



How are Teachers and Students' Perceptions of Problems with Practicum-Based Learning Methods and Media to Improve Students Critical Thinking Skills

Ervi Dwi Susanti^{a*}, Lambang Subagiyo^b, Elsje Theodora Maasawet^c

^{a,c} Dept. Biology, Mulawarman University, East Kalimantan, Indonesia

^b Dept, Physics, Mulawarman University, East Kalimantan, Indonesia

^aEmail: ervisusanti95@gmail.com, ^bEmail: lambang_subagiyo@unmul.ac.id, ^cEmail: emaasawet@gmail.com

Abstract

The purpose of this study is to find out the perception of teachers and students towards the problems of practicum-based learning methods and media to improve the critical thinking skills of students in grade XI. The research was carried out from December 9, 2021 to January 27, 2022 with a sample of all grade XI teachers and ten students in each grade XI at State High School 5, 11, 13, 17 and Wahidiyah Samarinda Senior High School. Qualitative descriptive is used as a research method by interviewing teachers and students. The results of the perception of teachers and students from the results of the interviews are that not all biology materials in class XI carry out practicum activities and the students' low thinking ability. Practicum activities cannot be carried out due to constraints due to the availability of facilities and infrastructure, difficult maintenance of tools and materials, and limited teaching and learning time in the classroom. In addition, the lack of skills of students in using tools and materials that can endanger students and the damage of practicum tools also affects practicum activities. The low ability to think critically is due to the cognitive score of students not always reaching the Minimum Completeness Criteria score and low interest in asking questions in the learning process. Therefore, it is necessary to develop practicum-based media (virtual lab) in collaboration with a guided inquiry model to support the learning process and improve students' critical thinking skills.

Keywords: critical thinking; learning media; learning methods; practicum.

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* Corresponding author.

1. Introduction

Biology is a branch of science that studies living things and nature. In the process of learning biology, not only learning about theories or concepts, but students must also be able to make observations, experiments, observations and analyses to prove a fact contained in the concepts that have been learned by carrying out practicums. Practicum can be carried out in laboratories, namely places to carry out scientific research, experiments, measurements, and scientific training [6]. An effective learning resource is a laboratory to achieve the expected competencies for students [6].

Lately, the world is being hit by a deadly, fatal and detrimental outbreak for health and education. Where all educational activities must be temporarily diverted until an undetermined time for safety for the whole world, including Indonesia. Over time, the Ministry of Education and Culture of Indonesia (2021) responded to the conditions of the Covid-19 pandemic by providing a dynamic learning policy for the 2021/2022 school year. Dynamic is limited face-to-face learning by prioritizing the vigilance, safety, and health of school residents. Students who attend the class are limited to a maximum of 50% of all students. Learning time in the classroom is also limited by each school and implements strict health protocols. So that some students are still learning from home online and must rotate with students who carry out face-to-face learning. The policy raises pros and cons in schools and parents. Because the final decision of students can be carried out face-to-face or not with parental consent [8].

Based on the results of observations that have been carried out in five schools, including State High School 5, 17, 11, 13 and Wahidiyah Senior High School in Samarinda, it is known that limited face-to-face learning is also applied to the five schools. In the five schools, the allocation of learning time which was initially 45 minutes in each learning hour was cut to only 35 minutes. The school implements a system of attending students in turn and only 50% of students every week attend face to face lessons in class and the remaining 50% do online learning. Students who attend the class have received approval from their parents/guardians. This certainly makes students and teachers carry out the learning process ineffectively and efficiently.

The implementation of the limited face to face learning policy greatly affects practicum activities at school because of the restrictions on learning time and also students who have to go online from home. In the 2013 curriculum of Senior High School grade XI, all biology subject matter requires proof or practicum. So that teaching and learning activities in the classroom in the new normal era certainly do not run as before and teachers and students must be able to adapt to these conditions. Teachers must be able to use and create learning media to bridge practicum activities carried out at school and online.

