

Biology Practicum Guides Problem Based Learning-Based to Improve Critical Thinking Skills for Class XI Students of SMA



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ABSTRACT: This study aims to design, design and develop a learning intervention.-based Practicum Guide *problem-based learning* to improve the critical thinking skills of class XI SMA students that are valid, practical, and effective. The instrument used was a validity questionnaire and a practicality questionnaire as well as a matter of effectiveness. The validity and practicality data analysis technique uses a Likert scale scoring and the effectiveness uses a t-test using SPSS 2.2. Based on the development and trial of *problem-based learning* to improve the thinking skills of students in class XI SMA, it was concluded that the results of the validity and practicality tests met the very valid criteria. The results of the effectiveness test have effective criteria.

KEYWORDS: problem based learning, practical guide, development, critical thinking.

I. INTRODUCTION

Education intends to develop the potential of students into quality human resources. The quality resources in question are human beings who believe and are devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, able to compete and become democratic and responsible citizens. In order to achieve this goal, the government has attempted through the establishment of various regulations to ensure that every citizen gets a quality education (Hermawati, 2012). According to Salamah (2019) that the quality of education can be seen from the quality of education that produces quality, productive, and competitive human resources (HR). One of the efforts to improve the quality of education is to make various innovations in the curriculum. One of the innovations currently being carried out is to include life skills education, namely life skills, soft skills and character education (Setyawati, 2013). The three educations are required to be able to develop higher-order thinking skills, one of which is critical thinking skills. According to Sudarma (2013), basically humans are creatures who can create creativity and are able to think critically in producing something innovative. These abilities must be supported by characters who are able to create innovations themselves so that critical thinking skills are very important to be raised in every individual, especially students. According to Liliyasi (2011), "The ability to think which is the basis of other thinking skills is the ability to think critically". Critical thinking skills affect the formation of students' scientific work.

Scientific work is an activity that emphasizes the scientific approach or method (Razi, 2013). According to Colburn (2000), scientific work-based learning is learning where students are involved in open problems, are student centered and involve hands-on. According to Subagyo, et al (2009), the learning process using scientific work can familiarize scientific behavior like scientists in finding concepts. In biology learning, scientific work can be integrated into learning tools, one of which is a practicum guide.

According to Killinct (2007), a practicum guide is a practicum facility that helps practitioners in carrying out practicum activity. Biology practicum activities have been formulated in the basic competencies of the 2013 curriculum in accordance with the Ministry of National Education No. 69 of 2013 concerning the basic framework and structure of the SMA/MA curriculum, so that teachers are required to carry out practical activities in order to achieve the expected learning objectives. Through practicum, students can be actively involved in observing, observing, hypothesizing, analyzing and drawing conclusions, so that students can correlate the theory and the results they get.

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Based on the results of critical thinking questions to students on the circulation system material at SMA Pertiwi 1 Padang, in October 2021 by giving essay by researchers to students, students' critical thinking skills were obtained with an average value of 55.8%. This figure, according to Maulana (2017), shows that the critical thinking skills of students at SMA Pertiwi 1 Padang are categorized as less critical.

Based on the results of interviews with the biology teacher of SMA Pertiwi 1 Padang, namely Mrs. Widya Aziz, S.Pd, M.Sc. in November 2021, it was discovered that practicum activities in schools were still using practicum instructions obtained from biology textbooks and LKPD (student worksheets) which are commonly used in the classroom learning process. The teacher usually duplicates the LKPD personally which is then distributed to students. The practical instructions listed in the package book and LKPD only contain a brief explanation, namely indicators, brief material and discussion columns. In the practical instructions there are no tools and materials and work procedures that should be in the components of the practicum guide, tools and materials and work procedures are only demonstrated in front of the class by the teacher. The practicum instructions used have not applied the approach or learning model and have not been able to develop the ability to think systematically, critically, logically, and analytically. In the practicum instructions there are only ordinary concept understanding questions, so that students only get the ability to memorize and remember levels.

