS is not available yet.

**Keywords** - needs analysis; development; practical guides; biology learning; science process skills; students

## I. INTRODUCTION

The problem of education in Indonesia is poor quality of education. It can be seen in The Learning Curve Pearson 2014 data that examine the world education rankings. It released the quality of education rankings worldwide, and Indonesia is in the last position of 40 countries recorded. It shows that education in Indonesia doesn't show satisfactory

results. The government has actually been realized poor quality of education in Indonesia as the government has tried to make various efforts to improve the quality of education. Some of them are by improving the curriculum. The curriculum changes should be a material improvement to achieve the goal of learning in shaping the character and

civilization of a dignified nation in order to educate the nation through the learning process.

Learning is essentially a process of achieving competence through targeted and systematic learning activities. Biology learning involves three s; there are the s of scientific attitude (*scientific attitude*) such as high curiosity, critical, creative, honest, loving environment, admitting the nature is the creation of Almighty God. The second is a scientific process (*scientific process*) that deals with problem-solving procedures with scientific methods such as problem identification, organizing hypotheses, analyzing data, making conclusions. The third is biology dimension as a product (*scientific product*) in the form of factual, procedural and conceptual knowledge (Poedjiadi, 2007).

Biology learning should be more emphasis on process, where students are active during learning to build their knowledge through a series of activities so that learning is more meaningful for them. Biology provides a variety of learning experiences to understand the concepts and processes of science. Learning activities that develop skills process are important to be involved so that students can understand the biology as a whole.

The fact that is found is that biology learning prefers product rather than process. Biology learning still emphasizes what competencies are known in science, but it does not explain how to know the competencies (Ali & Suastra & Sudiatmika, 2013). It shows that biology is still considered as a product, which is a collection of concepts that must be memorized by students. Biology learning should have been more meaningful if students know the details of the biology through the process, because through the process, students are required to be more creative and reasoning so that biology is not only memorization, but more prioritize on the process.

The process of science in biology learning can be developed through the application of the Science Process Skills (SPS). SPS is a skill directing students to be able to investigate the environment to construct a concept of science. SPS can be used to enhance scientific creativity and academic achievement. Students who are given SPS based learning are more successful than students who are given conventional learning (Aktamis & Ergin, 2008). These results indicate that giving SPS training improves the students' academic achievement. It also shows similar results that there is an improvement of student achievement at the end of the SPS training on practical activity in the

laboratory. In addition to improving academic achievement, SPS can be used to enhance students' scientific creativity.

Skill development can be applied with SPS due to several reasons. The first reason is the development of science progresses faster, so the teacher is no longer possible to teach all the facts and concepts to students. The second reason, according to psychologists that students easily understand the concepts are complex and abstract if it goes along by reasonable examples based with the situation and conditions they face in the way of self-practice. The third reason, the invention of science is not absolute but relative. A theory may be denied and rejected once people have gained new data that able of proving the theory's fallacy. Therefore, there is a new theory whose contains relative truth principally. The fourth reason is that learning should not only develop concepts and attitudes, but also develop process skills.

Process skills development can be developed through many skills. Dimiyati and Mudjiono (2013) suggest that SPS can be classified into two: basic science process skills and integrated science process skills. SPS also consists of basic SPS (basic skills) and integrated SPS (integrated skill) (Aziz & Ahmad, 2010). Over the last few decades, science educators have focused on basic SPS and integrated SPS. SPS is crucial for meaningful learning, as learning will continue throughout life, and students need to seek, interpret and assess evidence in the various conditions they face, and therefore giving SPS in educational institutions is very important to the future of students. If the skill is not sufficiently developed, the student cannot interpret the knowledge, for example if the relevant evidence is not collected, then the concept that has been obtained will not help the student to understand the event, therefore skills development is needed through the steps of SPS (Karamustafaoglu, 2011)

Basic science process skills include activities of observing, classifying, communicating, measuring, predicting, and concluding, while integrated science process skills include the activities of recognizing variables, creating data tables, graphs, describing inter-variable relationships, collecting and processing data, analyzing research, compiling hypotheses, defining variables, designing research, and experimenting. SPS students can be developed through a variety of ways, one of which is through teaching materials.

Teaching materials are important thing in the learning process, through teaching materials, SPS students are

expected to be improved. SPS training can also be involved with the development of teaching materials. The development of instructional materials is particularly important for directing students to develop their SPS. By having the instructional material, students would have big chance in developing their skills (Permanasari, Hamidah, & Widodo, 2013). One of instructional material is practical guide.