Learning media is an instrument or tool used in the teaching and learning process to provide direct understanding to students. Learning media can also make it easier for students to understand abstract material, increase learning independence and learning can take place more vividly [4]. Media can stimulate the development of students to think critically by using imagination, abilities and attitudes, thus giving rise to creativity and innovative works. Media can increase the efficiency of the learning process, because it can reach students in different places, and in an unlimited scope of time. Learning media can solve educational problems both in the micro and macro scope.

Thus, the use of media in learning is a necessity that cannot be ignored because media is a source of learning in the form of living things, objects, or events so that students acquire knowledge, skills, and attitudes. Media can generate motivation, and facilitate interaction between teachers and students [11]. Based on these problems, the researcher wants to find out the perception of teachers and students towards the problems of practicum-based learning methods and media to improve the critical thinking skills of students in grade XI.

2. Research Methods

The method used in this study is qualitative descriptive research. Qualitative research is research used to obtain descriptive data obtained through written or spoken words and attitudes from informants [10]. Qualitative research aims to gain understanding/meaning about a problem obtained from a natural setting and not the result of the treatment or manipulation of the variables involved [5].

Table 1: Interview Guideline Instruments for Teachers and Students

a. Guidelines for Teachers		
Aspects	Criterion	Number of Grains
Biology subjects	Minimum completeness criteria and constraints on the material	2
Learning methods	Method types	1
Media	Alternative use of media, components and importance of media, learning resources, use of mobile phones and the availability of the internet in schools	7
Internship	Types of practicums, constraints and availability of laboratory equipment	4
Critical thinking skills	Student activity	3
b. Guidelines for Students		
Aspects	Criterion	Number of Grains
Biology Subjects	Minimum completeness criteria, interest and constraints on the material	5
Media	Alternative media use, types of media used and interesting, learning resources and internet availability	5
Internship	Types of practicums, obstacles, implementation and implementation of practicum	5
Critical thinking	Student activity	1

This research was carried out from December 9, 2021 to January 27, 2022 with a sample of all grade XI teachers and ten students in each grade XI at State High School 5, 11, 13, 17 and Wahidiyah Samarinda Senior High School. So that the number of samples in this study is 9 teachers and 88 students.

Data collection in this study was conducted with interview activities to obtain primary data that focused on the use of practicum-based learning media methods in schools. The instrument used as an interview guideline can be seen in table 1. Then the data is analyzed using data reduction steps, data display and drawing conclusions [12].

3. Results and Discussion

The results of interviews and observations that have been conducted on Biology teachers in Senior High Schools with different Accreditations are presented in table 1 below:

Table 2: Results of Teachers' Interview Responses to Biology Learning in Class XI

Question	Teacher's answer conclusion		
	School*	School**	School***
What are the cognitive learning outcomes of students in biology subjects?	Always reaching the Completeness Criteria, only some students do not meet the Minimum Completeness Criteria during the daily test.	Always reaching the Minimum Completeness Criteria, only some students do not meet the Minimum Completeness Criteria during daily tests.	Always reaching the Completeness Criteria, only some students do not meet the Minimum Completeness Criteria during the daily test.
Are there any obstacles in the process of delivering material in class?	There is one school that has no obstacles and two schools have obstacles in the process of delivering Biology material	Limited learning time and practice media	The school does not have a projector so the learning source is only from books and materials delivered by teachers
What are the types of learning resources that teachers have used in class?	Teachers use two types of offline and online learning resources. Offline resources such as books, articles/modules/printed teaching materials, teaching aids and learning media. Web, e-book, video Source	In offline form such as books, animations on Power Points props (insectarium, herbarium and others)	Offline like student books and worksheets
What are the methods that teachers use most in biology learning?	Discussions, demonstrations, online learning, questions and answers, lectures, assignments, experiments	Discussion methods, online learning, question and answer and demonstration	Discussions, Q&A, lectures and assignments