Based on the results of the researcher's analysis of the questionnaire on the problems of biology practicum activities at Pertiwi 1 Padang High School which was filled out by 30 students, several problems were found regarding the implementation of practical activities which can be explained as follows. First, in the implementation of practicum, students tend to be passive and not fully involved. The results of the questionnaire show that only 26% of students are active in practicum activities. Second, the practicum guide emphasizes more on the results than on the process. This is due to the practicum guide used in the form of LKPD which does not meet the components of a practicum guide. The practical instructions listed on the LKPD only contain a brief explanation, namely indicators, brief material and discussion columns. In the practicum manual, there are no tools and materials and work procedures that should be included in the practicum guide component. According to Arifin (1995), the practicum components include 1) practicum title, 2) practicum objectives, 3) theoretical basis, (4) tools and materials, (5) working methods, (6) questions. The LKPD does not yet have an approach and has not facilitated students in working scientifically so that during practicum activities students cannot solve a problem in practicum activities and only focus on results. The results of the questionnaire show that 72% of students have not been able to solve a problem in practical activities. Third, students are less interested in the appearance of the practicum guide. The results of the questionnaire showed that 73% of students stated that the practicum guide did not have an attractive color combination and 77% of the students stated that the practicum guide did not have pictures that supported the material being practiced.

Based on this, it is necessary to have a practical guide that can facilitate students in gaining understanding and scientific work skills and able to improve the ability of students to solve a problem in learning. Efforts that can be made to improve students' critical thinking skills are through practicum activities supported by a practicum guide with a problem-based learning model. learning model is one of the learning models used to improve students' higher-order thinking in real-world situations (Rusman, 2012). Arends (2008) states that the essence of the problem-based learning model is to present a variety of authentic and meaningful problem situations to students, which can serve as a springboard for investigations and investigations, meaning that problem-based learning teaches students to start learning activities with a specific problem. must be solved so as to produce new knowledge. Problem-based learning models are suitable for use in biology learning, because problem-based learning models can increase students' understanding of what they are learning so that it is hoped that they can apply it in real conditions in everyday life and can improve students' critical thinking skills in solving problems. which is more complex.

According to the Ministry of Education and Culture (2016) that in the 21st century students must be able to develop Higher Order Thinking Skills (HOTS). Students' critical thinking skills must be developed to analyze, evaluate and draw conclusions in solving a problem. The results of the PISA (The Program For International Student Assessment) analysis from year to year show that the critical thinking skills of Indonesian students have not increased significantly. This can be proven, especially science material in 2012 which was ranked 65 out of 69 countries with a score of 382, while in 2015 it was ranked 62 out of 69 countries with a score of 403 from the international average score of 500 (Organization for Economic Cooperation and Development), 2015). The results of the PISA analysis are also in line with the learning outcomes of students at school.

Research conducted by Salmeri (2018) entitled, “Development of a Problem Based Learning to improve critical thinking skills of Bengkulu City Senior High School students. The results obtained from this study indicate that the Biology practicum guide based on Problem Based Learning has been said to be valid, practical and effective.-based Biology Practicum Guide Problem Based Learning that was developed has an effect on increasing students' critical thinking skills. based practicum guide is The Problem-Based Learning- expected to stimulate students to think critically to understand biological material and solve the

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problems contained in it so that learning can be student-centered. The current generation is very sensitive to technology, meaning that they have the advantage of being able to use technology to develop knowledge. This great potential should be utilized optimally by teachers so that learning can be carried out in a directed and effective manner, such as by presenting teaching materials in the form of Problem-Based Learning- order to achieve the objectives of the learning itself.

