

Validity of Microbiology Practice Guidance Based Scientific Approach for Students of STKIP South Nias

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Abstract - Government's efforts to improve education qualities are implemented through curriculum, media and facilities. One of media used for improving education quality is practice guidance. The purposes of the research were to develop guidance of microbiology practice based scientific approach for STKIP students of South Nias and to know its validity criteria. It was a research and development using Plomp development model. The instrument used was practice guidance validation sheet. This validation sheet used questionnaire in form of questions list given to some experts. The analysis ratings consisted on didactic, construct, and technical requirements. Technique of data analysis used was validity analysis by using practice guidance validity data. The validity of microbiology practice guidance based scientific approach was obtained from validation results from three experts by using validation sheet. The result of the research showed that the score of didactic requirement was 88.89% with "very valid" criterion; the score of construct requirement was 90% with "very valid" criterion; the score of technical requirement was 84.72% with "very valid" criterion; and the average score of these requirements was 87.87% with "very valid" criterion. The microbiology practice guidance based scientific approach was successfully developed with very valid criterion and expected to be able to guide implementation of practice activities so that students learning competences in cognitive, affective, and psychomotor domains can improve.

Keywords – Validity; Practice Guidance; Scientific Approach.

I. INTRODUCTION

Education is a process to influence students to adapt well with their environment, so that it will cause changes to appear in themselves and able to function in social life (Budiarti, 2014). It purposes to make students use scientific process competences, like determining problems, observing, analyzing, hypothesizing, experimenting, concluding, generalizing, and applying information with the necessary competences (Aktamis & Ergin, 2008).

Education quality is measured through students' achievement in learning process and their ability to apply what has been learned in daily life. The government's efforts to improve the education quality are implemented through curriculum, media and facilities. One of media used for improving the education quality is practice guidance.

The practice guidance is a manual in doing practice activities, which contains preparation, implementation, data analysis and reporting procedures. It purposes to guide students in doing practice activities. The practice activities not only help students to understand concepts, but also to push students to learn something, do something, and learn to do something (Sere, 2002).

Based on preliminary research done on April 14th, 2017 to 30 students of biology education major in STKIP South Nias about microbiology practice problems, there are some problems found. First, microbiology practice guidance has not available yet, so that students have not implemented scientific approach, like formulating problem, formulating hypothesis, collecting data, testing hypothesis and drawing conclusion. Second, students do not actively participate in the practice activities.

Beside that, on Saturday, April 15th, 2017, interview was also done to Mr. Yan Piter Basman Ziraluo, M. Pd., a microbiology lecturer of STKIP South Nias. From the interview, it was found that there are some problems in doing practice. First, students are difficult to do practice because practice guidance has not developed yet. In practice time, students were only to listen and take a not about practice steps and to understand every steps explained by teacher. Second, students' scientific process competences have not sharpened yet so that students' outcome in cognitive competence has not been optimal and the practice objective has not also achieved yet. It can be proven from the students' low practice score, like in Table 1 below.

Table 1. Microbiology Practice Score of Biology Education Students of STKIP of South Nias in Even Semester Year 2017/2018

No	Class	N	Average
1	A	23	64,4
2	B	24	60,6

(Source: BAAK STKIP South Nias, 2017)

Based on problems in implementing microbiology practice activities, a practice guidance is needed to design in order to make students have opportunity to construct their knowledge, get experiences to identify real problem, formulate it operationally, design the best procedure to solve the problem and implement it. The achievement of practice objectives will be difficult to reach if students are not accustomed to doing scientific process by themselves. One way to familiarize students with scientific process is through doing practice activities supported by practice guidance based scientific approach.

The practice guidance based scientific approach is a practice guidance that is able to sharpen students' competences suitable with their cognitive competence. Learning process by using scientific approach is the learning process which is designed in order to make students active in constructing concepts, laws or principles through stages of observing, formulating problems, proposing or formulating hypothesis, collecting data by using various techniques, analyzing data, drawing conclusion, and communicating the finding concepts, laws or principles (Daryanto, 2014). It is in line with Ayas (2015), who stated that learning process by using scientific approach has positive effect towards students' academic achievements.

The phases in the scientific approach can develop various skills, such as critical thinking skill, communication

skill, research and collaborative skill, and behavior character (Machin, 2014). There are some advantages of scientific approach. First, learning phases are systematic so that they facilitate teacher to manage learning process. Second, learning phases involve scientific process competences in constructing concepts, laws, or principles. Third, it can develop students' characters.

To know whether the developed practice guidance is suitable or not, it has to pass some testing steps. One of the tests is validity test. According to Thompson (2013), validity is to what extent an instrument measures what should be measured. Beside that, validity is a measurement accurateness aspect. A valid instrument is not only able to produce precise data, but also to give accurate highlight about the data. Accurate means the measurement can give highlight about detailed difference between one subject to other subjects

Validity test is done to know the validity of instrument used. An instrument is valid if it can measure what should be measured and reveal data from the researched variables precisely.

II. RESEARCH METHOD

It is a kind of 'research and development' research. It aims at producing a new product which has been validated, used as a guidance in doing practice activities, and expected to increase students' learning outcomes.

