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The implementation of osmosis practicum during the COVID-19 pandemic

Lissa Lissa[1]*, Nur Subkhi[1], Ipah Budi Minarti[2]
[1]Department of Biology Education, Faculty of Teacher Training and Education Universitas Wiralodra, Jl. Ir. H.Juanda Km. 3 Indramayu, West Java, Indonesia
[2]Department of Biology Education, FPMIPATI, Universitas PGRI Semarang, Jl. Sidodadi Timur no. 24 Semarang Central Java Indonesia
Corresponding email: *lissa@unwir.ac.id

ABSTRACT

Biology lessons conducted online during the COVID-19 pandemic have hampered school implementation practicum activities. Therefore, it is necessary to conduct research that aims to describe the implementation of biology practicum during online learning. This research was conducted to determine the impact of online osmosis practicum during the COVID-19 pandemic in class XI MIPA 4 SMA Negeri 1 Sindang with a sample of 27 students of class XI MIPA 4 and 1 biology teacher. The method used in this research is descriptive qualitative. The sampling technique was carried out by the purposive sampling method. The instruments used are observation sheets, questionnaire sheets, interview sheets, documentation, and field notes. The data analysis technique used is descriptive qualitative analysis. The osmosis practicum process is carried out independently by students using the guidance from the teacher provided. The practicum results are then reported in an activity video, and the teacher will check the video. The results of the research carried out showed that the implementation of the osmosis practicum went well. The readiness of the tools and practicum materials is in the very good category, students' understanding of doing practicum is in a good category, the conclusions are in a good category, and the practicum report is in the very good category. From the results obtained, it can be concluded that the implementation of the osmosis practicum in class XI MIPA SMA Negeri 1 Sindang was carried out online is implemented properly and effectively.

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INTRODUCTION

Biology learning is one of the science branches that contains many exciting learning experiences for students to quickly understand the process and concept (Tal & Tsaushu, 2018; Taşdelen & Güven, 2021). Biology learning becomes interesting when related to the application and benefits of real-life conditions (Mutanen & Uitto, 2020). Biology is a discovery process and a practicum is needed in the learning process (Tal & Tsaushu, 2018; Handayani, 2020). Practicum is one activity that allows the students to examine, apply and practice the theory they got (Vekli & Nazli, 2020; Widiatry, 2016). In addition, the practicum is also be used as a strategy to improve students' learning interests to get more understanding and develop their concepts (Hamidah et al.,

2014). Practicum learning is carried out in the laboratory and surrounding environment, so the students are more motivated (Variyan & Reimer, 2021). An effective practicum learning process students a better understanding of and master biology concepts compared to those who study without practicum learning (Baken et al., 2020; Sudesti, 2013).

The COVID-19 Pandemic impacted the education field, specifically the online learning process (Nisiforou et al., 2021). It affected the practicum activity that could not be held in the school laboratory (Variyan & Reimer, 2021). According to Kurniati et al. (2021), practicum learning is difficult to implement during online learning. It demands the teacher to have an alternative strategy so the students can get practicum learning. Practicum is essential in Biology learning (Baken et al., 2020), so the implementation should be considered in any situation, such as online learning during the COVID-19 Pandemic. Most teachers still conducted practicum during the COVID-19 Pandemic by asking the students to make practicum videos, and other supported and relevant assignments (Kurniati et al., 2021). The assessment of the presentation videos is an alternative way to assess individual practicum (Hendriyani & Novi, 2020). According to Moore et al. (2020), a practicum demo done by the teacher complete with an explanation and discussion is an alternative method of practicum during the COVID-19 Pandemic.

Many teachers are challenged to conduct online practicum. This fact is supported by Khusnah (2020), on science teachers in Jember that 33% of practicums were successfully conducted, and 67% of practicums were not successfully conducted. Sholikah et al. (2020), argued that failed practicum was due to the difficulties in finding substituting activities for the practicum. This condition happened in SMA Negeri in Indramayu. Generally, the Biology practicum was conducted at home independently. Before the outbreak of the COVID-19 Pandemic, the osmosis practicum was conducted directly at the school laboratory, but it could not be done during the pandemic. It urged the teacher to find innovation for the practicum learning conducted online. The challenges during online practicum are that the students were not disciplined to submit the practicum report; some were late, and others did not conduct the practicum correctly. The osmosis subject is a material that requires an explanation for its basic concept and needs to be proven by the experimental method. In Addition, the practicum allows the students to apply meaningful learning of the osmosis concept in daily real-life situations. It is necessary to conduct the research that aims to describe the implementation of the osmosis practicum during the COVID-19 Pancemic in SMA Negeri 1 Sindang.

METHOD

This research utilises descriptive qualitative research to describe the implementation of the osmosis practicum during the COVID-19 Pandemic at class XI MIPA 4 SMA Negeri 1 Sindang. The research subjects are 27 students of class MIPA 4 in SMA Negeri 1 Sindang academic year 2020-2021 and one biology teacher. This research used a purposive sampling technique that aimed to take the sample experienced in an online osmosis practicum.