Practical guide is an orientation of practical implementation that contains ways of preparation, data analysis implementation and report of practical activity which have been done. Zulyetti (2012) states that practical guide aims for helping and guide students to work continuously and targeted.

Based on the background of the problem that has been discussed, it can be concluded that preliminary research (*preliminary research*) to develop biological practical guide SPS based is needed to be done. The purpose of this research is to describe the characterization of practical guide which needed by teacher and students as a tools in learning, describing the appropriateness content skill (KI) and basic skill (KD) on the biology learning grade XI odd semester with curriculum 2013, describing concepts needed and make it as reference in developing practical guide, and describing the characterization of students who are product user target that has been developed.

## II. RESEARCH METHOD

This research use descriptive research. Descriptive research is a kind of method to describe and interpret the object as real. Several steps acquired as follows:

### 1. Problem and Need Analysis

In this phase collecting information about the problem in biology learning process and defining characterization practical guide needed by teacher and student as a tool for helping in learning process. Collecting information is through interviewing the teacher and student by using interview guide sheets. Besides, it is also important for substituting the questioner. The result of problem and need analysis can be used for consideration material in planning and developing the product for biology practical guide.

### 2. Curriculum Analysis

Curriculum analysis is activity through reading and understanding content skill (KI) and basic skill (KD) on the biology learning odd semester grade XI and its

appropriateness with curriculum 2013. This analysis aims to get achievement indicator that suitable to the learning purpose with the result of getting any material involve practical activity in learning process.

### 3. Concept Analysis

Concept analysis aims to identifying, featuring, and organizing concepts needed systematically and make them as reference in developing practical guide. The activities in this phase involve deciding practical activity and practical guide material, communicating the problem, formulating problem in every practical activity needed in developing biology practical guide based SPS. Material and practical activity create based on the learning purpose that has been formulating. Analysis result of this concept used as reference in developing product of biology practical guide.

### 4. Student Analysis

Student analysis aims for studying students' characterization that is the target of product user that has been developed. Activities in this phase is interviewing biology teacher of SMAN 1 Batusangkar and SMAN 2 Batusangkar. The analysis includes academic ability (knowledge, attitude, and skill), and the motivation toward practical so the practical guide obtained will be appropriate to students characterization.

Data collected through the proper instrument is being analyzed by using particular analysis technique. Technique analysis used in this research is descriptive statistical analysis. Descriptive statistical are statistical for describing or giving an illustration to the examined object through sample data or population. Descriptive statistic can be done without doing an analysis and making a conclusion that can be valid for general. There is several data providing in descriptive statistic that can be used like table and graphic (Sugiyono, 2014)

## III. RESULT AND DISCUSSION

### 1. Analysis Problem and Need

Based on the interview result on April 29<sup>th</sup> 2017 with biology teacher of SMAN 1 Batusangkar, Ms. Yosi Lolita, M.Si, it is known that practical guide used by student is LKS which is the combination of worksheet for material teaching and practical activity, guide includes separated sheets that teacher takes from internet or practical guide book which still apply curriculum of KTSP/ School Based Curriculum, meanwhile SMAN 1 Batusangkar has been

applied curriculum 2013. It shows inappropriateness between the curriculums with practical guide used. Teacher doesn't use sufficient practical guide. (Particular guide that their validity, practicality, and effectiveness have already being examined).

Based on interview 29<sup>th</sup> of April 2017 with biology teacher of SMAN 2 Batusangkar, Ms. Desi Rozetta, S.Pd. that curriculum guide used by student is practical guide from the package and LKS book. Teacher doesn't use sufficient practical guide yet (Particular guide their validity, practicality, and effectiveness have already being examined).

Interview result with 15 students on 18<sup>th</sup> Of July 2017 SMAN 1 Batusangkar, based on distributed practical analysis questioner, show that 87 % student answer that they don't have particular guide in doing biology practical. Beside, 80 % student states that practical able to train all aspect of students' basic SPS / basic science process skill, but student SPS integrated/ integrated process skill still doesn't develop optimally by using practical guide. Interview result with 15 students of SMAN 2 Batusangkar on 18<sup>th</sup> of July 2017 shows that 100 % students answer that they don't have particular guide in biology practical.

Biology practical guide used in the school doesn't fulfill demanding of KI and KD on curriculum 2013, beside practical guide used in school still in form of LKS, package book and separate practical activity sheets that have not been tasted validity, practicality and affectivity. The other fact found that biology practical guide doesn't much develop science process of students. Practical guide used by school doesn't apply such particular learning approach that able to increase students' motivation and skills so student's SPS do not develop maximally. Process can be trained to the student using the aspects in SPS. That is why, researcher develop biology practical guide based SPS. Through biology practical guide based SPS, student able to train their skills so science process achieved. SPS is a tool used to gain scientific information (product), to do scientific activities (process) and also to finish any scientific problem (attitude) (Aktamis&Ergin, 2008). The statement shows that biology practical guide based SPS that would be developed can be solution from students' problem in biology learning.

