

Student learning outcomes through technology-based online learning in the Biology Education Study Program

Riya Irianti *, Sri Amintarti, Nurul Hidayati Utami

Study Program of Biology Education, Faculty of Teacher Training and Education, Universitas Lambung Mangkurat, Banjarmasin City, South Kalimantan, Indonesia

*Corresponding Author Email: riyairiantipbiounlam@ulm.ac.id

Article Information	Abstract
Keyword: Learning outcomes; Online learning; Education technology; Biology education Kata Kunci: Hasil belajar; Belajar online; Teknologi pendidikan; Pendidikan biologi History: Received : 29/09/2022 Accepted : 29/01/2023	Online learning is an alternative solution in the learning process in the Covid-19 pandemic era. Technology plays a vital role as a teaching medium in the online learning process. This study aims to describe the learning outcomes of 323 Biology Education study program students. This research is a descriptive study with data obtained using observation sheet instruments to collect data related to online learning and documentation of learning outcomes scores which were analyzed using descriptive statistics. The technology used in online learning is Zoom Meeting, Google Meeting, WhatsApp, Youtube, and LMS (Learning Management system) in the form of SIMARI. The results of this study indicate that the average student learning outcomes of the Biology Education Study Program are 99%, having met the course completion criteria. This result shows that technology also plays a vital role in education, especially distance learning. Lecture activities experience a faster transformation in the use of technology. Abstrak Pembelajaran daring menjadi alternatif solusi dalam proses pembelajaran di era pandemic Covid-19. Teknologi berperan penting sebagai media ajar dalam proses pembelajaran daring. Penelitian ini bertujuan untuk mendeskripsikan hasil belajar mahasiswa program studi Pendidikan Biologi sebanyak 323 orang. Penelitian ini adalah penelitian deskriptif dengan data diperoleh menggunakan instrument lembar observasi untuk mengumpulkan data terkait pembelajaran daring dan dokumentasi skor hasil belajar yang dianalisis menggunakan statistik deskriptif. Teknologi yang digunakan dalam pembelajaran online yaitu <i>Zoom Meeting, Google Meeting, Whatsapp, Youtube, dan LMS (Learning Management system)</i> berupa SIMARI. Hasil penelitian ini menunjukkan bahwa rata rata hasil belajar mahasiswa Program Studi Pendidikan Biologi 99% telah memenuhi kriteria ketuntasan mata kuliah. Hal ini menunjukkan bahwa teknologi juga berperan penting pada dunia Pendidikan terutama pada pembelajaran jarak jauh. Kegiatan perkuliahan mengalami transformasi lebih cepat dalam penggunaan teknologi.

A. Introduction

The Covid-19 outbreak, which has affected 215 countries worldwide, including Indonesia, poses unique challenges for educational institutions, particularly universities. The government is taking some steps, one of which is that the Ministry of Education and Culture (Kemendikbud) has issued a regulation allowing students to study at home beginning in March 2020. In anticipation of the spread of Covid-19, most Indonesian schools and universities have implemented online learning.

The original face-to-face education system replaces to be online or distance learning. According to Setiyawan & Wijayanti (2020), an online learning process requires or is supported by an internet connection. Online learning via technology and the internet can be an alternative or additional option for lecturers and students to study without meeting in person.

Jamaluddin et al. (2020) stated that online learning has advantages, disadvantages, and challenges. Many teachers and students, including lecturers and students, have difficulties with online learning. These difficulties include interaction, assignment completion, signal interference, and learning disabilities in the network; students cannot collaborate online (Susanto, 2020), and it is difficult to get an overview of students' cognitive achievement (Yansa & Retnawati, 2021).

Moreover, Aboagye et al. (2020) asserted that students were not prepared or experienced online learning during the pandemic. Students are either afraid of the challenges of online learning or believe that the pandemic era is a time to spend with family. Due to the difficulties encountered during online education, teachers and lecturers must select the appropriate platforms, teaching materials, and technological media to assist students and students in learning from home.

To provide effective online learning to students, lecturers must be innovative and creative in their use of the appropriate platforms for online learning. Harsha & Bai (2020) revealed that innovative teaching is urgently needed to continue education and to overcome mental stress and anxiety during the lockdown. Next, Keller in Al-Jaberi (2018) found that most technology is integrated into today's learning environment to assist teaching activities.