Primary data in this research was taken from the observation result of the osmosis practicum. The forms of the data are observation sheets and questionnaires. Meanwhile, the

secondary data was taken from the biology teacher's responses to an interview about an online osmosis practicum. The comprehensive online osmosis practicum datas are taken from the checklists sheet and documentation through the field notes. The data collection technique was carried out by observing the students' practicum videos which were sent to Google Classroom, distributing Google Forms, conducting online interviews through Google Forms, completing the documentation for the checklist form from the teacher, and noting the field notes during the research.

The data analysis technique in this research was conducted in three steps of the analysis model Denzin & Lincoln, (2009): data reduction, data display, and conclusion drawing/verification. The data reduction was used to collect initial data from the research that matched the target, was obtained, and carried out on data generated from interviews, checklist sheets, and field notes. For the data display, this data was used for the data that has met the research targets of all instruments as well as for the verification stage. The practicum stage indicators to describe the implementation of online osmosis practicum during the COVID-19 Pandemic were adapted from Tesch & Duit (2004). They are 1) readiness of practicum tools and materials; 2) understanding of the practicum, 3) drawing conclusions, and 4) practicum report.

RESULTS AND DISCUSSION

The osmosis practicum was conducted independently by considering the instructions given by the teacher. The students completed the practicum independently at home by recording the practicum process and then sending it to the teacher. The teacher then observed the practicum video. The results are presented in Table 1.

Table 1. The observation data of the osmosis practicum implementation

No.	Practicum Stages	Indicator	The indicator percentage	The Criteria of Indicator	The Criteria of Stages
1	Preliminary	The readiness of practicum tools	81.5%	Very Good	Very Good
		The readiness of practicum materials	98.1%	Very Good	
2	Implementation	Do the practicum based on the practicum instructions	68.8%	Good	Good
3	Evaluation	Conclusion	74.1%	Good	Very Good
		Practicum Report	96.3%	Very Good	
Average Score			**83.8%**	**Very Good**	**Very Good**

To validate the observation data, the researcher distributed the questionnaire via Google Form to independently ask the students' responses during the implementation of the osmosis practicum. The result is presented in Table 2.

Based on Table 1, the preliminary stage with the tools and material readiness indicator has very good criteria with 89.9%. This result is similar to the questionnaire in Table 2, the readiness of tools and materials in the good criteria. This result was due to familiar and easy-to-find tools for the students a knife, transparent plastic bowl, and spoon. In comparison, the materials needed in this

practicum were carrots, sugar liquid, and clean water. The simple meaning of this practicum is that the students easily provide the tools and materials to hold the practicum well (Winangun, 2021).

Tabel 2. The questionnaire data of the osmosis practicum implementation

No.	The Practicum Stages	Indicators	Percentage	The Criteria of Indicator	The Criteria of Stages
1	Preliminary	The readiness of tools and materials	69.7%	Good	Good
2	Implementation	The practicum method	75.7%	Good	Good
		Understanding of practicum	77.0%	Good	
3	Evaluation	Conclusion	76.9%	Good	Good
		The practicum report	78.1%	Good	
Average Score			**75.5%**	**Good**	**Good**

The teacher's interview result reported that the important part of planning an independent practicum is considering whether the practicum will be run well when it is done at home. The considerations are about the complexity of the tools and materials, the procedures, the clear instructions, and guidance to the students in preparing the tools and materials by connecting online with them so the teacher will know when they encounter problems. This result is in line with Hendriyani & Novi (2020), which stated that the implementation of an online practicum would be run effectively and correctly by selecting the appropriate topic and considering easy tools and materials so the students can creatively and independently provide the practicum by self (Vekli & Nazli, 2020).

The practicum implementation stages based on observation and questionnaire results have good criteria. This result means the students could do the practicum based on the instructions. The teacher's interview result reported that most of the students had done the practicum correctly. The instruction was explicit enough, so they were easily and on time for the independent practicum. Based on Table 1, in the implementation stage, there is one indicator: do the practicum based on the instructions. This indicator has three activities that are assessed and presented in Table 3.

Table 3. The indicator data to do the practicum based on the practicum instructions

Indicator	Activities	Percentage	Criteria
Do the practicum based on the practicum instructions	The students are able to cut and peel the carrot cub correctly and efficiently	77.8%	Good
	The students are able to punch a hole in the middle part of the carrot to form a tube	53.7%	Enough
	The students are able to fill the bowl with water and put the carrot that was filled with sugar correctly based on the practicum instructions	86.1%	Very Good
	The students are able to note the observation data result	57.4%	Enough
Average Score		**68.8%**	**Good**

The first activity has good criteria because most students cut the lower carrot cub and peeled the carrot correctly and efficiently. The second activity has enough criteria. The hole created by the students in the carrot was correct and neat. During the practicum, the students needed a longer

time to punch a hole in the carrot. This result showed that they had trouble with this activity. The third activity has very good criteria. It can be seen in the students' practicum videos that they filled the bowl with water, put the sugar liquid in half of the carrot hole, and then put it in the bowl easily and quickly. The fourth activity has enough criteria. It can be seen that only some students who had noted the observation result in their notes or paper during the pre and post-osmosis process. The students noted the practicum result qualitatively by measuring the height of water and sugar liquid using a ruler. The teacher's interview result reported that few students had conducted the practicum process incorrectly. In some practicum implementations, some students had not paid attention to the practicum instructions, which caused different results practicum (Siburian et al., 2017).