Based on the analysis, then the problem may come are biology practical guide doesn't sufficient to the KI and KD on curriculum 2013/ school based curriculum demanding, also biology learning take more attention on product s than science process so it needs teaching material that guaranty

for achieving students' process s should be developed. One of teaching material is biology practical guide based SPS.

## 2. Curriculum Analysis

This analysis shows achievement indicator that appropriate with the purpose of learning as material involve practical activities in learning achieved. Practical activities include observing animal cell, and plant cell structure, observing the event of diffuse and osmosis, observing the event of plasmolysis and deplasmolysis, observing plant tissue preparat, animal tissue preparat, observing the frog's calf muscle tissue, observing the blood stem on tadpole, observing erythrocyte cell structure, and examine blood type.

This analysis result at appropriate achievement indicator with the learning purpose so material involves practical activities in learning achieved. Practical skill is science process skill. Practical determine as thing that never separate from curriculum. Science process skill is cognitive and psychomotor skill used in solving problem. Through the practical, process skill in identifying a problem, objective investigation, data collecting, and practical work would be trained and scoring separately. (Akinbobola&Afolabi,2010).

In this research, knowledge skill obtained from test after practical activity is done by giving test questions to students and score obtained are used to define the sufficient criteria with the own score. SPS support students to think, asses, investigate, evaluate, and skill in solving problem and creative (Ozgelen, 2012).

## 3. Concept Analysis

This analysis indicate sufficient achievement indicator with the learning purpose so material involve practical activities in learning achieved such as Cell, Membrane Transport, Plant Tissue, Animal Tissue, Movement System, and Circulation System.

Concept analysis is main concepts identification on material of biology grade XI odd semester. Researcher organizes main concept that will be taught systematically and ordering the material and lesson concepts material so it is understood by the students. After identifying concept on the material, formulating learning purpose that referee to learning indicator that suitable to the curriculum 2013 should be done.

The most important of science purpose is increasing students understanding about concept science. Science

concept is identified as scientific data, scientific attitude and information collecting. The most important from concept science is ways of collecting an information and scientific method phases. Ways to collect scientific data and scientific phase is technical process. Thus, students should have skills include SPS. The best way to measure students' SPS is seeing at lab report, observation and oral presentation (Feizioglu, Demirdag, Akyildiz, & Altun, 2012).

SPS learning can do through providing graphic, data analyzing, creating experiment, and scientific written and science communication. This skill is taught using an approach that can give more challenge to the students to master those skills. (Dirks, 2006:219)

#### 4. Students' Analysis

Subject used in this research is student grade XI math and science (MIA) SMAN 1 Batusangkar. Practical guide design based SPS which has been developed is designed to student of senior high school ages 16-18 years old.

Based on Piaget study theory (1980) that child on age of 11-18 years old is in the phase of operational formal. In this phase students have been able to think abstract, logically, drawing a conclusion, interpreting and developing hypothesis. This analysis result becomes assumption that student grade XI senior high school belong to that ages have been able to apply aspects in SPS.

Students grade XI Senior High School includes the belonging ages able to apply the aspect in SPS. Science examination that using approach of students' centered has a lot of beneficial, which is mean students do not only do experiment regularly but actually the students think about the outcome that they have collected and meaning of that outcome. When they are in practical, students tend to say that they get the mistake experiment when they get vice versa result or different from what they've expect. In the learning of process based, student never mistake when they get insufficient result, but student should evaluate positive And negative from the result they've collected (Catherine Anne S. Balaney & Elnor C. Roa, 2013)

SPS involves cognitive/ intellectual, manual and social skills. Cognitive or intellectual skill through SPS will be applied when student uses their mind, manual skill involve in using tool and material, measurement, organizing and constructing tools. Social skills through SPS will be applied students interact each other in the process of teaching learning. Cognitive development has tight relation with SPS.

Student is in the phase of think concretely able to apply basic SPS. Meanwhile, student is in the formal operational phase can implement integrated SPS (Ozgelen, 2012). Instruction based SPS used can increase formal reasoning of student effectively and speech method relatively. (Amos A.M. Shaibu, Jonathan S. Mari, 2003).