Online learning is a type of lecture that can be used as a solution during the Covid-19 pandemic. According to Moore et al. (2011), Online learning is learning that takes place over an internet network and provides accessibility, connectivity, flexibility, and the ability to initiate various learning interactions. Research conducted

by Zhang et al. (2004) showed that the employment of the internet and multimedia technology could change how knowledge is conveyed and can be an alternative to learning in traditional classrooms. Online learning is learning that can bring together students and lecturers to carry out learning interactions with the help of the internet (Kuntarto, 2017).

At the implementation level, online learning necessitates using mobile devices such as smartphones or Android phones, laptops, computers, tablets, and iPhones to access information anytime and from any location (Gikas & Grant, 2013). During the WFH period, universities must strengthen online learning (Darmalaksana, 2020). In recent years, online education has become popular (He et al., 2014). Online learning is needed in learning in the era of the industrial revolution 4.0 (Pangondian et al., 2019).

The use of mobile technology in educational institutions has significantly contributed to achieving distance learning goals (Valk et al. 2010; Korucu & Alkan, 2011). A variety of media can also be used to aid in the implementation of online learning. Virtual classes, for example, using Google Classroom, Edmodo, and Schoology services (Enriquez, 2014; Sicut & Ed, 2015; Iftakhar, 2016) and instant messaging apps like WhatsApp (SO, 2016). Another function of social media platforms, such as Facebook and Instagram, is helpful for online learning (Kumar & Nanda, 2019).

Online learning connects students to learning resources (databases, experts/instructors, libraries) that are physically separate or even far apart but can communicate, interact, or collaborate (directly/synchronously and indirectly/asynchronously). Online learning is a type of distance learning that uses telecommunication and information technology, such as the internet and CD-Rooms (Molinda, 2015).

Online learning, also known as distance learning, aims to meet educational standards by utilizing Information Technology and computers or gadgets linked between teachers and students and lecturers and students. Learning can still be done correctly with the help of this technology. It is hoped that education will run smoothly with this information technology. E-learning is one of several information technologies that can be used as a learning medium. E-learning is a learning innovation that can be used in delivering learning materials and changes in the abilities of various student competencies.

Aside from e-learning, the learning process can also include using Google Classroom, video conferencing, telephone or live chat, zoom, or a WhatsApp group. This learning is an educational innovation designed to address the challenge of a lack of diverse learning resources. However, there are sometimes obstacles and unfinished student learning outcomes in practice.

All the literature on e-learning indicates that not all students will be successful in online learning. This is due to the learning environment factors and the characteristics of students (Nakayama et al., 2007; Nortvig et al., 2018; James, 2021). Based on the previous, the goal of this study was to determine student learning outcomes during the Covid-19 pandemic through technology-based online learning in the Biology Education Study Program, FKIP, Lambung Mangkurat University.

B. Material and Method

This study was quantitative and descriptive in design. The population studied consisted of 323 students enrolled in the Biology Education Study Program. The chosen sample is total (includes all population members). The student learning outcomes scores and documentation were collected using instruments, and then online learning data was collected using observation sheets. Lecture schedules, online learning processes via various technology and internet-based platforms, and learning evaluations were all observed. Furthermore, the documentation of student learning outcomes scores is used as the course's final grade. The obtained data were calculated using descriptive statistics and the learning outcome categories specified in the 2020 Academic Handbook for the Faculty of Teacher Training and Education, Lambung Mangkurat University (See Table 1).

Table 1 Criteria for assessing student learning outcomes

No	Range of Numeral Values	Alphabetical Value
1	≥ 80	A
2	77 - < 80	A-
3	75 - < 77	B+
4	70 - < 75	B
5	67 - < 70	B-
6	64 - < 67	C+
7	60 - < 64	C
8	50 - < 60	D+
9	40 - < 50	D
10	00 - < 40	E

C. Results and Discussion

Online learning is implemented to break the chain of the spread of Covid-19 by using various technologies at Lambung Mangkurat University, especially the Biology Education Study Program. Learning applications and multiple platforms accessed via the internet were used as technology. The results of student scores were closely related to the completeness of student learning. Grades from assignments (homework, essays, and portfolios), quizzes (scheduled and unscheduled), practicum reports, field practicum, laboratory practicum, practicum exams, midterm exams (UTS), final semester exams (UAS), and other evaluations are used to assess student learning outcomes.