Based on the questionnaire result in the implementation stage, there are two measured indicators; 1) Practicum method; dan 2) Understanding of the practicum. The practicum method indicator has good criteria. This result indicated that the independent osmosis practicum method was conducted very well. Based on the teacher's interview result, the teacher stated that doing the practicum during the pandemic has some limitations and challenges. The practicum was conducted independently, so the teacher needs more appropriate consideration to have the practicum run well. This result aligns with Frima et al. (2020), that independent practicum was done correctly because the students had understood the practicum steps. The practicum is effectively run by considering the instructions given by the teacher (Baken et al., 2020).

The indicator of understanding the practicum has good criteria. This result shows that most of the students had understood the osmosis practicum. Based on the interview results, the teacher stated that the students had understood how to use the tools and materials for the osmosis practicum. The teacher measured students' understanding of the membrane transport material by evaluating reports, discussing practicum results, and daily test assessments. Discussions during the online practicum can help students understand the practicum material (Saraswati & Mertayasa, 2020). The teacher stated that most students understood the osmosis material, and some still had difficulties. The practicum implementation makes students understand the membrane transport material better than without the practicum (Vekli & Nazli, 2020). The lack of understanding of the material being practiced is one of the obstacles to implementing online practicums (Setiyaningsih et al., 2021).

The evaluation or post-practicum stage has two indicators; conclusions and practicum reports. Based on the observations, the conclusion indicator has good criteria by the questionnaire results, which shows that the conclusion indicator has good criteria. This result indicates that students were good at concluding and relating the practicum result to the appropriate theory. Drawing conclusions with other theories can increase the accuracy and truth of observations (Ananda & Fadhli, 2018). Based on the practicum video, most students could conclude correctly and were accompanied by the appropriate theory. However, some students had drawn wrong conclusions, and other students had not concluded the practicum results. Based on the teacher's interviews, some students concluded that the practicum results did not match the theory. To equate perceptions and avoid misconceptions, the teacher provides conclusions on the material from the

practicum results to students through group chat discussions. Following research (Faizah et al., 2016), discussion activities can minimize the occurrence of misconceptions in science learning.

Based on the observations, the practicum report indicator has very good criteria. This result is not much different from the practicum report indicator questionnaire, which has good criteria. The time to complete the osmosis practicum and submit reports is August 6-12, 2021. Almost all students had submitted practicum reports according to the time set by the teacher. This result is in follows the interview results, and the teacher stated that the time to complete the practicum was sufficient to do the practicum independently and make a report. The teacher indicated that students were not on time to collect practicum reports. This result follows research by Bajri et al. (2021), that most students have submitted reports on time. Only a few students are late in submitting practicum reports because they are constrained in understanding systematics.

In this osmosis practicum, the teacher makes it easier for students to make practicum reports by providing a simple format. The teacher's effort in carrying out online practicums is by providing a simple and easy format or form of practicum reports for students to work (Wahyuningtias et al., 2021).

Based on the observation of the practicum video, the challenges that occurred when carrying out the practicum are that some students have limitations in providing tools and materials according to the practicum instructions. Some students have not done the practicum according to the instructions, so the practicum is not following the theory. Some students had not understood the practicum materials and still had difficulty concluding the practicum results. Based on interviews, the challenges faced by the teacher in implementing the practicum were not being able to guide directly, the practicum objectives were not achieved, and misconceptions. The challenges are also about limited tools, materials, and procedures. The solution to these challenges is remote guidance (Nisiforou et al., 2021), answering student questions related to practicum, evaluating students, and discussing the practicum results. The learning objectives in the practicum cannot be fully achieved through the online process (Saraswati & Mertayasa, 2020). So teachers must guide students online to achieve learning objectives (Jauhari et al., 2021) and avoid misconceptions (Luzyawati & Hidayah, 2019).

CONCLUSION

The implementation of the osmosis practicum during the COVID-19 pandemic in SMA Negeri 1 Sindang includes the preliminary, implementation, and evaluation stages that were carried out independently. Based on the result of the observation and questionnaire the preliminary stage was classified as very good and good. The stages of implementation based on the observations and questionnaire are classified as good. At the same time, based on the results of observations and the questionnaire, the evaluation stage was classified as very good and good. Overall, the average stages of the implementation of the osmosis practicum have good criteria.

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