The practicum guide developed contains three basic competencies, namely the material on the motion system is KD 3.5, namely Analyzing the relationship between the structure of the organ making up the organ network in the motion system and linking it to the bioprocess so that it can explain the mechanism of motion and functional disorders that may occur in the human movement system through literature studies, Observations, experiments, and simulations, the material about the circulatory system is KD 3.6 Analyzing the relationship between the structure of the tissues making up organs in the circulatory system in relation to bioprocesses and functional disorders that can occur in the human circulatory system and material about the digestive system is KD 3.7 Analyzing the relationship between the structure tissues that make up organs in the digestive system in relation to nutrition, bioprocesses and functional disturbances that can occur in the human digestive system.

Based on this background, the researchers conducted research on the development of a practicum guide with the title "Development of Problem Based Learning to Improve Critical Thinking Skills for Class XI High School Students".

II. RESEARCH METHODS

Type of research is development research. The product developed is problem-based learning to improve the critical thinking skills of class XI high school students that are valid, practical, and effective. The development model used in this study is the Plomp model, consisting of three stages, namely the initial investigation stage, the development stage or prototyping, and the assessment stage. The subjects of the experiment were 30 students of class XI MIPA 2 and 1 biology teacher at SMA Pertiwi 1 Padang. The types of data in this study are qualitative and quantitative data. The instruments used in data collection were observation/interview sheets, self-evaluation instruments, the validity instruments of the Practicum Guide, the practicality instruments of the Practicum Guide, and the effectiveness of the Practicum Guide instruments. The validity and practicality data analysis technique uses a Likert scale scoring and the effectiveness uses a t-test using SPSS 2.2.

III. RESULTS AND DISCUSSION

Table 1. Results of Data Analysis Validation of Three Validators

No	Aspect	Value (%)	Criteria
1.	Didactic	91.67%	Very Valid
2.	Construct	88.09%	Very Valid
3.	Technical	88.09%	Very Valid
Average - Average		89.28%	Very Valid

Table 2. Small Group Evaluation Results.

No	Aspect	Value (%)	Criteria
1.	Ease of Use	95.83%	Very practical
2.	Efficiency of use	91.67%	Very practical
3.	Attractiveness	93.75%	Very practical
4.	Easy to interpret	87.5%	Very practical
5.	Has equivalent	85.41%	Very practical
Average Practicality		89.28%	Very practical

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Table 3. Practicality Assessment by Teachers.

No	Aspect	Value (%)	Criteria
1.	Ease of Use	95.83%	Very practical
2.	Efficiency of use	100%	Very practical
3.	Attractiveness	91.67%	Very practical
4.	Easy to interpret	87.5%	Very practical
5.	Has equivalent	87.5%	Very practical
Average Practicality Value		92.5%	Very practical

Table 4. Results of Practical Data Analysis by Students.

No	Aspect	Value (%)	Criteria
1.	Ease of Use	89.58%	Very practical
2.	Efficiency of Use	87.5%	Very practical
3.	Attractiveness	86.67%	Very practical
4.	Easy to interpret	88.8%	Very practical
5.	Has equivalent	87.5%	Verypractical
Average Practicality		88.02%	Very practical

Table 5. Critical Thinking Ability Assessment Results.

Class	N	Xmin	Xmax	Mean	Standard deviation
of Experiment	30	60	90	78.00	7.086
Control	30	48	78	61.60	7.509

Table 6. Prerequisite Test Results for Normality and Homogeneity of Critical Thinking Ability.

No.	Parameter	Significance	Description
1.	Normality	0.200	Normal
2.	Homogeneity	0.791	Homogeneous

Table 7. Calculation Results of Critical Thinking Ability t-test.

Class	Significance	Conclusion
Control	0.000	H0 rejected
Experiment The		

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Practical guide before being used is validated first to be validated by experts. This is in accordance with Yusuf (2007)'s statement that validation is carried out with the help of experts in accordance with competence in their fields. The validator carefully rereads the contents of the practicum guide, checking whether the description of the practicum guide is in accordance with the rules for compiling the practicum guide. The higher the validity of a product, the better the conclusions drawn and the better the level of meaning and usefulness. This is supported by research conducted by Afriadi et al., (2013), a product that is very valid shows the suitability, significance, and usability of the product.

