Student Learning Difficulties in Online Biochemistry Practicum: An Experiences during Covid-19

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Abstract

Background: Covid-19 pandemic changed all aspects of human life, including education. Biochemistry practicum activities that should be carried out in the laboratory must be done online. This study analyzes students' learning difficulties in carrying out biochemical online practicum in the Covid-19 pandemic era. Methods: This research uses the descriptive qualitative method. The Sample consisted of 63 respondents from students majoring in biology education at UIN Walisongo. The instrument used was a questionnaire with The Gutman scale. Data analyzed using percentage difficulty analysis. Results: the implementation of online biochemistry practicum experienced less difficulties. The percentage of barriers in the difficult category is, material mastery barriers 30.5%, practical implementation barriers 28.8%, internal barriers 25.8%, and external barriers 36.6%. Conclusions: Selection of appropriate learning methods and media is needed to make it easier for students to understand online practicum material.

Keywords: Biochemistry Practicum, Difficulty Learning, Online Learning, Pandemic

Introduction

Biology education students must take theoretical and practical courses to get their bachelor's degree. Biochemistry practicum is one of the compulsory subjects required by every student in the Department of Biology, Faculty of Science and Technology (FST), UIN Walisongo Semarang. This course supports Biochemistry theory. Practicum is an activity that has a vital role in improving teaching and learning outcomes (Baeti et al., 2014). Practicum is a way of presenting theories using experiments (Yeni, 2017). Materials that are practiced include the identification of carbohydrates, fats, and proteins and observing enzyme activity. Practicum activities are usually carried out directly or offline in the Biochemistry Laboratory with lecturers assisted by laboratory assistants. Practicum activities are often associated with students’ science learning in the laboratory, hoping to apply their knowledge in lectures (Melati, 2003). Existing activities in the practicum turned out to have a positive impact on improving student abilities. Ariyati
The pandemic has pioneered online learning simultaneously tertiary institutions. The existence of the Covid-19 education sector can be seen with schools' closure to one of them is education. The pandemic's impact on the This pandemic has an impact on various sectors of life, and caused by Sars-CoV2 and has hit almost worldwide rapidly (Abdullah, 2020; Balkhair, 2020; Benvenuto et al., 2020). This pandemic has an impact on various sectors of life, and one of them is education. The pandemic's impact on the education sector can be seen with schools' closure to tertiary institutions. The existence of the Covid-19 pandemic has pioneered online learning simultaneously almost all over the world (Bao, 2020; Goldschmidt & Msn, 2020).

Online learning is a learning experience by utilizing internet access assisted by mobile phones or computers (Kusuma & Hamidah, 2020; Zhu & Liu., 2020). Through this online learning, lecturers and students were learning with the teleconference. While online learning is the best solution, learning activities are not stopped, and the spread of Covid-19 can be reduced. However, online learning presents its challenges when applied; one of the challenges is how to keep the class active, especially in Generation Z (Herliandry et al., 2020). The benefit of online learning is facilitated teacher and students to make a learning interaction online. This interaction makes it possible to share papers, materials, and presentations. Meanwhile, online learning gives students the possibility to study anywhere and anytime (Hartanto, 2016).

Generation Z is a millennial generation that always uses the internet and social networks (Csobanka, 2016). Generation Z has a different approach and way of learning. This generation Z learning is unique and always involves “networking” (Nasution, 2020). Generation Z does not know the world without the internet, they have excellent device skills, and Social network sites are the primary platform for communication (Nagy, 2016; Nagy & Székely, 2012). Generation Z grows with advances in technology; Generation Z actively uses smartphones, which is not addictive; they use smartphones because it has become an essential part of their lives (Wijoyo, 2020).

Challenges in online learning can be overcome if there is good cooperation between students and lecturers. Without this cooperation, it can cause learning difficulties for students. difficulties in student learning can occur due to various barriers. When the barriers are not known to determine the solution to solve them, the learning objectives will not be achieved. Therefore, it is necessary to analyze to determine students’ difficulties, especially in biochemistry online practicum courses in the covid-19 pandemic era.