Question	Teacher's answer conclusion		
	School*	School**	School***
	and practicum in the laboratory		
What are the alternative media that are often used by teachers in the classroom?	Learner worksheets, Power Point, animations, videos and real images	Power Point, props, videos and real images	Props, real pictures and animations from books
What components should be present in learning media?	Theory, real images, videos, evaluation questions, summaries, experiments/proofs, lists of difficult words, and animations	Summary and images	Theory, real pictures, videos, evaluation questions, summaries, case studies, experiments/proofs, lists of difficult words and animations
Have teachers ever carried out practicum activities in Biology learning?	Once, but in the previous year due to time restrictions and restrictions on the number of students who can attend class in the new normal learning	Before the pandemic and learning was carried out online and the implementation of new normal learning, practicum was carried out	Never, but never again after the new normal learning due to time restrictions and restrictions on the number of students who can attend class
What types of practicum are often carried out during learning?	For class XI materials, all of them do practicum Practicum with materials that are easy to find in the school environment and students' homes	Only the type of practicum does not require chemicals such as membrane transport on cell matter, growth observation on plant tissue matter, and so on	It is difficult to carry out practicum, if you only do practicum with materials that are easy to find in the school environment or students' homes
Are there any obstacles in the implementation of practicum in the laboratory?	Microscopes are moldy because they are not maintained, so that only a few microscopes can function, as well as the lack of procurement of objects and preparations in the laboratory, lack of skills of students in using tools and materials that can endanger students	This school does not yet have a laboratory room, so practicum can only be carried out in a classroom and can only carry out practicum that does not require chemicals that require a special room to store it.	This school does not have facilities and infrastructure to support practicum activities such as laboratories, tools and chemicals

Question	Teacher's answer conclusion		
	School*	School**	School***
	and damage to practicum equipment		
What microscopes are available in school laboratories?	Light microscope	Microscope stereo	Does not have
Is it in biology learning that students are active in asking questions?	Only a small number of students are active, and most students are passive and never ask questions depending on the material being taught	Only a small number of students are active, and most students are passive and never ask questions depending on the material being taught	Only a small number of students are active, and most students are passive and never ask questions depending on the material being taught
Do students always think critically in learning, practicum and discussion?	Most learners	Only a small percentage of students	Only a small percentage of students
Do students have difficulty answering practice questions and exams in biology subjects?	Still on some material	Still on some material	Still on some material
Is it allowed to use mobile phones at school? How does the internet connection in schools have good quality?	Can use mobile phones and the internet quality is very good	It is allowed to use mobile phones, the internet quality is good and sometimes there is interference in the network	Because the school is affiliated with the pesantren so it is not allowed to use mobile phones and the internet quality is good
What do teachers think about the importance of developing learning media in schools?	It is very important because learning media is useful to make it easier for teachers to deliver teaching materials and is useful for students to understand the material delivered more quickly, supporting the quality of education	It is very important that learning becomes more interesting and students do not get bored with the lecture method in class	It is very important, to support learning activities in the classroom and make it easier for students to understand the material
What kind of media alternatives must be developed in learning in	Teaching materials, journals, Power Points , teaching aids, websites,	Power Point, real videos and images, animation and practicum-based	Teaching materials, Power Point, teaching aids, websites, real

Question	Teacher's answer conclusion		
	School*	School**	School***
this modern era?	videos and real images, animation and practicum-based media	media	videos and images, animation and practicum-based media
Have teachers ever developed practicum-based learning media at school?	Never, because of limited capabilities and still not knowing the picture of the media that will be made	Never, because of the lack of knowledge about making media with a coding system	Never due to lack of human resources and time

Description: *Accredited school A (State Senior High School 5, 11 and 13 Samarinda), ** Accredited school B (State Senior High School 17 Samarinda) and *** Accredited school C (Wahidiyah Senior High School Samarinda)

Based on the results of interviews and observations that have been conducted, Table 2 above shows the results of the responses of 9 teachers to Biology learning in grade XI obtained from 17 interview questions. Practicum cannot be carried out in schools because it is constrained by the availability of facilities and infrastructure, difficult maintenance of tools and materials, and limited teaching and learning time in the classroom. In addition, the lack of skills of students in using tools and materials that can endanger students and the damage of practicum tools also affects practicum activities. Science learning such as biology, practicum plays an important role [1]. Some schools do not have laboratory rooms so practicum is carried out in classrooms, so not all types of practicum can be done. Such as practicums that require certain materials and tools that require special care and handling.

