



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

Rahmah Qonita^{1*}, Muhammad A'tourrohman¹, Ulwiyah¹, Erna Wijayanti¹

¹Walisono State Islamic University, Jl. Prof. Dr. Hamka, Tambakaji, Kec. Ngaliyan, Kota Semarang, Jawa Tengah, Indonesia 50185

* Correspondent Email: rahmahqonita95@gmail.com

ARTICLE INFO

Article history

Received: 12 Sep 2020

Accepted: 17 Mar 2021

Published: 30 Apr 2021

Keywords:

Biochemistry Practicum
Difficulty Learning
Online Learning
Pandemic

Kata kunci:

Kesulitan Belajar
Pandemi
Pembelajaran daring
Praktikum Biokimia

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 Walisono. 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.

Kesulitan Belajar Mahasiswa dalam Praktikum Biokimia Online: Pengalaman Selama Covid-19

ABSTRAK

Background: Pandemi Covid-19 mengubah semua sisi kehidupan manusia, termasuk bidang pendidikan. Kegiatan praktikum biokimia yang seharusnya dilaksanakan di laboratorium, harus dilakukan secara daring. Penelitian ini bertujuan untuk menganalisis kesulitan belajar yang dihadapi mahasiswa dalam melaksanakan praktikum biokimia secara daring di era pandemi Covid-19. **Metode:** Penelitian ini menggunakan metode kualitatif deskriptif. Sampel berjumlah 63 responden dari mahasiswa jurusan pendidikan biologi UIN Walisono. Instrumen yang digunakan berupa kuisisioner menggunakan skala Gutman. Data dianalisis menggunakan analisis persentase tingkat kesulitan. **Hasil:** Pelaksanaan praktikum biokimia secara daring kurang mengalami kesulitan. Persentase masing-masing hambatan dalam kesulitan pelaksanaan praktikum biokimia secara virtual yaitu, hambatan penguasaan materi 30,5%, hambatan pelaksanaan praktikum 28,8%, hambatan internal 25,8%, dan hambatan eksternal 36,6%. **Kesimpulan:** Pemilihan metode dan media pembelajaran yang tepat diperlukan untuk memudahkan mahasiswa dalam memahami materi praktikum secara daring.



©2021 by authors. License Bioeduscience, UHAMKA, Jakarta. This article is open access distributed under the terms and conditions of a Creative Commons Attribution (CC-BY) license.

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 Walisono Semarang. This course supports of 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

(2010) shows that practicum-based learning can improve students' critical thinking skills. Because with practicum-based learning, students must be active in solving problems, thinking critically, and creatively analyzing and applying concepts. Besides, practicum activities can improve science process skills (Suryaningsih, 2017) and improve laboratory skills with competency mastery (Baeti et al., 2014). Therefore, practicum activities are essential things that should be done by students to increase a variety of skills that are useful for their future lives.

Practicum activities usually carried out face-to-face or offline must be carried out online during the Covid-19 pandemic. Covid-19 is a disease that attacks the respiratory tract with a clinical spectrum of mild to moderate, severe illness, and critical illness. Covid-19 is a disease outbreak 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% 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.

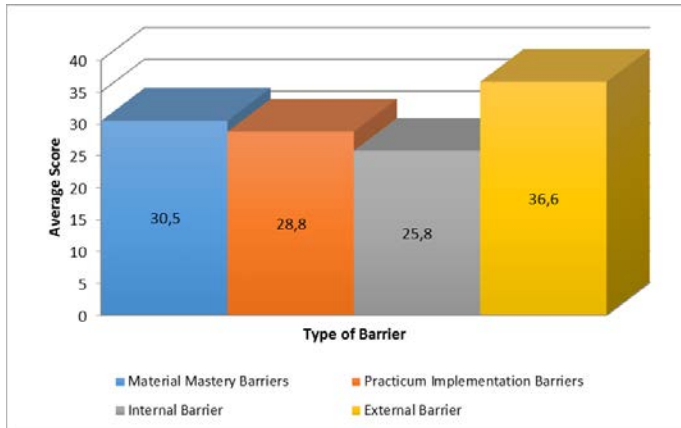


Figure 1. Percentage of types of barriers to the implementation of biochemistry practicum courses online.

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.

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
Practical Implementation	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
Internal	Nothing motivation	63	27%	Less difficulty
	Nothing interest		34,9%	Less difficulty
	Nothing attention		12,7%	No difficulty
	Impaired health		28,6%	Less difficulty
External	Do not feel calm	63	50,8%	Less difficulty
	Physical and physical condition is disturbed		46%	Less difficulty
	Nothing tools		20,6%	No difficulty

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

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 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 trough 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

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 barrier 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.