This research is still rarely carried out because the online biochemistry practicum has only been implemented since the pandemic covid-19. All of the procedures have been changed and have an impact on the students during online practicum. So this research is needed to determine the level of difficulty of students in carrying out online biochemistry practicum. The purpose of our study is to determine the learning difficulties of students in online biochemistry practicum in the pandemic era, which included four barriers of difficulties. Our study results are expected to be the basis for designing online practicum lectures to be effective and efficient so that learning objectives can be adequately achieved.

Methods

Research Design

This research used a qualitative descriptive method conducted during one semester of the 2019/2020 academic year. This research population was students of the Biology Education Department, Faculty of Science and Technology UIN Walisongo Semarang. The purposive sampling technique was used to focus on a particular characteristic of a population, and this research got a total sample of 63 students who were carrying out an online biochemistry practicum.

The questionnaire used an instrument adapted from Ilhamdi et al. (2020) and Faika & Side (2013) to measure each variable studied using the Gutman Scale. Questionnaires that included (1) material mastery barriers, (2) learning process barriers, (3) internal barriers, and (4) external barriers are distributed online via Google form.

Data Analysis

Data were analyzed using the analysis of the percentage of difficulty with the category 0-25% the category there was no difficulty, 26-50% the category had less difficulty, 51-75% the category had enough difficulty, and 76-100% the category had difficulty in the practicum (Ilhamdi et al., 2020).

Result

Analysis of student learning difficulties in online biochemistry practicum is known by filling out the questionnaire by students who have taken online biochemistry practicum course. The questionnaire questions are summarized in four barriers: mastering
material barriers, barriers to practical implementation, internal barriers, and external barriers. Based on the analysis result using the percentage of difficulties (Faika & Side, 2013; Ilhamdi et al., 2020), the percentage of difficulties obtained from various obstacles is presented in Figure 1.

![Figure 1. Percentage of types of barriers to the implementation of biochemistry practicum courses online.](image)

Based on Figure 1, it is known that external barriers are the highest learning barriers causing students learning difficulties, which is 36.6%. The detailed analysis of each obstacle will be presented in the following description.

Difficulties of student learning on the material mastery barriers are in the category of no difficulty, less difficulty, and enough difficulty. Based on the analysis results, it is known that students have difficulty analyzing the relationship between concepts, which is 55.6%. The percentages of each indicator in detail are presented in Table 1. as follows. The learning difficulties faced by students during the process of implementing biochemistry online practicum are in the category of no difficulty and less difficulty. In detail, the percentage of each indicator of student learning difficulties in carrying out online biochemistry practicum is presented in Table 1 too. Difficulties of student learning in online biochemistry practicum courses on internal barriers are no difficulties and less difficult. Student learning difficulties on external barriers are in the category of not having difficulties, lacking difficulty, and having enough difficulty. The highest percentage of external barriers is in many practical materials, which is 63.5%.

![Table 1. Student learning difficulties in material mastery constraints, practical implementation barriers, internal barriers, and external barriers.](table)

