Learning during COVID-19 pandemic: A systematic literature review

Awal Kurnia Putra Nasution[1], Mustafa Kamal Nasution[1], Muhammad Hasyimsyah Batubara[2], Imam Munandar[3]

[1]Faculty of Tarbiyah, Institut Agama Islam Negeri Takengon, Aceh, Indonesia
[2]Department of English Education, Faculty of Education Institut Agama Islam Negeri Takengon, Aceh, Indonesia
[3]English Language Department, Faculty of Teacher Training and Education, Institut Agama Islam Negeri Takengon, Aceh, Indonesia

Article Info	ABSTRACT
	The COVID-19 pandemic has transformed education worldwide. Learning that is usually done offline has turned into online learning to avoid the spread of the COVID-19 virus. The purpose of writing this article is to describe the latest and updated learning conditions during the COVID-19 pandemic. What kind of learning was carried out during the COVID-19 pandemic, was the learning effective, how was the learning outcome, and the challenges faced. The systematic literature review is used to find answers to this article's purpose by synthesizing 53 articles selected according to the criteria. The synthesis results found that online learning was carried out using video conference as a substitute for face-to-face meetings, discussions, exams, and learning feedback using supporting applications. The internet was the direct support. Most of the learning shows significant results. Learning outcomes cannot be concluded whether it is good or not. There are many challenges during learning. It indicates that the world of education is not fully ready to transform from offline learning to online learning. A standard platform for online learning and rules of learning is required to minimize negative impacts and pay attention to the socio-emotional aspect.

Corresponding Author:

Awal Kurnia Putra Nasution
Faculty of Tarbiyah, Institut Agama Islam Negeri Takengon
Aman Dimot Street, 24519, Central Aceh, Indonesia
Email: awalkpn@gmail.com

1. INTRODUCTION

The COVID-19 pandemic that has hit the entire world has forced the world of education to change and improve to keep learning for students. Face-to-face (offline) learning is temporarily eliminated throughout schools, turning to face-to-face learning that is carried out remotely to prevent the spread of the COVID-19. School holidays are an effort to prevent the spread of COVID-19. Creating effective learning is very important. Even though online learning is not new to be implemented, it still presents a challenge for educators [1]. Online learning is one of the options that can be chosen today [2].

There are several studies that investigated the effectiveness of online learning. For example, Nguyen who argued that there were no significant differences in online learning [3]. Lee stated that online learning was successfully used in teaching [4]. Means *et al.* found that there is a slight difference in the average results of online learning compared to face-to-face [5]. Neuhauser mentioned that the difference between online and face-to-face learning was also not found [6].

Online learning during a pandemic has many challenges. Educators are starting to teach that begins with the computer (or other devices), while students start learning online at home with parents' help [7]. The

quality of infrastructure and learning systems also affects the success of online learning [8]. One of the problems faced by online learning is internet access [9]. This cannot be separated from teachers' readiness to adequately prepare online learning activities [10]. The findings of challenges in learning during COVID-19 pandemic are undoubtedly unique and diverse. Hopefully, the results of this challenge will be the beginning of finding solutions for effective learning to be carried out during the COVID-19 pandemic, considering that until August, 2020, there is no sign that this pandemic will be end. The questions of this research are: i) How is learning carried out during the COVID-19 pandemic?; ii) How is effective learning been during the COVID-19 pandemic?; iii) What are the learning outcomes during the COVID-19 pandemic?; iv) What are the learning challenges during the COVID-19 pandemic?

