

The Development of IPA Guiding Practicum with Constructivism Oriented For Junior High School Student at Class VII

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Abstract - The implementation of practical requires students to be able to work in the laboratory or in the field. By practicing, students can gain knowledge, understanding, scientific work skills, can maintain concepts from initial knowledge, and develop scientific attitudes. Students will get new experiences and direct experience so that they are more motivated in learning. The implementation of practicum activities in schools requires a practical guide that can construct students' knowledge so that students more easily understand the material to be practiced. One approach that can be used in developing a practical guide is constructivism that can build students' initial knowledge. However, in the school of the 1st Junior High School of Ulakan Tapakis, the practicum does not have a specific guide or practical guide. Based on this, research is conducted which aims to produce practical, valid and effective practical guides.

This type of research is development using the Plomp model. The plomp model consists of three stages of development namely: 1) the initial investigation phase, 2) the stage of developing and making a prototype, and 3) the assessment phase. The data collection instruments used in this study are constructivism oriented science guide guideline sheets, practical questionnaires for teachers and students, student affective observation sheets, psychomotor observation sheets, and student learning outcomes tests. The guideline of the prototype of guiding practicum was validated by 3 experts and 2 teachers.

The results showed that didactic aspects, construct aspects and technical aspects by experts 81.0%, and by practitioners 82.5% with very valid categories. The results of practicality by teachers and students show that both categories are very practical (81.7% and 85.2%). The results of the practical guideline test effectiveness from the positive, affective and psychomotor aspects show that effective guidance helps achieve the three competency domains. So that it can be concluded that the constructivism-oriented science practice guide has a very valid category, very practical, effective.

Keywords - Practical Guide, Constructivism, Validity.

I. INTRODUCTION

Integrated science learning includes Biology, Physics and Chemistry. Science learning uses a scientific approach that can provide understanding to students in knowing, understanding various materials using a scientific approach that information can be obtained from anywhere, anytime, and does not depend on the teacher. Learning activities that can make students learn more meaningfully one of them uses learning methods in the form of experiments or lab work. Practicum is an ideal vehicle for developing generic abilities, both in the form of planning, implementation, and reporting. Besides that, it is also potential for developing capabilities in terms of decision making, problem solving, communication, group work, and high-level reasoning.

About 80% of the science learning process in SMP is accompanied by practicum (Gibb, in Taufik, Rustaman, and Anna, 2016: 2). So practicum is very important to do practicum for junior high school students, if practicum is not implemented, it results in low student learning outcomes seen by the percentage of the science learning process. Thus practicum activities, students will understand a material rather than only accept material explanations from the teacher. One way to train students to work scientifically to obtain knowledge, skills and scientific value is through practical activities. On the success of the teaching and learning process, among others, is influenced by the compatibility between the subject matter and the level of thinking ability of students (Habib, 2014). According to

Piaget, each individual will experience a level of cognitive development, and junior high school students in Indonesia at the beginning of class VII still have a level of formal operational cognitive development, due to the average age above 12 years (Ibda, 2015).

At that level, children can use concrete operations to form more complex operations (can think abstractly). The delivery of science materials in junior high school is mostly abstract. One of the science materials that makes it difficult for students in this even semester is the organization of life because the material is quite extensive in learning ranging from cells, fingers, organs, organ systems and organisms. Then the material of global warming because this material is a lot that confuses students because the greenhouse effect makes students think that the house is made of all glass.

In this material the learning is more dominated by practical activities. So far, practicum activities have not been carried out optimally because teaching materials are not yet available in the form of practical guides that are easily understood by students, the existing guidelines are too simple and often confuse students because the written steps require further understanding and the sentences are too simple. The sketches of the experimental designs available are unattractive and disproportionate, this can be seen in the 2013 printed edition of the Natural Sciences book of the Ministry of Education and Culture. Practical activities can also enrich experience, develop scientific attitudes, learning outcomes will last longer in memory students and students will get real experience so students are more motivated in learning. This is in accordance with the activities of the practice aimed at creating a process of discovery and giving experience directly (Rustaman, 2005: 2)21-30

Based on the results of observations that the author did on November 2016 at SMPN 1 Ulakan Tapakis, SMPN 1 Sintuk Toboh Gadang, and SMPN 3 Ulakan Tapakis in class VII, found several problems regarding the implementation of Biology practicum in science learning. First, students do not yet have a practical guide in conducting practical activities and still use the guidance in the Ministry of Education and Culture publication booklet which is also used in classroom learning activities. The stages of work on practicum guides in the textbook include practicum titles, objectives, tools and materials, and work methods. Therefore, the practicum guide that is used does not give the opportunity for students to play an active role in carrying out practical activities and develop scientific learning process skills because students only follow the steps or procedures listed in the practical guide. Learning resources

in practical activities are expected to guide students to stimulate students to learn actively, independently and motivated. Therefore, a practicum guide is required who is given a problem about what will be practiced, then the initial questions are asked so that the students do a more directed practicum, so that the practicum activities are expected to be in accordance with the material to be practiced.