| Factors                      | Indicators                                      | Number of Respondents | Percentage of Difficulties | Difficulty Category |
|------------------------------|-------------------------------------------------|------------------------|----------------------------|---------------------|
| Mastery of the material      | Basic skills in biology                         | 63                     | 12.7%                      | No difficulty       |
|                              | Basic skills in chemistry                       |                        | 23.8%                      | No difficulty       |
|                              | The ability to understand the concept of matter |                        | 30.2%                      | Less difficulty     |
|                              | The ability to analyze the relationships between concepts |                        | 55.6%                      | Enough difficulty   |
|                              | The presence of lecturers                       | 63                     | 23.8%                      | No difficulty       |
|                              | The presence of assistants                      |                        | 41.4%                      | Less difficulty     |
|                              | The presence of students                        |                        | 4.8%                       | No difficulty       |
|                              | The lecturer was present on time                |                        | 30.2%                      | Less difficulty     |
|                              | The assistants was present on time              |                        | 47.6%                      | Less difficulty     |
|                              | The students was present on time                |                        | 17.5%                      | No difficulty       |
|                              | Availability of reference books                 |                        | 46%                        | Less difficulty     |
|                              | Lecturer learning methods                       |                        | 27%                        | Less difficulty     |
|                              | Assistant learning methods                      |                        | 42.9%                      | Less difficulty     |
|                              | The suitability of the assignment material      |                        | 3.2%                       | No difficulty       |
|                              | Lecturer explanation                            |                        | 17.5%                      | No difficulty       |
|                              | Assistant explanation                           |                        | 34.9%                      | Less difficulty     |
|                              | Media of Learning                               |                        | 47.6%                      | Less difficulty     |
| Practical Implementation     | Nothing motivation                              | 63                     | 27%                        | Less difficulty     |
|                              | Nothing interest                                |                        | 34.9%                      | Less difficulty     |
|                              | Nothing attention                               |                        | 12.7%                      | No difficulty       |
|                              | Impaired health                                 |                        | 28.6%                      | Less difficulty     |
| Internal                     | Do not feel calm                                | 63                     | 50.8%                      | Less difficulty     |
|                              | Physical and physical condition is disturbed    |                        | 46%                        | Less difficulty     |
|                              | Nothing tools                                   |                        | 20.6%                      | No difficulty       |
Discussion

Overall, the results of this research showed that in the implementation of the online biochemistry practicum, it was categorized as having less difficulty. The outbreak of Covid-19 across the globe has forced educational institutions to shut down to control the spread of this virus. This happening made the teaching professionals think of alternative methods of teaching during the lockdown. E-learning seems to be the forthcoming trend. It has been extending widespread. E-learning is best suited for everyone. Depending on their availability and comfort, many people choose to learn at a convenient time. This enables the learner to access updated content whenever they want it. Due to the wide set of benefits, it gives to students. E-learning has become quite popular among the students. E-learning has become quite popular among the students across the world particularly, the lockdown period due to the Covid-19 pandemic (Radha et al., 2020). This relates to the research subject, which is generation Z. Generation Z is a millennial generation that always uses the internet and social networks (Csobanka, 2016). Generation Z has a different approach and way of learning. This generation Z learning is unique and always involves “networking” (Nasution, 2020). Also, blended learning that combines learning face-to-face and online is already getting used to lecturers when teaching before a pandemic, so students are accustomed to learning by the internet.

The rapid development of the internet and the emergence of various applications and social media present new features that anyone can access. The use of social media wisely can be integrated into learning generation Z. In practice, social media can be used as an online class, a forum for discussion, a place to share learning materials, share videos and pictures, also share information links around lessons (Nasution, 2020). Following the explanation, social media use as a learning media will facilitate learning and teaching activities during the Covid-19 pandemic because it provides various features for communicating and sharing information.

Although students are already accustomed to using the internet for social networking or searching for information, specific barriers are felt by students, causing learning difficulties. Based on the results of the analysis, note that the learning difficulties of the highest mastery of material barriers exist in the indicator of the ability to analyze the relationship between concepts that is 55.6%. This finding guide us to give some solutions to improve the level of cognitive in the science education students. Higher order thinking skills (HOTS) are components of critical thinking skills and creative thinking skills that can be innovative, creative, and imaginative (Jaelani & Retnawati, 2016). One of the approach can be apply to improve HOTS is STEM that integrates the area of Science, Technology, Engineering, and Mathematics. Integrated STEM education has long been used to increase student HOTS because taught STEM, students develop key skills including problem solving, creativity, critical analysis, and independent thinking (Undang et al., 2019). STEM is a approach to focus problems from the real world which have a Science and Technology component from the student’s perspective, in which there are concepts and processes, then students are invited to investigate, analyze, and apply the concepts and processes to real situation.