Based on the academic guidelines of Lambung Mangkurat University, the weight of the assessment for student graduation in each subject is Assignment (30%), UTS (30%), and Final Examination (40%). Calculation guides convert numerical scores into letter grades with predetermined weights. The final score is in numbers (0–100) and converted to letters (A, A-, B+, B, B-, C+, C, D+, D, and E) based on academic rules.

Based on the final grade, students were said to have completed the lecture process if they received at least a C. 40 courses in the Biology education study program received grades of A, B+, B, C+, C, D+, D, and E during the odd semester of the 2020/2021 academic year. Figure 1 depicts study completion in odd semester courses for the 2020/2021 academic year.

Based on the recapitulation of the results of the odd semester student assessment of the Biology Education Study Program FKIP ULM for the 2020/2021 academic year, it is known that:

- 1) 99% of student scores in the odd semester of the 2020/2021 academic year met course completion criteria, indicating that learning outcomes were successful. Students who received an A received the highest percentage of students, up to 49.58%. This result demonstrated that nearly half of the students received an A in the courses offered.
- 2) The percentage of students who received D+, D, and E scores was 0.14%, 0.18%, and 0.41%, respectively, still less than 1% of the total number of students and courses offered in the Biology Education Study Program, as D and E refer to the same and repeat students. Students who received D+, D, or E grades were required to repeat courses the following year, requiring student commitment and perseverance in the next lecture. Lecturers are also expected to

provide special treatment to academically weak students, so they try to deliver material repetition.

The implementation of learning was done through the internet in the odd semester of the Biology Education Study Program for the 2020/2021 academic year, using various facilities such as zoom meetings and google meetings. It was supported by the LMS (learning management system) as a SIMARI. The achievement of the

material in the course reflects the learning direction. Course material achievement was measured using ability benchmarks developed for learning achievement. The accomplishment of CPMK courses was referred to as optimal achievement. In odd semesters, four semesters were presented, each with 36 study program courses and seven compulsory courses from the faculty and Lambung Mangkurat University.