Table 3: Results of Student Interviews in Class XI Biology

Question	Conclusion of the student's answer		
	School*	School**	School***
Do you like biology subjects?	• 76.66% of students like biology	• 70.00% of learners love biology	• 75.00% of learners love biology
	• 23.33% of students disliked biology	• 30.00% of learners dislike biology	• 25.00% of students dislike biology
What is your biological value? Is it always above the Minimum Completeness Criteria in each material?	• 78.33% of students always achieve the Minimum Completeness Criteria	• 80.00% of learners always achieve the Minimum Completeness Criteria	• 62.50% of learners always meet the Minimum Completeness Criteria
	• 21.67% of learners do not always meet the Minimum Completeness Criteria	• 20.00% of learners do not always meet the Minimum Completeness Criteria	• 37.50% of learners do not always meet the Minimum Completeness Criteria

Question	Conclusion of the student's answer		
	School*	School**	School***
Are there any obstacles in understanding the Biology material in class?	Difficulty understanding scientific theories and words	Difficulty understanding scientific theories and words	Difficulty understanding biological concepts and their application
Which biology subject do you find difficult to understand?	Cell matter, and some topics of plant and animal tissues	Cell matter, and some topics of plant and animal tissues	Cell matter, and some topics of plant and animal tissues
What kind of biology learning interests you?	Games, animated videos, demonstrations and practicums	Games, animation videos and practicum	View animation videos and practicum
Do you always ask questions in class about biology learning?	18.33 %Active asking 73.33%Passive asking 8.33 % never asked	25.00% Active asking 60.00% Passive asks 15.00% Never ask	25.00% Active asking 62.50% Passive asks 12.50% Never ask
Is practicum always carried out in biology material?	No, depending on the material, availability of tools and materials	No, depending on the material, availability of tools and materials	No, depending on the material, availability of tools and materials
What practicum is often done on biology material?	Membrane transport (diffusion and osmosis)	Membrane transport (diffusion and osmosis)	Membrane transport (diffusion and osmosis)
Are there any obstacles when carrying out practicum?	Difficult to find tools and materials	Difficult to find tools and materials	It is difficult to find tools and materials because most students stay at school (hostel)
Is practicum always carried out in the school laboratory?	Not	Not	Not
Have you ever carried out a computer-based practicum at school?	State High School 5 and 11 Samarinda have never implemented, while for State High School 13 Samarinda has implemented	Never	Never
What are some of the learning resources you often use?	Books, Student Worksheets, articles and the internet	Books, Student Worksheets, articles and the internet	Books, and Worksheets for Students
What learning media do you think are more interesting to use in biology learning?	Images, video animations and demonstrations	Images, video animations and demonstrations	Video animation

Question	Conclusion of the student's answer		
	School*	School**	School***
Can you easily access learning resources and learning media anytime and anywhere?	The internet can be used anywhere and anytime	The internet can be used anywhere and anytime	No, because books are difficult to use everywhere
What should a media contain?	Materials, images, videos, animations and sample questions	Materials, images, videos, animations and sample questions	Images, materials, animated videos
Does the internet connection at your school have a good connection?	Yes, but sometimes the network is also a nuisance	Yes, but sometimes the network is also a nuisance	Yes, but sometimes the network is also a nuisance

Description: *Accredited school A (State Senior High School 5, 11 and 13 Samarinda), ** Accredited school B (State Senior High School 17 Samarinda) and *** Accredited school C (Wahidiyah Senior High School Samarinda)

The data from the interview results in table 3 was obtained from 88 student respondents. In accredited school A (State High School 5, 11 and 13 Samarinda), data were obtained from 60 respondents, accredited school B (State High School 17 Samarinda) 20 respondents, and accredited school C (Wahidiyah Senior High School Samarinda) 8 respondents.