2.   RESEARCH METHOD
2.1. Article selection process

Article searches were conducted in August, 2020. To find articles relevant to the title and questions to be answered, investigations were carried out using keywords searched on the Science Direct, Eric, and Ebscohost databases. The keywords used to search for related articles are 'learning and COVID' or 'learning and COVID-19'. We found 194 articles from Science Direct, 52 articles from Eric, and 19 articles from Ebscohost. A total of 265 article titles were found related to the keyword. Then, four titles were found for the same title, so that the full titles that screened for abstract were 261 articles. After the abstract screening, 180 articles were excluded because of 163 articles were out of scope, four articles were not during the COVID-19 pandemic, and 13 were not empirical articles. The next process was a full-text screening, then 28 articles were not included, because eight articles were not about learning and 20 articles were not empirical. So that at the synthesis stage, there were only 53 articles. Figure 1 shows the detail of article selection process.
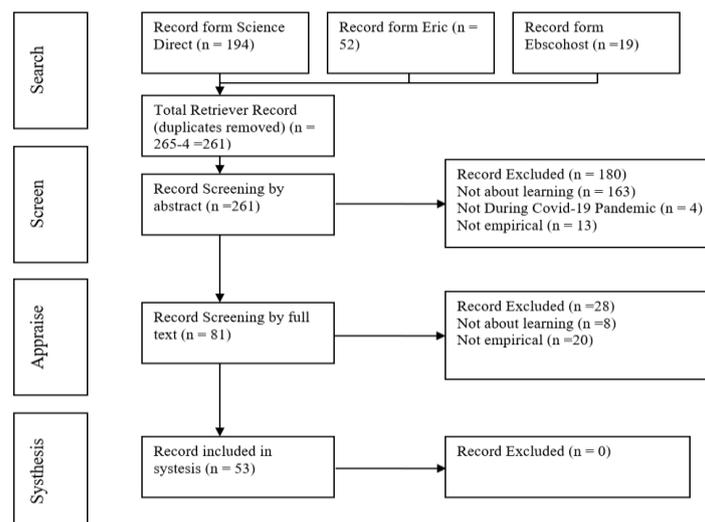

Figure1. Flowchart article selection process [11]

3.   RESULTS
3.1. Learning during the COVID-19 pandemic

As the Chinese government's widespread application of school education during the pandemic prevention and control period prioritizes the following seven requirements: i) Strengthening student home study guidance. It is necessary to arrange work time and rest time reasonably, in order for the content of teaching and teaching time to be appropriate; ii) Standardization of online teaching behavior, so as not to increase the burden on teachers and students; iii) Further enhance the development of online learning platforms for primary and secondary schools, and continue to enrich learning resources, and prevent addressing standard classroom teaching methods, duration, and settings; iv) Strengthen the online teaching resource review mechanism of primary and secondary school students, and strictly review online learning resources to ensure high quality; v) Make full use of the free learning resources provided by the cloud platform of the national primary and secondary school network and China Education Television Channel 4 air classrooms to serve students' home studies and ensure students' learning needs in rural and remote areas;

vi) Integrate epidemic prevention, life education, public safety, and mental health into online e-learning; vii) Care about students' physical and psychological health, guide students to strengthen physical exercise, and seriously improve myopia prevention and control [12].

During the COVID-19 pandemic, school in Guiyang, China, was closed. Students studied at home, and learning was done online, while the communication media used to interact between teachers and parents were WeChat groups, DingDing group, and QQ group. Learning activities are carried out using the DingDing platform: i) At 8:00 am, the principal checks the presence of teachers and students; ii) Before 8:00 am, teachers publish student work; iii) From 8:00 am-10:40 am students work independently based on teacher assignment/instruction; iv) From 10.40 am-12.00 pm teacher reviews student work or teach online; v) After take a break, learning is continuing from 14:30-17:40 with synchronous teaching (the division of each subject session for one hour) [13].

Learning is carried out by utilizing a digital library in Denmark [14]. All schools ranging from preschool to tertiary institutions in Portugal were closed. Learning was transferred online using the internet. Tools used were Moodle, Zoom, and examinations were also carried out online. The government is also developing several applications to support learning [15].

High schools in England carried out online virtual learning [16]. Self-learning is carried out while schools are closed in Vietnam [17]. Learning at The Kingdom of Saudi Arabia (KSA) is carried out by online virtual learning as a substitute for face-to-face learning [18]. Jha and Arora mentioned online learning was using e-learning [19]. Elementary and secondary schools in New York implement online learning [20]. They were learning by utilizing communication technology and internet technology to support online-based distance learning [21]. The study was conducted on learning conducted among girls in shelters during the COVID-19 pandemic. In New York, learning was carried out using Zoom. Classes starting on 09.00 am and finished on 12.55 pm. The teachers posted assignments using Google Classrooms. Sports activities were also eliminated, so that students left earlier [22].

3.2. Learning in higher education found

Learning in China employed online-based learning with DingTalk at Zhejiang University (ZJU). Learning with DingTalk begins with a teacher's learning session, then students make presentations, followed by a question-and-answer session, and homework. Learning at ZJU starts with the teacher providing learning material, then continues with a discussion. All learning will be held after the theme is completed [23].