The development of microbiology practice guidance based scientific approach is by using Plomp model development. The Plomp model development has some phases, which are preliminary investigation phase, development or prototype phase, and assesment phase (Plomp, 2013).

In the preliminary investigation phase, interviews were done to microbiology lecturer, curriculum analysis and student analysis were also done to get highlight of product developed. Next, in the development or prototype phase, it was consisted on prototype I, prototype II, prototype III and prototype IV. In the assessment phase, a test was done to the real classroom.

In the development or prototype phase, validation test was done to the microbiology practice guidance based scientific approach in prototype II phase. It was done by testing it to the experts. The validation of practice guidance based scientific approach was done by three experts. The test results were used to revise so that it fulfilled the users' needs and it was able to apply in the real classroom. The

following is experts' validation instruments used in this research.

THE VALIDITY SHEET OF MICROBIOLOGY PRACTICE GUIDANCE BASED SCIENTIFIC APPROACH FOR STKIP STUDENTS OF SOUTH NIAS

A. DIDACTIC REQUIREMENTS

No	Assessment Indicators	Score			
		1	2	3	4
		STS	TS	S	SS
1	Microbiology practice guidance based scientific approach is equipped with practice regulations, practice guidance manual, and tool recognition.				
2	Microbiology practice guidance based scientific approach is suitable with achieved standard competence and basic competence.				
3	Microbiology practice guidance based scientific approach is suitable with achieved indicators.				
4	Practice activities objective is arranged based on basic competence and indicators.				
5	Presented learning materials give information and concepts related to practice activities.				
6	The writing of scientific name in practice guidance is suitable with nomenclature writing system.				
7	Microbiology practice guidance based scientific approach has activities suitable with scientific approach.				

No	Assessment Indicators	Score			
		1	2	3	4
		STS	TS	S	SS
8	Microbiology practice guidance based scientific approach is to measure students' scientific process competences.				
9	Practice activities objectives are arranged according to types of activities done.				
Total					

B. CONSTRUCT REQUIREMENTS

No	Assessment Indicators	Score			
		1	2	3	4
		STS	TS	S	SS
1	It is used communicative language.				
2	It uses good and right Indonesian language.				
3	It is used appropriate spelling.				
4	Stages in practice activities is systematically done suitable with scientific approach, like observing and formulating problem, formulating hypothesis, testing hypothesis, analyzing data dan drawing conclusion.				
5	Every practice activities have same order.				
Total					

C. TECHNICAL REQUIREMENTS

No	Assessment Indicators	Score			
		1	2	3	4
		STS	TS	S	SS
1	Presented cover can figure practice guidance identity and content.				
2	Font is clear and consistent.				

3	Font size is consistent and readable.				
4	Pictures in the practice guidance can convey intended message.				
5	Pictures sources are written in every picture taken from other literatures.				
6	Colour combination of the practice guidance is interesting.				
Total					

The validation analysis used practice guidance validity data which were obtained from analysis of data collection instrument in form of questionnaire fulfilled by some experts. The data analysis was done by scoring for each item. The scoring was based on Likert Scale in the table 2 below.

Table 2. Categories and Likert Scale Scores of Practice Guidance Validity

Score	Category
4	Very agree (SS)
3	Agree (S)
2	Disagree (TS)
1	Very disagree (STS)

Source: Modified from Yusuf (2007)

After that, the scoring results were tabulated and percentaged by using the following formula.

$$\text{Validity Score} = \frac{\text{obtained score}}{\text{maximum score}} \times 100\%$$

Based on the validity score obtained, scoring criteria towards microbiology practice guidance based scientific approach validity were determined according to criteria in the table 3 below.

Table 3. Validity Categories of Practice Guidance

Validity Score (%)	Category
0-20	Not Valid
21-40	Less Valid
41-60	Valid Enough
61-80	Valid
80-100	Very Valid

Source: Modified from Riduwan (2011)

III. FINDING AND DISCUSSION

1. Finding

The validation of practice guidance based scientific approach was based on experts' validation items accordance to practice guidance based scientific approach arrangement stages. As a result, the practice guidance based scientific approach in microbiology subject was produced. Then, practice guidance based scientific approach was validated by some experts. The validity consisted on three aspects, which are didactic aspect, construct aspect, and technical aspect. The validators in this validation process were Dr. Abdurrahman, M.Pd., as a linguist, Dr. Darmansyah, ST, M.Pd., as technologist, and Dr. Linda Advinda, M.Kes., as a materialist.

The validation results of practice guidance based scientific approach are as follows:

VALIDITY ANALYSIS RESULTS OF MICROBIOLOGY PRACTICE GUIDANCE BASED SCIENTIFIC APPROACH

A. VALIDATION OF DIDACTIC REQUIREMENTS

The results of the technical requirements validation analysis can be seen in Table 4.