References

- Abdullah, B. A. (2020). COVID-19 Pandemic: A New Chapter in the History of Infectious Diseases. *Jurnal Oman Medical*, 35(2).
- Ariyati, E. (2010). Pembelajaran berbasis praktikum untuk meningkatkan kemampuan berpikir kritis mahasiswa. *Jurnal Matematika Dan IPA*, 1(2), 2–5.
- Baeti, S. N., Binadja, A., & Susilaningih, E. (2014). Pembelajaran Berbasis Praktikum Bervisi SETS untuk Meningkatkan Keterampilan Laboratorium dan Penguasaan Kompetensi. *Jurnal Inovasi Pendidikan Kimia*, 8(1).
- Balkhair, A. A. (2020). COVID-19 Pandemic: A New Chapter in the History of Infectious Diseases. *Oman Medical Journal*, 35(2).
- Bao, W. (2020). COVID-19 and Online Teaching In Higher Education: A Case Study Of Peking University. *Human Behavior and Emerging Technologies*, 2(2), 113–115.
- Benvenuto, D., Giovanetti, M., Ciccozzi, A., Spoto, S., Angeletti, S., & Ciccozzi, M. (2020). The 2019-new coronavirus epidemic: evidence for virus evolution. *Journal of Medical Virology*, 92(4), 455–459.
- Csobanka, Z. E. (2016). The Z generation. *Acta Educationis Generalis*, 6(2), 63–76.
- Faika, S., & Side, S. (2013). Analisis kesulitan mahasiswa dalam perkuliahan dan praktikum kimia dasar di jurusan kimia FMIPA Universitas Negeri Makassar. *Chemica: Jurnal Ilmiah Kimia Dan Pendidikan Kimia*, 12(2), 18–26.
- Goldschmidt, K., & Msn, P. D. (2020). The COVID-19 pandemic: Technology use to support the wellbeing of children. *Journal of Pediatric Nursing*, 3(3), 3–5. <https://doi.org/10.1016/j.pedn.2020.04.013>
- Hartanto, W. (2016). Penggunaan E-Learning Sebagai Media Pembelajaran. *Jurnal Pendidikan Ekonomi*:

- Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi Dan Ilmu Sosial*, 10(1).
- Herliandry, L. D., Nurhasanah, N., Suban, M. E., & Kuswanto, H. (2020). Pembelajaran Pada Masa Pandemi Covid-19. *JTP-Jurnal Teknologi Pendidikan*, 22(1), 65–70. <https://doi.org/10.21009/jtp.v22i1.15286>.
- Ilhamdi, M. L., Sukib, S., & Ardhuha, J. (2020). Analisis Kesulitan Mahasiswa dalam Kegiatan Praktikum di Laboratorium. *Jurnal Pijar Mipa*. <https://doi.org/https://doi.org/10.29303/jpm.v15i2.1900>.
- Jaelani, & Retnawati, H. (2016). The challenges of junior high school mathematic teachers in implementing the problem based learning for improving the higher order thinking skills. *Journal of Counseling and Education*, 5(3), 1–13.
- Khasanah, D. R., Pramudibyanto, H., & Widuroyeki, B. (2020). Pendidikan Dalam Masa Pandemi Covid-19. *Jurnal Sinestesia*, 10(1), 41–48.
- Kusuma, J. W., & Hamidah. (2020). Platform Whatsapp Group Dan Webinar Zoom Dalam Pembelajaran Jarak Jauh pada Masa Pandemi Covid 19. *Jurnal Ilmiah Pendidikan Matematika*, 5(1), 97–106.
- Melati. (2003). Persepsi Mahasiswa Tentang Penyelenggaraan Praktikum pada Pendidikan Tinggi Terbuka Jarak Jauh (Kasus: Program Studi Agribisnis Fmipa Universitas Terbuka). *Jurnal Pendidikan Terbuka Dan Jarak Jauh*, 14(1), 45–56.
- Nagy, Á. (2016). *Youth policy: From leisure sociology to leisure pedagogy (Manuscript)*.
- Nagy, Á., & Székely, L. (2012). The basis and the structure of the tertiary socialisation field and the “Youth-Affairs” as an autonomous area. *Acta Technologica Dubnicae*, 2(2), 1–18.
- Nasution, A. K. P. (2020). Integrasi Media Sosial dalam Pembelajaran Generasi Z. *JTIP: Jurnal Teknologi Informasi Dan Pendidikan*, 13(1), 80–86. <https://doi.org/10.24036/tip.v13i1.277>.
- Radha, R., Mahalakshmi, K., Kumar, Sathish., V., & Saravanakumar, A. (2020). E-Learning during Lockdown of Covid-19 Pandemic: A Global Perspective. *International Journal of Control and Automation*, 13(4), 088–1099.
- Rohwati, M. (2012). Penggunaan education game untuk meningkatkan hasil belajar IPA biologi konsep klasifikasi makhluk hidup. *Jurnal Pendidikan IPA Indonesia*, 1(1).
- Sabran, S., & Sabara, E. (2019). Keefektifan Google Classroom sebagai Media Pembelajaran. In *Seminar Nasional LP2M UNM*.
- Sucipto, L., & Mauliddin, M. (2016). Analisis kesulitan belajar mahasiswa dalam memahami konsep bilangan real. *Beta: Jurnal Tadris Matematika*, 9(2), 197–211.
- Suryaningsih, Y. (2017). Pembelajaran berbasis praktikum sebagai sarana siswa untuk berlatih menerapkan keterampilan proses sains dalam materi biologi. *BIO EDUCATIO: (The Journal of Science and Biology Education)*, 2(2).
- Syah, M. (2009). *Psikologi Pendidikan dengan Pendekatan Baru*. Rosdakarya.
- Undang, R., Agus, S., & Abdurrahman, A. (2019). A combined hots-based assessment/stem learning model to improve secondary students’ thinking skills: a development and evaluation study. *Journal for the Education of Gifted Young Scientists*, 7(3), 435–448.
- Widodo, A., Maria, R. A., & Fitriani, A. (2016). Peranan praktikum riil dan praktikum virtual dalam membangun kreatifitas siswa. *Jurnal Pengajaran MIPA*, 21(1), 92–102.
- Wijoyo, H. (2020). *Generasi Z & Revolusi Industri 4.0*. CV. Pena Persada.
- Yeni, S. (2017). Pembelajaran Berbasis Praktikum Sebagai Sarana Siswa Untuk Berlatih Menerapkan Keterampilan Proses Sains dalam Materi Biologi. *Jurnal Bio Education*, 2(2), 49–57.
- Zhu, X., & Liu., J. (2020). Education in and After Covid-19: Immediate Responses and Long-Term Visions. *Postdigital Science and Education*. <https://doi.org/10.1007/s42438-020-00126-3>