The results of the interview showed that Biology lessons were interesting for students because they learned about living things and the environment that can be found in daily life. However, biology is also difficult for students to understand because it is difficult to understand scientific and theoretical words and the difficulty of proving something that cannot be seen with the eyes directly. Based on the results of the interview, students experienced difficulties in biological metrics that could not be seen directly, such as the subject of cells, plant tissues, and animals. This is evidenced by the average number of students who do not like Biology lessons of 26.11% and 26.39% of students do not always achieve the Minimum Completeness Criteria value in each biology material. This average shows the low critical thinking ability of students in dealing with the problems given by the teacher in the classroom. Another thing that shows the low critical thinking ability of students is shown by scores that do not reach the Minimum Completeness Criteria and interest in asking questions in class. The average student who asked questions was active at 22.78%, passive at 65.27%, and never asked at 11.94%.

The results of interviews with teachers and students of class XI in tables 2 and 3 can be concluded that not all biology materials in class XI carry out practicum activities and the students' thinking ability is low. The low ability to think critically is shown by the low cognitive score of students who do not achieve the Minimum Completeness Criteria because in the learning process students are still not active in asking questions. So it can be said that students only receive material presentations from teachers, without exploring the material that has been delivered by the teacher in more depth.

Thinking is defined as the process of examining a problem through various questions and connecting knowledge appropriately [2]. The thinking ability that must be possessed by students in the learning process is critical thinking skills. Critical thinking is the process of thinking intellectually using reflective, independent, clear and rational thinking [3].

The ability to think critically can encourage students to come up with new ideas or thoughts about problems about the world, especially in biology subjects. Questioning activities can start the process of formulating a problem that occurs to train students' critical thinking skills. In addition to formulating problems, critical thinking skills also need to combine facts and ideas with the process of analyzing and evaluating [13]. Students are trained to select various opinions, so that they can distinguish which opinions are relevant and which are irrelevant, as well as which opinions are correct and incorrect. Thus, helping students make conclusions by considering data and facts that occur in the field. This is in accordance with the indicators of critical thinking skills put forward by Angelo systematically, namely the skills of analyzing, synthesizing, recognizing and solving problems, concluding and evaluating or assessing [13].

Efforts that can be made to improve critical thinking skills from research results require a learning process that can make students more active and can prove biological concepts and theories that have been conveyed by teachers. One way that can be done is by conducting practicum-based learning and training students' critical thinking skills. One of the practicum-based learning models that can be applied in schools is the inquiry learning model. Results of previous research by Putri and his colleagues. (2022) it shows that the use of the guided inquiry learning model can improve students' critical thinking skills with the initial ability of students increasing from 25.20 to 57.23 [10]. Guided inquiry is also one of the learning models recommended by the 2013 curriculum [8].

In addition to the learning model, learning media also plays an important role in supporting practicum activities that cannot be done face-to-face. Practicum can be done virtually. Virtual lab is a representation of a laboratory adapted from a real laboratory to software. An object that cannot be seen by the naked eye can be visualized with a virtual laboratory, students will more easily understand a concept so that they do not only focus on words and illustrations in books. Virtual laboratories can overcome a variety of limited resources and can be multiplied so that they do not require high costs [14].

To overcome the problem of school unpreparedness in providing practicum services directly in the laboratory. These problems can be overcome with learning media that help teachers overcome problems in the laboratory such as virtual laboratories. Therefore, it is necessary to develop practicum-based media (virtual lab) in collaboration with a guided inquiry model to support the learning process and improve students' critical thinking skills.

4. Conclusion

Based on the results of the above research, it can be concluded that not all biology materials in class XI carry out practicum activities and the students' low thinking ability. Practicum activities cannot be carried out due to constraints due to the availability of facilities and infrastructure, difficult maintenance of tools and materials, and

limited teaching and learning time in the classroom. In addition, the lack of skills of students in using tools and materials that can endanger students and the damage of practicum tools also affects practicum activities. The low ability to think critically is due to the cognitive score of students not always reaching the Minimum Completeness Criteria score and low interest in asking questions in the learning process. Therefore, it is necessary to develop practicum based media (virtual lab) in collaboration with a guided inquiry model to support the learning process and improve students' critical thinking skills.

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