Basic skill in the process skill is fondation of integrated skill that generally more complex in solving problem in an experiment, so basic process skill is a skill that becomes a foundation of integrated process skill (Mei, 2007).

#### IV. CONCLUSION

From data analysis that has been conducted, preliminary research result can be stated: first, practical guide used in school still in form of LKS, package book or separate practical activity sheets that have not been tasted validity, practicality and effectively. Second, practical guide used in school doesn't apply such approach of particular learning that able to increase students' motivation and skill. Practical approach used still use conventional method that makes students' SPS doesn't much develop. Third, school takes more attention at product than science process. Forth, students' skill in developing scientific work or SPS in biology learning do not trained enough. Fifth, Practical guide that used doesn't suitable with the basic demand of content standard curriculum 2013/ School Based Curriculum and sixth, biology practical guide with based SPS doesn't exist.

#### REFERENCES

- [1] Akinbobola, A. O., & Afolabi, F. (2010). Analysis of Science Process Skills in West African Senior Secondary School Certificate Physics. *American-Eurasian Journal of Scientific Research*, 4(5), 234-240.
- [2] Aktamis, H., & Ergin, O. (2008). The Effect of Scientific Process Skills Education on Students' Scientific Creativity, Science Attitudes and Academic Achievements. *AsiaPacific Forum on Science Learning and Teaching*, 9(1), 21. Retrieved from <http://search.proquest.com/docview/61875613?accountid=14719>
- [3] Ali & Suastra & Sudiarmika. 2013. "Pengelolaan Pembelajaran IPA ditinjau dari Hakikat Sains pada SMP di Kabupaten Lombok Timur". *E-Journal Program Pasca Sarjana Universitas Pendidikan Ganesha Program Studi IPA*. Vol. 3. Hal 3.

- [4] Amos A.M. Shaibu, Jonathan S. Mari, A. B. (2003). The Effect of Procee-skill Instruction on Secondary School Students' Formal Reasoning Ability in Nigeria. *Science Education International*.
- [5] Aziz, M.S. & Ahmad Nurulazam Md Zain. 2010. "The Inclusion of Science Process Skills in Yemeni Secondary School Physics Textbooks". *European Journal of Physics Education*. Vol. 01. ISBN 1309-7202.
- [6] Catherine Anne S. Balanay, & Elnor C. Roa. (2013). Assessment on Students' Science Process Skills: A Student-Centred Approach. *International Journal of Biology*, 3(1). Retrieved from www.ijobed.com
- [7] Dimiyati dan Mudjiono. 2013. *Belajar dan Pembelajaran*. Jakarta: PT. Rineka Cipta.
- [8] Dirks, C. dan Matthew Cunningham. 2006. "Enhancing Diversity in Science: Is Teaching Science Process Skills the Answer?". *Life Sciences Education*. Vol. 5, 218-226.
- [9] Feyzioğlu, B., Demirdağ, B., Akyıldız, M., & Altun, E. (2012). Developing a science process skills test for secondary students: Validity and reliability study. *Educational Science Theory and Practice*, 12(3), 1899–1906.
- [10] Karamustafaoğlu, S. (2011). Improving the Science Process Skills Ability of Science Student Teachers Using I Diagrams. *Eurasian J. Phys. Chem. Educ*, 3(1), 26–38. Retrieved from <http://www.eurasianjournals.com/index.php/ejpce>
- [11] Mei, Y.T.G. 2007. "Promoting Science Process Skills and The Relevance of Science Through Science Alive Programme". Proceedings of the Redesigning Pedagogy: Culture, Knowledge, and Understanding Conference, Singapore, May.
- [12] Özgelen, S. (2012). Students' Science Process Skills within a Cognitive Domain Framework. *Eurasia Journal of Mathematics Science & Technology Education*, 8(4), 283–292. <https://doi.org/10.12973/eurasia.2012.846a>
- [13] Permanasari, A., Hamidah, I., & Widodo, A. (2013). The Analysis Of Science Teacher Barriers In Implementing Of Science Process Skills (SPS) Teaching Approach At Junior High School And It ' s Solutions, 4(27), 185–191.
- [14] Poedjiadi, A. 2007. *Pendidikan Sains dan Sains Terpadu (dalam Ilmu dan Aplikasi Pendidikan*. Bandung: Pedagogiana Press.
- [15] Sugiyono. 2014. *Statistika untuk Penelitian*. Bandung, Penerbit Alfabeta.
- [16] Zulyetti, D. 2012. *Pengembangan Penuntun Praktikum Biologi Berbasis Inkuiri Terbimbing Untuk Kelas XI SMA Semester I*. Thesis. Padang: Unpublished.