Learning at the Inova Fairfax Medical Campus, Virginia, is carried out in a virtual class using video conference with Zoom for two hours [24]. Medical education in America utilized Zoom in learning. This is to maintain social distancing that was applied during the COVID-19 pandemic. Zoom selection is due to having exclusive features, namely: Screenshare, Whiteboards, Polls, Breakout rooms, Annotation, Chat and file share, nonverbal feedback virtual background recording.

Other platforms used to support learning activities are video conference software, Twitter, Slack, WhatsApp, and e-mail [25]. Learning in medical education in India, teachers use Google Classroom to discuss online discussion on teaching topics. The teacher provides materials and feedback on the material being discussed. Some other supporting applications are Zoom, Google Meet, Microsoft Teams, Voxvote, Google Form, and Canvas [26], [27].

Distance learning is achieved using Universal Design for Learning (UDL). Educators use blackboard, canvas to learn video with Zoom, and the Microsoft Teams to explore synchronous and asynchronous discussions. Asynchronous discussion provides flexibility to allow meetings at night when learners are not busy, to be used to upload photos or videos which can be accessed at any time [28]. Distance learning online is carried out using blended learning [29]. Lectures are conducted online remotely with the concept of remote learning [30]. Learning is done online remotely [31], [32].

Learning using YouTube is practiced at the University of Pennsylvania [33]. The virtual class is prepared to face lockdown during the COVID-19 pandemic at Politecnico, Torino. All learning are conducted online by utilizing a learning portal [34]. Virtual classrooms are used to maintain interactions between nursing educators and students [35]. Learning is carried out using video conference website and canvas applications [36]. Telehealth was used during the COVID-19 pandemic in the learning process [37].

Spain used technology for learning. The use of this technology is an opportunity for teachers to develop new learning models [38]. Learning at the University of Birmingham, United Kingdom, is carried out by holding weekly Zoom webinars, interactive polls, and learning feedback using Kahoot [39]. In Jordan, government policy establishing emergencies. It led to the shift from conventional learning to e-learning models. It is showing the long-standing use of digital e-learning tools, including smartphones, laptops, and iPad tablets, ultimately affecting their mental and psychological health [40].

In India, learning is done by utilizing e-learning; students utilize software in android during the learning session [41]. Zoom-on sessions practiced three days a week, for 60 minutes. These session were reviewing the material posted to the Microsoft Teams, so that it can be reached in any case for polls and tests,

online quizzes and jeopardy sessions [42]. Learning is carried out using educational technology in social media [43]. Online education is applied in universities [44], [45]. Smart learning is being used in Saudi Arabia during the pandemic, while knowledge can take advantage of webinars, podcasts, prerecorded sessions, and social media [46]. Learning in higher education is carried out online by utilizing the learning management system (LMS) in developing and implementing a curriculum. It includes syllabus, course content, exams, assignments, Blackboard and Desire2Learn (D2L) to teach online [47].

Learning in Zambia utilizes digital learning based on social media, for sharing videos using YouTube, for online learning using Skype and Lifesize [48]. Learning at Makerere University, Uganda is carried out with the problem based learning (PBL) concept, which is carried out online using Zoom and other LMS [49]. Learning uses virtual classrooms, where instructors and students can video conferencing, view recorded videos and written materials, submit their materials, and view shared schedules [50]. Virtual learning must pay attention to "ethical love" and compassion [51]. Virtual learning was utilized during the COVID-19 pandemic, using PowerPoints and view boxes in presentation sessions [52]. Learning using technology becomes a choice, virtual meetings using Google Voice, WebEx, and Zoom audiovisual conferencing and e-learning using Blackboard, Moodle, Vista, and Angle [53]. Learning at Harvard Medical School is carried out online using Zoom while maintaining the face-to-face learning experience. The flipped classroom concept is used as a reference, where students on the day before lectures start must prepare the material to be discussed [54]. Learning shifts to virtual learning by utilizing Zoom, Slack, and the Microsoft Teams [55]. Learning to use Zoom instead of face to face [56]. Learning is carried out online by utilizing technology in the form of Zoom, virtual reality, and augmented reality simulations [57]. Exams are conducted in an open book under online supervision [58].

Learning at business schools is conducted online [59]. Learning at European Health Care and Urology Trainees is done online [60]. Development of online learning modules practiced at the University of Arkansas for medical sciences, USA [61]. Learning in orthopedic education uses digital content in electronic textbooks, scientific journals, online presentations, and video tutorials [62]. Learning innovation in the form of a flipped classroom model is used in learning; online conferences are used as a substitute for face-to-face, online examinations [63]. Since students must remain at home, learning must utilizes digital platforms such as video, social media, Facebook, Zoom, Skype, Google Meet, or Microsoft Teams [64].