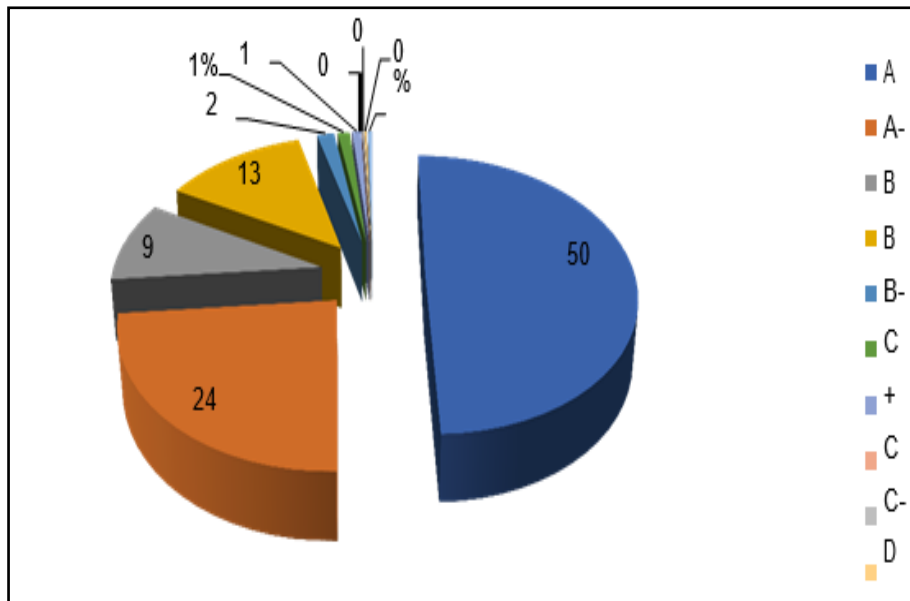


Figure 1 Graph of Learning Completeness

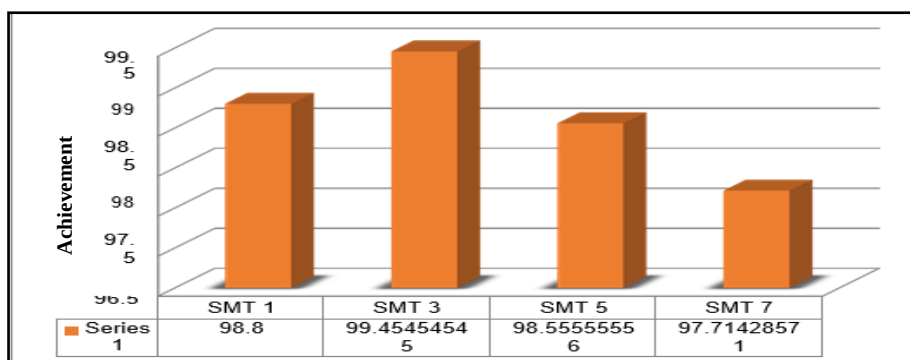


Figure 2 Achievement of Course Materials

According to data analysis results in Figure 2, the achievement of course a material in each odd semester was greater than 95%. The average achievement of lecture material in semester 1 was 98.8%, and the average in semester 3 was 99.45%. The average achievement of lecture material in semester 5 was 98.55%, and the average achievement in semester 7 was 97.71%. According to the data above, the highest achievement was in semester five courses, while the lowest achievement was in semester 7. The following are

some of the obstacles that have prevented it from reaching 100% in course materials:

- 1) Students could not complete some practicum activities online, resulting in inefficient material delivery.
- 2) Assignments given to students were unable to be adequately completed due to various obstacles, such as network issues and time management, resulting in poorly delivered material.

- 3) Because the student was late taking the course, there were courses in semester seven that were active for students in the 2013 curriculum.

Based on the recapitulation of the odd semester results of the Biology Education Study Program of FKIP ULM for the 2020/2021 academic year, it is identified that:

- 1) Courses that did not achieve 100% of the lecture material were courses in which there was a practicum/tutorial.
- 2) Even though the lectures were held online, more than 97% of the lecture material in the odd semester of the 2020/2021 academic year met the achievement criteria.
- 3) Course lecturers can create videos that include a practicum to maximize the achievement of lecture material in the following semester. Alternatively, substituting a simpler practicum that is still accomplished through lecture material can be done.

Overall, students who participated in flexible online learning achieved good learning outcomes and met the learning completion criteria. Online learning allows students to attend lectures from the comfort of their own homes or from anywhere in the world. Lecturers delivered lessons via virtual classes that can be accessed from anywhere and at any time, without regard for space or time. Under this condition, students can choose which courses to take and which tasks to complete. Sun et al. (2008); El Refae et al. (2021) found that student satisfaction with learning is influenced by the flexibility of time, learning methods, and locations in online learning.

This benefit is because the learning process used in the Biology Education Study Program optimized the E-learning provided, namely SIMARI. SIMARI media, which is information and communication technology, allows students to study at any time and from any location. E-learning is classified into two types: synchronous and asynchronous. Synchronous means that you are studying and learning at the same time. The learning process occurs concurrently between lecturers and students via Zoom meetings, Google meetings, and Whatsapp groups provided by lecturers on the SIMARI page. This media enables online interaction between lecturers and students. Synchronous training requires lecturers and students to connect to the internet simultaneously. Lecturers provide learning materials, and students can listen directly via the internet. Students can also ask questions or comment directly on SIMARI or via chat. Synchronous training represents an actual class but is virtual, and all students are

connected via the internet. A virtual classroom is another term for synchronous training.

Second, asynchronous refers to not occurring at the same time. Students can choose from various learning options, with lecturers providing materials. Asynchronous training in SIMARI e-learning allows students to access learning materials uploaded by lecturers from any location and at any time. Students can complete learning at any time within a predetermined schedule range.

The learning process, enhanced by various information and communication technologies and the internet, then contributes to the production of student learning outcomes, nearly all of which meet the completeness criteria of learning outcomes, namely 99%. It can be used as evaluation material for the 1% of students who have not completed it.

The application of this technology is relevant to the current situation in 2022 post-covid. Currently, teaching and learning activities are taking place face-to-face, and the impact of using higher technology during the pandemic has resulted in innovations that are always used in the learning process. According to Andini et al. (2022), the Covid-19 pandemic triggered an acceleration of educational transformation. Even though understanding material is more difficult and internet access is hampered for students in remote areas, educators are becoming more technologically literate and more active in innovating. Syarif & Mawardi (2021) have the same opinion that teachers and students can still meet face to face through online media, even though monitoring student activities is quite difficult. According to Ahmad (2022), the internet plays an important role in supporting unlimited access to electronic information, but you still have to be careful with fake information.