Second, practicum activities must be carried out because it supports aspects of skills in KI 4 whose components include observing, asking, trying, processing, presenting, reasoning and creating in order to make students who think and act effectively and creatively in concrete and abstract domains. According to the Ministry of Education and Culture (2017: 13), assessment of learning outcomes includes aspects of attitudes, aspects of knowledge, and aspects of skills carried out in a planned and systematic way to monitor the process, learning progress and improvement of learning outcomes. Practical activities should be able to train students to carry out scientific work steps, namely critical of the problem, so students are able to identify problems, develop hypotheses of the problems studied, design experiments and draw conclusions and to find concepts and construct knowledge so students can maintain their own acquired knowledge. According to Sadeh (2009: 1143), students use a guide to record each stage of the investigation process, namely: planning, implementation, data collection, data processing and discussing the results of the lab. Students also use a guide to record the difficulties faced during the practicum.

Third, it is known data from three schools that students like practicum activities as much as 92.33%. Practical activities are the most anticipated activities by students because through practical activities, students more quickly understand the theory of learning taught by teachers in the classroom. Therefore, through practical activities students can understand and apply a theory so that students get the meaning of the material under study. According to Subiantoro (2009: 8), there are four main reasons for the importance of practicum activities, namely (1) practicums generate student learning motivation; (2) practicum developing basic skills in carrying out experiments; (3) practicum becomes a vehicle for learning scientific approaches; and (4) practicums support the understanding of subject matter.

In classroom learning, students only observe or listen to the material explained by the teacher, students are not directly involved in the learning process, and students are

only directed to memorize the material. This makes students more quickly forget the material the teacher has explained. Therefore, practicum activities are carried out with the initial questions to motivate students in practical activities and to train students in understanding the material and students will also get the opportunity to be able to experience directly the material being studied.

The fourth problem, practical activities that are rarely implemented become one of the things that cause the low value of student learning outcomes because given the limitations of tools and materials in the laboratory, require facilities and costs that are relatively expensive in its implementation, and in general practical activities and require a long time, so desired lab activities are not achieved.

Based on this, it is necessary to develop a practical guide that can facilitate students in gaining understanding and scientific work skills. This practical guide is adjusted to the indicators, the minimum facilities owned by the school, the condition of the students, and separate from the LKS or textbook used. This practical guide was developed to be oriented towards constructivism, which emphasizes more on students building their own learning knowledge with guidance or without the guidance of teachers to engage actively in the practicum process. This is in line with that expressed by Sumiati and Asra (2008: 14), that constructivism learning develops the thinking of students to learn more meaningfully by working alone, finding themselves and constructing their own new knowledge and skills, so that the knowledge gained by students is the result of interpregnancy experiences his mind.

Constructivist approach is suitable if used in practical activities because it will make students more active in practicum, enrich new experiences, can maintain concepts from initial updates, develop scientific attitudes, learning outcomes will last longer in students' memories, students

will get new experiences and firsthand experience so that it is more motivated in learning. Learning that refers to constructivism learning theory focuses more on student success in reflecting on what has been ordered and done by the teacher, in other words students are more encouraged to construct their own knowledge through assimilation and accommodation activities (Lapono, 2008 : 28). This is in accordance with the statement of Fitriani (2013: 2), constructivism is used to help students in learning that connects new experiences and information with the knowledge they already have into new knowledge so that the results emerge new cognitive structures. The advantages of constructivism-oriented practical guide are that students are able to construct an object that is observed and maintain the initial concept obtained if they have made observations / experiments and discovered new concepts.

Based on these matters, the research wants to carry out research with the title "Development of Constructivism Oriented Science Practicum Guide for Even Semester VII Grade Students".

II. METHODS

This type of research is development *using* the Plomp model. The Plomp development model consists of three stages of development namely; 1) the initial investigation phase, 2) the stage of developing and making prototypes, 3) the assessment stage. The data collection instrument used was a validation sheet to measure the feasibility / validity of the product developed by constructivism oriented science guide guidance validation sheets conducted by 3 expert teams in accordance with their respective fields and studies and 2 teachers. The validation results are then used for revisions so that the practicum guideline sheet really meets the user's needs. Here the instrument validation expert use:

Sheet of validity of IPA guiding practicum with construtivism oriented

A. Didactic Aspect

	Aspect Assessed	Value			
		1	2	3	4
		reject	agree	agree	Very agree
a.	Its main activity in accordance with KI, KD, indicators and objectives lab to be achieved				
b.	The purpose of the activities practicum in accordance with the activities to be carried out				

c.	Constructivism-oriented practical activities facilitate the understanding of own concepts				
d.	Practical activities are presented in accordance with the stages of constructivist approach Practical guidance Practical guides				
e.	makes it easier for students to answer questions and find solutions to problems				
f.	can motivate students to foster critical, creative thinking and independent in constructing its own knowledge				
g.	Practical guide with constructivism approach can help students work scientifically in finding ideas / concepts				

B. Aspect Of Construction

	Aspects Assessed	Value			
		1	2	3	4
		Reject	o agree	agree	Very agree
a.	Practice guide constructivism oriented has an identity to facilitate the administrative process				
b.	Having order and pet for the use of practicum guides Practical guides				
c.	have the introduction of laboratory instruments that are appropriate material				
d.	Constructivism-oriented practical guide has a clear sentence structure				
e.	Material summary for each practicum topic presented has been systematic				
f.	language used is communicative				
g.	Using good and correct Indonesian language rules The language				
h.	used can develop students' thinking skills				
i.	Using terminology in accordance with the concepts subject				

C. Technical Aspects

No	Aspects Assessed	Value			
		1	2	3	4
		Reject	o agree	agree	Very agree
	a. Font and sentences				
1)	Using clear types of writing				
2)	Using easy-to-read font sizes				
3)	Conformity to the use of punctuation				
4)	Use of sentences in practicum guides in accordance with the rules of good and correct Indonesian language				
	b. Picture				
1)	Images and tables in accordance with the concept				
2)	Images are clearly presented, interesting and colorful				
3)	Picture description according to the picture				
	c. Integrity				

1)	Suitability of the use of color compositions in the practical guide				
2)	Design of simple and interesting practical guide design				
3)	Color on the cover Practical guide can attract reading interest and make the practitioner interested in knowing the contents of the guide				

Data collected from this study is the result of constructivism-oriented science guide validation. Guidance feasibility data in the form of Likert scale 1-4 with the provisions:

- Strongly Agree (SS) with weight 4
- Agree (S) with weight 3
- Not Agree (TS) with weight 2
- Strongly Disagree (STS) with weight 1

Then, the results of scoring are tabulated and the percentage is sought by using the formula:

$$\text{Validity Value} = \frac{\text{Score obtained by}}{\text{Maximum Score}} \times 100\%$$

Based on the value of the validity obtained, it is determined the assessment criteria for the validity of constructivism-oriented science practice guides. with the provisions as in Table 1.

Table 1. Determination Criteria Validity Level

% Range	Category
0-20	Very Invalid
21-40	Invalid
41-60	Valid enough
61-80	Valid
81-100	Highly Valid

Modified from (Riduwan, 2004)

III. RESULTS AND DISCUSSION

The results of the practicum guiding validation assessed by the expert validator are very valid and the validation results from the practitioner / teacher validator are also very valid. This means that the practicum guide that has been developed already has very good quality and can be used as a guideline for class VII even science practice activities. See Tables 2 and 3.

Table 2. Results of Practical Guidance Validation by Expert Validators.

No	Criteria for assessment	Average validity	Category
1.	Didactic Terms	81.0	Very Valid
2.	Construction Terms	79.6	Valid
3.	Technical Requirements	82.5	Very Valid
Number		243.1	Very Valid
Average		81.0	

Table 3. Results Practicum Guide Validation by Practitioners / Teachers.

No	Criteria for assessment	Average validity	Category
1.	Didactic Terms	78.6	Valid
2.	Construction Terms	83.3	Very Valid
3.	Technical Requirements	85.7	Very Valid
The total number		248.0	Very Valid
Average		82.5	

in Practical Tests done to the experimental class students and to the teacher the results of the practicality test were both very practical. From the results of the affective domain above, it can be said that the percentage of practicum activities using a practicum guide in the experimental class is higher at 77.0% of the class controls that carry out

practical activities without practicum guidance which is as much as 73.4%. From the results of the psychomotor domain, the percentage of implementation of practicum activities uses a higher practicum guide, namely 77.1% of the ordinary class who carry out practical activities without a practical guide, which is 72.2%. The cognitive domain

obtained from the test sheet is given in the form of an essay test. Cognitive data results obtained hypothesis accepted.

In the results of constructivism-oriented practical guide validation the results have been valid. This indicates that the practical guide developed in the even semester of class VII SMP is in accordance with core competencies, basic competencies, indicators, and learning objectives. According to Lufri (2007: 113), the level of validity is related to accuracy (*appropriateness*), meaningfulness (*meaningfulness*), and usefulness (*usefulness*) of a conclusion made. This is also in accordance with the opinion of Sugiyono (2012: 363), validity is the degree of accuracy between the data that occurs in the object of research with actual data, meaning that it is not different or appropriate between the two data.