3.3. The effectiveness of learning during the COVID-19 pandemic

The synthesis results indicate that not all studies address the effectiveness of learning during the COVID-19 pandemic. However, there are still several statements stated that learning during the pandemic is effective, effective and efficient, appears to be effective, and less effective than face-to-face learning. For more details, Table 1 shows the effectiveness of learning during the COVID-19 pandemic.

Table 1. Effectiveness of learning during the COVID-19 pandemic

Studies	Finding
[65]	Looks effective (the lessons learned improve skills and self-confidence)
[56]	Less effective (distance learning is not better than face-to-face learning)
[13], [17], [26], [27], [29], [42], [52], [54]	Effective (effective teaching is quality learning and increasing understanding [65])
[25]	Effective and efficient (the learning carried out can achieve the objectives by utilizing appropriate technology [66])

3.4. Learning outcomes during the COVID-19 pandemic

The synthesis results show several findings. Although not all studies discussed student learning outcomes, six studies have examined them. Some studies state that student learning outcomes decreased. Some findings say learning outcomes are not different; learning outcomes can be maintained, learning outcomes that increase, positive learning outcomes, and extraordinary learning outcomes. The complete results of the synthesis of learning outcomes can be seen in Table 2.

Table 2. Learning outcomes during the COVID-19 pandemic

Studies	Finding
Haider and Al-Salman [40]	Low academic achievement
McGuinness [32]	Learning achievement can be maintained
Berger *et al*. [67]	No different performance
Durfee *et al*. [54]	Excellent
Delahunty *et al*. [68]	Improve learning outcomes
Jowsey *et al*. [29]	Has a positive effect and has an impact on learning outcomes

3.5. Learning challenges during the COVID-19 pandemic

There were many learning difficulties and challenges during the COVID-19 pandemic. The challenges are in the sense of lack internet access, teachers' incapacity to use technology, nervousness when using technology. Hence, there are difficulties regarding teacher interaction; students restricted learning facilities, pressures and disturbances. For more details, the learning challenges are presented in Table 3.

Table 3. Learning challenges

Finding	Studies
Nervous about using video conferencing	[69]
Difficulty motivating children to do schoolwork and parents' time demands and finding it challenging to teach educational content without teacher training and technological challenges	[32]
Current online challenges for students include students' ability to cope with technology, adequate home resources to facilitate online learning or a stable internet connection	[18]
Challenges in the use of social media technology	[70]
The challenge of adapting and innovating quickly includes educating students	[36]
technological difficulties, emotional	[16]
Challenges include skills and competencies that are not always available on the teaching staff, students, administration and management centers, or academic managers.	[38]
Difficulty communicating electronically with students	[52]
Significant challenges include feelings of isolation from students and colleagues, inconsistent evaluation of teaching, and varying degrees of academic freedom and curriculum control	[47]
The challenges of improving integration of technology and education; how students learn more independently in online teaching, instructor teaching and models online teaching make more sense; how to make online learning a stronger link between home education and school education is an issue that needs to be addressed in online teaching.	[21]
Despite the many difficulties associated with the sudden transition from face-to-face learning to online learning, there are many opportunities, including those focused on this study.	[22]
limited learning resources during the learning process	[49]
Too many online teacher teaching jobs	[13]
Problems faced by students concern depression, poor internet connectivity, and an unsupportive learning environment at home	[41]
The challenge is in the form of power supply in using social media and new technology for learning	[43]
Online learning is an alternative when classroom learning is deferred, whereas it cannot replace the need for on-site and face-to-face learning	[23]
Challenges for education include engagement via video conferencing and social media platforms, a balance of home and work life, and increasing fear of burnout	[25]
Some faculty struggled with new technology, participants with poor bandwidth connections, and some had difficulty reviewing imaging	[63]
There were difficulties to overcome, mostly since digital competence, computers, and access to the Internet were not widespread through the Portuguese population	[15]
Personal relationships between teachers and students can be challenging in virtual courses	[54]
Challenges in the form of Policy and exam assessment	[58]
Challenges with information technology such as inadequate infrastructure to support the effective use of computers and tablets are challenges experienced by users, along with low self-confidence and satisfaction when learning online when their internet and computer skills are weak	[29]
Make teaching methods move from offline to online, develop independent student learning skills as well as school interest, based on the characteristics of student learning at home, digitalize internal tools, how school administrators can organize the work of various types of staff and address the relationship between unified teaching staff	[12]
The challenge for academics is to ensure that students in both situations have a high-quality learning experience, without one group feeling neglected	[44]
The main challenge of this new platform lies in the willingness of the faculty to use this technology	[55]