D. Conclusion

Based on the research findings, the following conclusions have been reached 99% of student scores in the odd semester of the 2020/2021 academic year met course completion criteria, indicating that learning outcomes were successful. Even though the lectures were held online, more than 97% of the lecture material in the odd semester of the 2020/2021 academic year met the achievement criteria. Online lectures were delivered using various information and communication technologies, including SIMARI e-learning, zoom meetings, Google meetings, WhatsApp groups, YouTube, and other online media. Lecture activities experience a faster transformation through technological literacy.

E. References

- Aboagye, E., Yawson, J. A., & Appiah, K. N. (2020). Covid-19 and e-learning: The challenges of students in tertiary institutions. *Social Education Research*, 2(1), 1–8. DOI: <https://doi.org/10.37256/ser.21202142.2>.
- Ahmad, I. F. (2022). Urgensi literasi digital di indonesia pada masa pandemi covid-19: Sebuah tinjauan sistematis. *Nusantara: Jurnal Pendidikan Indonesia*, 2(1), 1-18. DOI: <https://doi.org/10.14421/njpi.2022.v2i1-1>
- Al-Jaberi, N. M. (2018). The use of computer programs and applications by undergraduates and its relations to their motivation toward e-learning and academic performance. *International Journal of Education & Literac Studies*, 6(4), 114–121. DOI: <https://doi.org/10.7575/aiac.ijels.v.6n.4p.114>
- Andini, I., Safitri, N. A. N., & Hendri, H. (2022). Analisis efek pandemi Covid-19 terhadap pendidikan di Indonesia. *JKEM: Jurnal Ilmu Komputer, Ekonomi Dan Manajemen*, 2(1), 196–204. Retrieved from <https://ummaspul.e-journal.id/JKM/article/download/2866/828>
- Darmalaksana, W. (2020). *WhatsApp kuliah mobile* (Fakultas Ushuluddin UIN Sunan Gunung Djati). Retrieved from <https://digilib.uinsgd.ac.id/30354/>
- El Refae, G. A., Kaba, A., & Eletter, S. (2021). Distance learning during COVID-19 pandemic: satisfaction, opportunities and challenges as perceived by faculty members and students. *Interactive Technology and Smart Education*, 18(3), 298-318. DOI: <https://doi.org/10.1108/ITSE-08-2020-0128>
- Enriquez, M. A. S. (2014, March). Students' perceptions on the effectiveness of the use of Edmodo as a supplementary tool for learning. In *DLSU Research Congress* (Vol. 2, No. 6, pp. 1-6). Retrieved from <https://www.dlsu.edu.ph/wp-content/uploads/dlsu-research-congress-proceedings/2014/LLI-II-010-FT.pdf>
- Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, 19, 18-26. DOI: <https://doi.org/10.1016/j.jheduc.2013.06.002>
- Harsha, R., & Bai, T. (2020). Covid-19 lockdown-challenges to higher education. *Cape Comorin*, 2(4), 26-8. DOI: <https://doi.org/10.13140/RG.2.2.16290.25281>.
- He, W., Xu, G., & Kruck, S. E. (2014). Online IS education for the 21st century. *Journal of Information Systems Education*, 25(2), 101-106. Retrieved from <https://aisel.aisnet.org/jise/vol25/iss2/1/>
- Iftakhar, S. (2016). Google classroom: what works and how. *Journal of Education and Social Sciences*, 3(1), 12–18. Retrieved from http://jesoc.com/wp-content/uploads/2016/03/KC3_35.pdf
- Jamaluddin, D., Ratnasih, T., Gunawan, H., & Paujiah, E. (2020). Pembelajaran daring masa pandemik Covid-19 pada calon guru: hambatan, solusi dan proyeksi. *Karya Tulis Ilmiah UIN Sunan Gunung Djati Bandung*, 5(2), 1-10. Retrieved from <https://digilib.uinsgd.ac.id/30518/>
- James, P. C. (2021). What determines student satisfaction in an e-learning environment? A comprehensive literature review of key success factors. *Higher Education Studies*, 11(3), 1-9. DOI: <https://doi.org/10.5539/hes.v11n3>
- Korucu, A. T., & Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *Procedia-Social and Behavioral Sciences*, 15, 1925-1930. DOI: <https://doi.org/https://doi.org/10.1016/j.sbspro.2011.04.029>
- Kumar, V., & Nanda, P. (2019). Social media in higher education. *International Journal of Information and Communication Technology Education*, 15(1), 97–108. DOI: <https://doi.org/10.4018/IJICTE.2019010107>
- Kuntarto, E. (2017). Keefektifan model pembelajaran daring dalam perkuliahan bahasa Indonesia di perguruan tinggi. *Indonesian Language Education and Literature*, 3(1), 99–110. DOI: <https://doi.org/10.24235/ileal.v3i1.1820>
- Molinda, M. (2015). *Instructional technology and media for learning New Jersey Columbus*. Ohio.
- Moore, J. L., Dickson-Deane, C., & Galyen, K. (2011). E-learning, online learning, and distance learning environments: Are they the same?. *The Internet and higher education*, 14(2), 129-135. DOI: <https://doi.org/https://doi.org/10.1016/j.jheduc.2010.10.001>
- Nakayama, M., Yamamoto, H., & Santiago, R. (2007). The impact of learner characteristics on learning performance in hybrid courses among Japanese students. *Electronic Journal of E-Learning*, 5(3), 195-206. Retrieved from <https://www.learntechlib.org/p/175506/>
- Nortvig, A. M., Petersen, A. K., & Balle, S. H. (2018). A literature review of the factors influencing e-learning and blended learning in relation to learning outcome, student satisfaction and engagement. *Electronic Journal of E-learning*,