When viewed from didactic aspects, all indicators assessed by experts and educational practitioners have different values. The validation results from experts are higher than the results of practitioners. Because experts / experts pay more attention to the accuracy and accuracy of the indicators assessed, and regulate the use of practical guides that can be used by clever students to slow students. This constructivism-oriented science practice guide is stated to be very valid by the validator, because this practicum guide is in accordance with the applicable curriculum and can be used in practical activities. This is in accordance with the opinion of Riza (2015) which states that based on the validity test, the three validators state that biology practicum guides are oriented towards constructivism that the design researcher has included in a very valid category. This shows, the practical guide developed in the mother of class XI high school biology lessons can be used in practical activities.

Based on the construction aspects of the practicum guide that was developed to be declared valid by the validator, it is very valid by practitioners. The assessment was different because in the expert validator, the assessment was carried out specifically and assessed by each expert. This aspect relates to having rules and instructions for using practicum guides, having a clear sentence structure, use of words, spelling and punctuation, so that it is easily understood by the user. and has a systematic theoretical basis, and presentation of material that is clear and easy to understand.

Assessment of technical aspects / uses is also in a very valid category according to the validator's assessment. This means that all components in the technical requirements, including writing, drawing, and graphics, have been fulfilled properly and correctly. The assessment of the practitioner's

validator is also higher than that of the expert validator, this is because the practitioner's validator evaluates in general from all components. Unlike the case with expert validators who assess in detail in accordance with the field of study. The same thing was also found in the study of Kartika (2016: 137) that the practical guide was also said to be very valid in terms of technical aspects. This means that all components in the technical requirements have been fulfilled properly and correctly. The picture displayed in the summary of the practical material, the type of writing used and the size of the writing and the appearance of the presentation of the contents of the practical guide are interesting and can convey the message well. Widjayanti (2008: 2) describes the technical requirements relating to writing, drawing, and appearance in constructivism-oriented practice guides.

In the practicality test carried out in three stages, namely one-on-one trials, small group trials, and large group trials. Of the three practicality tests that have been carried out, it was found that the practical guide used is easy to carry, easy to use, and has sufficient time in conducting practical activities. The results of the one-on-one trial through the interview sheet of three students on average gave a positive response. It can be seen from students' responses that constructivism-oriented practical guides are easy to use, attractive colors and have good combinations. This shows that the practical guide can facilitate students in understanding the work steps and practicing the practice well.

The results of practical tests in large groups showed a positive response in terms of practicality using constructivism-oriented practical guides. Practical results by students are higher than the practical results of the teacher, indicating that the practical guide is very practical when used and has sufficient time when used in practical activities. Research results of Riza (2015: 136) state that biology practicum guides oriented to constructivism are categorized as very practical, which shows that biology practicum guides oriented to constructivism are considered useful and practical to be used as one of the students' media in learning.

The effectiveness test was carried out to find out whether there were impacts, influences, and results caused because the use of science practice guides was constructivist in orientation to practical activities on learning motivation, activities, and student learning outcomes in the experimental class and control class during the activity practicum takes place. Learning outcomes include observations of cognitive,

affective, and psychomotor students through learning outcomes tests at the end of practical activities. The results in accordance with Anggraini's research (2017: 107) state that the assessment of effective aspects of the biology learning module with constructivist learning approaches is equipped with a mind map that has been carried out by all students including criteria of good to very good and effective use. The following is an explanation of the results of the effectiveness tests that have been carried out.

Based on the results of statistical tests on data on student learning outcomes in the experimental class and control class, it is known that there are differences in learning outcomes between the two classes which are given different treatments. The experimental class gets a higher average learning outcomes than the control class with the Minimum Completion Criteria (KKM) in science subjects at Ulakan Tapakis 1 Public Middle School which is 75. This data shows that the use of constructivism-oriented practical guides on practical activities is more effective in improving learning outcomes students compared to the way they usually do practical activities. This is in accordance with the opinion of Jasumayanti (2013) which states that the application of constructivism is very influential on student learning outcomes.

IV. CONCLUSION

Based on the results of research and testing of constructivism-oriented science practicum guide for Even Class VII Semester Middle School students, the conclusion is that validity with very valid categories, practicalities with very practical categories of teacher and student assessment, and effectiveness with effective categories of observation aspects affective, psychomotor and cognitive domain evaluations. The value of testing on the hypothesis test is accepted which is obtained based on the value of learning outcomes of class VII students of even semester SMP. So that constructivism-oriented science practice guides can be used during the learning process as teaching material (practical guide) that helps teachers and students to understand the material, helps in achieving learning goals so as to improve student learning outcomes.

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