4. DISCUSSION

4.1. Learning during the COVID-19 pandemic

The COVID-19 pandemic has brought significant changes to learning in schools, from preschool to college level. Learning that is usually carried out entirely face-to-face or partly face-to-face and partly online (blended learning) have wholly switched to online learning. Online learning is an option by considering the rules of maintaining distance to prevent the spread of the COVID-19 virus. Reductions in learning hours were also implemented, and the elimination of subjects that required physical contact, such as learning sports.

Online learning in China is made as closely as possible to the education applied before the pandemic. Learning begins with the teacher and student absences in the morning, followed by work on the teacher's assignments. After that, the teacher reviews the student's studies; the next stage, the teacher conducts online learning (live teaching). Learning media is used to support the learning process in the form of applications such as WeChat, DingDing, and QQ group [13]. The introduction of this online learning must also bear in mind teachers and students' health factors.

Learning during the pandemic has transformed into learning that uses technology, with one of the absolute conditions in the form of internet access. Online learning is carried out using video conference

application, with Zoom as the most widely used option in schools; besides that, there are Google Meet and Skype. During the video conference session, the presentation was assisted by the use of Canvas, Blackboard, and PowerPoint. Social media also plays an essential role in online learning. Social media which are widely used, namely Facebook, Twitter, WhatsApp. This is because social media has features that can be used for learning, such as sharing videos, pictures, links, and discussing learning materials. E-learning, which is specifically used in the education sector, is also widely used, such as Moodle and LMS [14], [15]. For the implementation of the exam, there are those who carry out the examination under online supervision with video conferencing, and some are only giving assignments for learning feedback using Google Form.

There are two types of online learning that are practiced, namely synchronous and asynchronous. Synchronous learning is face-to-face learning in class using live video conference. Asynchronous offers flexible learning whenever learning material can be accessed and discussed. Several essential tools to support this learning are laptops, smartphones, tablets, and internet. There is something missing when all teaching is done online, namely socio-emotional between students and teachers. This needs to be considered so that the quality is also well maintained. Even though good learning must also pay attention to "love ethics" [51].

Socio-emotional is a very crucial factor in online learning, so this factor must be a teacher's concern when teaching full-online. One of the conditions for effective learning is a positive attitude and mood towards school, and this is a socio-emotional part [71]. Socio-emotional factors, which form the relationship between teachers and students, have a relationship with student achievement [67]. Socio-emotional aspects in the form of interaction need to be improved in online learning [68]. Seeing the importance of socio-emotional factors in learning, whereas in online learning these socio-emotional factors are automatically reduced and neglected, it is necessary to develop an online learning model that takes these aspects into account.

Another important thing that is the key to success in online learning is digital competence, so teachers and students must be given special training to learn it. Digital competence is a necessity in the digital era [69]. Online learning currently forces learning to be done by utilizing technology, teachers and students who have useful digital competence will present quality learning.

4.2. The effectiveness of learning during the COVID-19 pandemic

Learning that was carried out during the COVID-19 pandemic was carried out by utilizing online video conference. Effective learning is learning that produces certain skills and practices and is of high quality [65]. In terms of effectiveness, there are several studies that state that online learning appears to be effective during non-face-to-face learning. In this learning, using video conference to replace face-to-face, the use of video conference requires good communication skills, especially virtual communication. One of the benefits of learning like this is the increased ability and self-confidence of students. This is the cause so that the learning looks effective to use. Sayem *et al.* stated that distance learning is effective and increases learning motivation [70]. Another study stated that distance learning is effective and efficient. This learning uses Zoom in practice prepare strategies and tips for implementing learning by video conference; with adequate preparation, the learning can be carried out effectively and efficiently. This is in line with research conducted by Guzacheva, which states that learning using Zoom is effective for distance learning [72]. One study stated that virtual learning was no more effective than face-to-face learning. This learning uses Zoom as a communication tool; the disadvantages of using Zoom are stiff communication and a lack of visuals that can be displayed. This is because the material being taught should be implemented using a practical method by switching learning by using a Zoom, causing a reduction in visuals that can be displayed during learning.