Various factors can affect the cognitive abilities of students. One of them is facilities and infrastructure in learning. The use of internet-based applications such as Google classroom needs to be supported by the readiness of human resources to improve online learning, internet facilities, and the need to implement learning media to enhance learning activities in the classroom (Sabran & Sabara, 2019). Besides, lecturers also influence the ability of students to understand concepts. This can be seen from students’ teaching style, learning methods, and emotions to the lecturers concerned (Sucipto & Mauliddin, 2016). The level of cognitive also influenced by some factors, there are: internal factor (this factor related with physical factor and psychological factor) and external factor that related with learning atmosphere (Syah, 2009). Therefore, lecturers need to design appropriate learning so that the cognitive level of students can be increased.

The process of implementing biochemistry labs online is different from practicums in laboratories. So, it is necessary

| There is no book of practical | 30,2% | Less difficulty |
| Practical material a lot | 63,5% | Enough difficulty |
| Practical questions a lot | 39,7% | Less difficulty |
| Practicum questions are not following the practice material | 12,7% | No difficulty |
| Pre-test results were not returned | 42,9% | Less difficulty |
| Practicum schedule a lot | 38,1% | Less difficulty |
| Too many report | 27% | Less difficulty |
| Practical instructions are not compiled accordingly | 20,6% | No difficulty |
| There is no coordination between lecturers, assistants, and laboratory assistants | 33,3% | Less difficulty |
| The atmosphere of the house is uncomfortable | 50,8% | Less difficulty |
to choose the appropriate learning methods and media. In addition to the choice of methods and media, the supporting factors for online learning are students' readiness to improve online learning, internet facilities, and the need to implement learning media to enhance learning activities in the classroom (Sabran & Sabara, 2019). One of the obstacles in the process of online practicum implementation is learning media (47.6%). The learning media used are sourced from Youtube videos, which sometimes use English as the language of instruction. This makes students find it difficult to understand the purpose and objectives of the practicum video. Therefore, lecturers need to develop learning media appropriate to students' characteristics, situations, and conditions so that learning objectives can be adequately achieved.

Learning objectives can be achieved well if there is good cooperation between all parties involved in the learning process. Analysis of the level of difficulty of internal barriers most commonly felt by students in the less difficult category is on indicators of no interest (34.9%), impaired health (28.6%), and no motivation (27%). This happened because there were differences in the implementation of the practicum directly from the online practicum. Besides, according to Rohwati (2012), the selection of learning media that is less precise can reduce the interest and motivation of students in participating in learning. High internet usage also allows the influence or impact of student health (Herliandry et al., 2020).

Analysis of students' level of difficulty on the aspect of external barriers is one indicator that falls into the category quite difficult; one of the difficulties in this barries is too much practical material (63.5%). Practicum material carried out online is a lipid test, saponification reaction, bromelain and papain enzyme test, amylase enzyme in yeast and saliva, and vitamin C test (benedict reagent, FeCl3, lugol). Too much material will make students bored because everything is studied online. Whereas for the less difficult category, there are several indicators (Table 4), one of which is the uncomfortable home atmosphere (50.8%). Widodo et al. (2016) said online practicum has several advantages, including: reducing the risk of experimental activities that are too dangerous, reducing costs for materials, students can repeat demonstrations on the material at any time and students can learn from various sources. But, an uncomfortable home atmosphere will cause students to not focus on attending the online lab, so much material is poorly understood. Besides, a slow internet network can be an obstacle for students at any time (Khasanah et al., 2020). Therefore, learning strategies to help students' understanding of online practicum material are important to adjust to the conditions of each student's residence, so as not to burden parents and students themselves.

**Conclusion**

Based on the study results, it can be concluded that the difficulties faced by Walisongo UIN students in biochemistry online practicum activities are in the less difficult category. The percentage of each obstacle that resulted in student learning difficulties are external barriers (36.6%), material mastery barriers (30.5%), practical implementation barriers (28.8%), and internal obstacles (25.8%). Finally, researchers suggest that online biochemistry practicum activities pay attention to the influencing factors during the online practicum activity process. It is necessary to select appropriate learning methods and media to make it easier for students to understand online practicum material.

**Declaration statement**

The authors reported no potential conflict of interest.

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