Table 4. The Results of Construct Requirements Validation Analysis

Indicator	Validator Assessment			Total	Validity Score	Criteria
	1	2	3			
1	4	4	4	12	88,89%	Very Valid
2	3	4	4	11		
3	3	3	4	10		
4	3	3	4	10		
5	4	3	3	10		
6	4	3	3	10		
7	3	4	4	11		
8	3	4	4	11		
9	4	3	4	11		
Total	31	31	34	96		

B. VALIDATION OF CONSTRUCT REQUIREMENTS

The results of the technical requirements validation analysis can be seen in Table 5.

Table 5. The Results of Construct Requirements Validation Analysis

Indicator	Validator Assessment			Total	Validity Score	Criteria
	1	2	3			
1	3	4	4	11	90%	Very Valid
2	3	4	3	10		
3	3	4	3	10		
4	4	4	4	12		
5	4	3	4	11		
Total	17	19	18	54		

C. VALIDATION OF TECHNICAL REQUIREMENTS

The results of the technical requirements validation analysis can be seen in Table 6.

Table 6. The Results of Technical Requirements Validation Analysis

Indicator	Validator Assessment			Total	Validity Score	Criteria
	1	2	3			
1	3	3	3	9	84,72%	Very Valid
2	4	3	3	10		
3	4	3	3	10		
4	4	3	4	11		
5	4	3	4	11		
6	4	3	3	10		
Total	23	18	20	61		

2. Discussion

The validity of practice guidance based scientific approach is obtained from validation result which used experts' validation sheet which includes suitability of practice guidance based scientific approach and basic competencies of microbiology subject. According to Lufri (2007), validity is a measurement that shows to what extent an instrument can measure what should be measured. The validity score of didactic aspect was 88.89% with 'very valid' criteria. The validity of didactic aspect is stated as very valid by validators because the developed microbiology practice guidance based scientific approach has fulfilled practice guidance arrangement requirements. It shows that the developed practice guidance has practice regulations, practice guidance manual and tools recognition. Practice activities are suitable to basic competencies, practice indicators and objectives that will be achieved. The objective of practice activities is determined based on

activities done. The materials in the practice guidance are systematic and support the practice activities done. The practice activities are served based on scientific approach phases. According to Masratika (2016), scientific can improve students' comprehension towards learning materials and also increase students' learning outcomes. It is in line with Pratiwi (2015), who stated that scientific approach can improve learning outcomes optimally. The scientific approach in learning process influences students' learning outcomes because it involves process competences, like clarifying, measuring, predicting, explaining and summarizing.

The score of construct requirement validity was 90% with very valid criteria shows that the developed practice guidance is suitable to principles of good and right Indonesian language. Beside that, it also contains scientific approach phases, which are consisted of observing and formulating of the problems, formulating hypothesis, testing hypothesis, analyzing data, and drawing conclusion. In the problem observation and formulation phase, students observed the pictures given. After that, they wrote problems regarding to the pictures. In the hypothesis formulation phase, they formulated hypothesis and gave some answers about the formulated problems in the previous phase. Then, in the hypothesis testing phase, they did experiment in order to get data to prove or deny the hypothesis. Next, in the data analyzing phase, they analyzed the obtained data or information based on hypothesis testing. Finally, in the last phase, they drew conclusion about hypothesis and observation results. It is in line with Maasawet (2011), who stated that the important phase of drawing conclusion is to relate various hints and facts to students' background knowledge in order to predicting final result of an observation. If the conclusion supports the hypothesis, it means the hypothesis is accepted. On the other hand, if the conclusion denies the hypothesis, it means the hypothesis is rejected.

The score of technical requirement validity of microbiology practice guidance was 84.72% with very valid criteria. The validators gave very valid criteria because of some indicators. First, its cover design has contained subject identity, to whom it is made, and its composers' identity. Second, it used readable font and font size. It used some different fonts in order to make it more interesting so that students are not bored in reading it and to differentiate the title and the content of it. Third, the appropriateness of pictures and learning materials put in it so that students are easy to understand the materials. It can be seen that the pictures in practice guidance is clearly visible. In addition,

picture sources and description are also put down in the pictures. It is in line with Prastowo (2011), who stated that pictures are necessary to support and clarify the content of materials. Beside that, they can attract students' attention so that students do not feel bored in learning. Fourth, the layout design has used interesting colour combination. It is because it was designed by using Microsoft Office Publisher 2010 program.

The average calculation of total validity score was 87.87% with very valid criteria. According to Rochmad (2011), a product is valid if it is equal and its components are related each other consistently. It is supported by Hakim (2017), who stated that the valid practice guidance can be used as learning materials to improve students' learning outcomes. The very valid criteria of the microbiology practice guidance based scientific approach indicates that it can be used as guidance in doing microbiology practice activities, push students' activeness in practice activities, facilitate students to sharpen scientific process competences, and improve students' learning competences in cognitive, affective and psychomotor domains.

IV. CONCLUSION

Based on research finding and discussion, it can be concluded that the format of practice guidance based scientific approach has been successfully produced for microbiology practice activities. It can be used as guidance in doing microbiology practice activities. Furthermore, it has very valid validation if it is seen from didactic, construct and technical requirement aspects. Therefore, it can be used to help students in doing practice activities in order to improve students' learning competences in cognitive, affective and psychomotor domains.

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