Lessons learned during the COVID-19 pandemic are mostly said to be effective. This can be seen in previous studies that mention this [13], [17], [26], [27], [29], [42], [52], [54]. Effective virtual learning must use an effective format so that learning objectives can be achieved [52]. Overall, learning that shows effectiveness in online learning has something in common in terms of learning preparation that must be good, and complete strategies and tips are needed before its implementation. Learning to use Zoom to be effective should use user guides to help students and teachers [73]. The effectiveness of online learning during the COVID-19 pandemic is inseparable from the learning outcomes, and challenges faced. This current literature review revealed that the learning outcomes are varied. The challenges faced during learning are also various. Learning during a pandemic seems not truly effective in replacing face-to-face learning, but it is suitable applied during the pandemic.

4.3. Learning outcomes during the COVID-19 pandemic

The learning during the COVID-19 pandemic show various outcomes as presented in Table 2. The findings indicate that the use of learning aids for too long leads to an issue of mental well-being for students. This is due to changes that are too drastic in the learning system and method. Poor learning outcomes can be affected by learning time [74]. Lack of interaction between students when learning distance also affect learning outcomes [75].

These different learning outcomes are caused by different ways of implementing online learning in various schools. Each school chooses a different learning approach according to multiple factors, such as school readiness, students, and available learning media [76]–[78]. The speed of internet access is the primary determinant [79], [80]. Good learning outcomes are determined by the preparation of various supporting factors of the learning process.

4.4. Learning challenges during the COVID-19 pandemic

The learning challenges faced during the COVID-19 pandemic are complicated. From the point of view of education providers, in this case, schools or colleges, the challenges faced in the form of supporting infrastructure for learning carried out online [29]. From the teacher's perspective, not all teachers are ready and able to transform from face-to-face learning to online learning, which requires more skill in the mastery of technology [32]. Students found challenges in the form of difficulty dividing their study time at home, as well as the burden of tasks so they felt stress during learning [16]. On the parents' side, parents who were not prepared for the school's online learning curriculum thought that parents need proper preparation [32]. Another thing most widely seen in terms of technical preparation for online learning is the internet [15], [18], [29], [41]. It is the principal factor in the introduction of distance learning, as well as learning resources such as laptops/computers and smartphone.

5. CONCLUSION

Learning during the COVID-19 pandemic is almost entirely carried out online. In general, online learning is carried out by video conference, which begins with a teacher's teaching session, continues with a discussion session, and ends with assignments and a learning feedback survey. A very crucial determining factor in online learning is the socio-emotional and digital aspects of teacher and student competence. In terms of learning effectiveness, some schools show that learning is carried out effectively, however other schools found that learning is ineffective. For learning outcomes, the learning outcomes are various, some are good whether the others are bad. The challenges encountered during the learning process are vary. It is ranging from teachers, students, and parents who are not ready to transform in learning mode, inadequate environment and infrastructure. It is also including problems with an internet connection and learning support tools. It is necessary to create a standard platform for online learning and learning rules, in order to reduce negative impact or weakness.