- 16(1), 46-55. Retrieved from <https://www.learntechlib.org/p/191054/>
- Pangondian, R. A., Santosa, P. I., & Nugroho, E. (2019, February). Faktor-faktor yang mempengaruhi kesuksesan pembelajaran daring dalam revolusi industri 4.0. In *Seminar Nasional Teknologi Komputer & Sains (SAINTEKS)* (Vol. 1, No. 1). Retrieved from <http://prosiding.seminar-id.com/index.php/sainteks/article/view/122>
- Setiyawan R A, & Wijayanti P S. (2020). Analisis kualitas instrumen untuk mengukur kemampuan pemecahan masalah siswa selama pembelajaran daring di masa pandemi. *Jurnal Lebesgue : Jurnal Ilmiah Pendidikan Matematika, Matematika dan Statistika*, 1(2), 130-139. DOI: <https://doi.org/10.46306/lb.v1i2.26>
- Sicat, A. S., & Ed, M. A. (2015). Enhancing college students' proficiency in business writing via schoology. *International Journal of Education and Research*, 3(1), 159-178. Retrieved from <http://ijern.com/journal/2015/January-2015/14.pdf>
- SO, W. W. S. (2016). Whatslearn: The use of whatsapp for teaching and learning. *Turkish Online Journal of Educational Technology*, 2016(December Special Issue), 1359-1365. Retrieved from <https://repository.eduhk.hk/en/publications/whatslearn-the-use-of-whatsapp-for-teaching-and-learning-5>
- Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & education*, 50(4), 1183-1202. DOI: <https://doi.org/10.1016/j.compedu.2006.11.007>
- Susanto, T. (2020). Peningkatan hasil belajar siswa melalui metode team games tournament pada pembelajaran online matematika kelas V SD Negeri Jagalan. *Jurnal Pendidikan Dompot Dhuafa*, 10(2), 31-35. Retrieved from <http://jurnal.pendidikandd.org/index.php/JPD/article/view/223>
- Syarif, A., & Mawardi, I. (2021). Learning policy analysis during the Covid-19 pandemic: Between opportunities and challenges and their impact on Islamic education. *Urecol Journal. Part A: Education and Training*, 1(1), 9-17. DOI: <https://doi.org/10.53017/uje.10>
- Valk, J. H., Rashid, A. T., & Elder, L. (2010). Using mobile phones to improve educational outcomes: An analysis of evidence from Asia. *International Review of Research in Open and Distributed Learning*, 11(1), 117-140. DOI: <https://doi.org/10.19173/irrodl.v11i1.794>
- Yansa, H., & Retnawati, H. (2021). Identifikasi praktik dan hambatan guru dalam asesmen kognitif matematika di masa pandemi Covid-19. *Jurnal Elemen*, 7(1), 86-99. DOI: <https://doi.org/10.29408/jel.v7i1.2585>
- Zhang, D., Zhao, J. L., Zhou, L., & Nunamaker, J. F. (2004). Can e-learning replace classroom learning?. *Communications of the ACM*, 47(5), 75-79. DOI: <https://doi.org/10.1145/986213.986216>