The validity of the practicum guide was assessed by three validators. Analysis of the data from the validity assessment sheet of the practicum guide that was developed in terms of didactic aspects, construct aspects, and technical aspects. If the data generated from a product is valid, it can be said that the product developed has provided an overview of the development goals correctly and in accordance with the reality and actual conditions (Arikunto, 2013). The results of the validation data analysis of the practicum guide show that the developed practicum guide has a validity value of 89.28% with very valid criteria.

Based practicum guide problem-based learning on the material of the motion system, circulation system and digestive system is related to the ease of practicum guidance by teachers and students in learning.-based practicum guide problem-based learning on the material of the motion system, circulation system and digestive system is carried out in stages. The first assessment is carried out on a small group or small group. Students are selected based on high, medium and low ability levels. Each level of ability consists of two students, so the total number of students in the small group test is six people. based practicum guide problem-based learning starts from the assessment of 6 students in the small group getting an average score of 90.83% with the criteria of "very practical". Furthermore, the assessment of the practicality of problem-based learning on the field test test by 30 students got an average score of 88.02% with the criteria "very practical" and the assessment from the biology teacher got an average score of 92.5% in the "very practical" category. The practicum guide that has been developed provides convenience in terms of use, both in presenting material using language that is easy to understand and also in clear font sizes.

The effectiveness of the practicum guide can be seen from the students' critical thinking skills obtained after students use the practicum guide in the learning process. The results of the assessment of the effectiveness of the developed practicum guide are effectively used as teaching materials in the learning process. Students' critical thinking skills are assessed through daily tests of the movement system, circulation system and digestive system. The instrument used in the form of essay as many as 10 items. Testing the effectiveness of the practicum guide was carried out using the t-test, because the data were normally distributed and homogeneous. Based on the t-test, the results obtained that the hypothesis is accepted. Therefore, it can be concluded that the use of problem-based learning on the material of the motion system, circulation system and digestive system is effectively used for learning.

Teachers participate in building students' understanding.

Teacher participation, for example, presents problems from the material studied in a problem-based learning. According to Strobel and Barneveld (2009) Problem Based Learning is student-centered learning, where students get solutions to the problems they face and build their own knowledge.

Learning model Problem Based Learning improves students' critical thinking skills about a given problem. According to Yulianti, et al., (2018) Problem Based Learning can develop students' critical thinking skills to become people who are able to make their own decisions to make decisions and solve problems. According to Nasution (2008) thinking skills are a means to achieve educational goals so that students are able to solve problems at a higher level.

At the stage of problem orientation, students can analyze the information presented. The problems presented in the practicum guide in the form of discourse are sourced from news and journals related to the material of the motion system, circulation system and digestive system. The problems given in the practicum guide aim to arouse the curiosity of students by connecting theory with everyday life. Students are required to determine problem identification and formulate problems at the problem orientation stage.

The next stage is to develop and implement a plan. This stage is carried out so that students conduct a literature study to answer the formulation of the problem that has been made. Students think in groups to relate the problem to the practicum guide by conducting a literature study so that the problem can be solved optimally.

Then the stage of determining the solution, students present the results of the discussion by presenting in front of the class. At this stage, group discussions are carried out. At this stage, students are also trained to be responsible for answering problems in the practicum guide during the discussion. The courage possessed by students to express opinions requires students to make presentations in front of the class.

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The last stage is evaluation, students assess the strengths and weaknesses of other groups and then make conclusions. The presenter group looks for answers

from the responses that have been given by other groups. Then the teacher evaluates the results of the discussion and together concludes the learning materials contained in the practicum guide.

IV. CONCLUSION

Based on the development and testing of Problem Based Learning to improve critical thinking skills of students in class XI SMA, it was concluded that the results of the validity and practicality tests met the very valid criteria. The results of the effectiveness test have effective criteria.

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