REFERENCES

[1] M. Durrani, "Debate style lecturing to engage and enrich resident education virtually," *Medical Education*, vol. 54, no. 10, pp. 955–956, Oct. 2020, doi: 10.1111/medu.14217.
[2] J. Stern, "Introduction to Online Teaching and Learning," pp. 1-10, 2018. [Online]. Available: https://www.wlac.edu/online/documents/otl.pdf
[3] H. Abas, "The Effectiveness of Online Learning: Beyond No Significant Difference and Future Horizons," *MERLOT Journal of Online Learning and Teaching*, vol. 11, no. 2, pp. 309–319, 2015.
[4] M. J. Lee and A. J. Ko, "Comparing the effectiveness of online learning approaches on CS1 learning outcomes," *ICER 2015 - Proceedings of the 2015 ACM Conference on International Computing Education Research*, 2015, pp. 237–246, doi: 10.1145/2787622.2787709.
[5] B. Means, Y. Toyama, R. Murphy, and M. Baki, "The effectiveness of online and blended learning: A meta-analysis of the empirical literature," *Teachers College Record*, vol. 115, no. 3, pp. 1–47, 2013, doi: 10.1177/016146811311500307.
[6] C. Neuhauser, "Learning Style and Effectiveness of Online and Face-to-Face Instruction," *International Journal of Phytoremediation*, vol. 21, no. 1, pp. 99–113, 2002, doi: 10.1207/S15389286AJDE1602_4.
[7] W. Bao, "COVID -19 and online teaching in higher education: A case study of Peking University," *Human Behavior and Emerging Technologies*, vol. 2, no. 2, pp. 113–115, 2020, doi: 10.1002/hbe2.191.
[8] A. Yudiawan, B. Sunarso, Suharmoko, F. Sari, and Ahmadi, "Successful online learning factors in covid-19 era: Study of Islamic higher education in West Papua, Indonesia," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 10, no. 1, pp. 193–201, 2021, doi: 10.11591/ijere.v10i1.21036.
[9] H. Morgan, "Best Practices for Implementing Remote Learning during a Pandemic," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, vol. 93, no. 3, pp. 135–141, 2020, doi: 10.1080/00098655.2020.1751480.
[10] C. M. Toquero, "Challenges and Opportunities for Higher Education amid the COVID-19 Pandemic: The Philippine Context," *Pedagogical Research*, vol. 5, no. 4, p. em0063, 2020, doi: 10.29333/pr/7947.
[11] A. Liberati *et al.*, "The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration," *PLoS Medicine*, vol. 6, no. 7, 2009, doi: 10.1371/journal.pmed.1000100.
[12] X. Cheng, "Challenges of 'School's Out, But Class's On' to School Education: Practical Exploration of Chinese Schools during the COVID-19 Pandemic," *SSRN Electronic Journal*, vol. 5, no. 2, pp. 501–516, 2020, doi: 10.2139/ssrn.3565605.
[13] N. Zhao, X. Zhou, B. Liu, and W. Liu, "Guiding Teaching Strategies with the Education Platform during the COVID-19 Epidemic: Taking Guiyang No. 1 Middle School Teaching Practice as an Example," *SSRN Electronic Journal*, vol. 5, no. 2, pp. 531–539, 2020, doi: 10.2139/ssrn.3565625.
[14] M. M. Jæger and E. H. Blaabæk, "Inequality in learning opportunities during Covid-19: Evidence from library takeout," *Research in Social Stratification and Mobility*, vol. 68, no. 100524, pp. 1–5, 2020, doi: 10.1016/j.rssm.2020.100524.

[15]   S. Serpa and M. J. Sá, "The Global Crisis Brought about by SARS-CoV-2 and Its Impacts on Education: An Overview of the Portuguese Panorama," *SSRN Electronic Journal*, vol. 5, no. 2, pp. 523–530, 2020, doi: 10.2139/ssrn.3565613.

[16]   H. R. Haverback, "Middle Level Teachers Quarantine, Teach, and Increase Self-Efficacy Beliefs: Using Theory to Build Practice during COVID-19.," *Middle Grades Review*, vol. 6, no. 2, p. 6, 2020.

[17]   T. Trung, A. D. Hoang, T. T. Nguyen, V. H. Dinh, Y. C. Nguyen, and H. H. Pham, "Dataset of Vietnamese student's learning habits during COVID-19," *Data in Brief*, vol. 30, no. 105682, pp. 1–7, 2020, doi: 10.1016/j.dib.2020.105682.

[18]   D. A. AlAteeq, S. Aljhani, and D. AlEesa, "Perceived stress among students in virtual classrooms during the COVID-19 outbreak in KSA," *Journal of Taibah University Medical Sciences*, vol. 15, no. 5, pp. 398–403, 2020, doi: 10.1016/j.jtumed.2020.07.004.

[19]   A. K. Jha and A. Arora, "The neuropsychological impact of E-learning on children," *Asian Journal of Psychiatry*, vol. 54, no. 102306, pp. 1–2, 2020, doi: 10.1016/j.ajp.2020.102306.

[20]   D. Rupley *et al.*, "Mobilization of health professions students during the COVID-19 pandemic," *Seminars in Perinatology*, vol. 44, no. 7, pp. 1–5, 2020, doi: 10.1016/j.semperi.2020.151276.

[21]   L. Zhou, S. Wu, M. Zhou, and F. Li, "'School's Out, But Class' On', The Largest Online Education in the World Today: Taking China's Practical Exploration During The COVID-19 Epidemic Prevention and Control as an Example," *SSRN Electronic Journal*, vol. 4, no. 2, pp. 501–519, 2020, doi: 10.2139/ssrn.3555520.

[22]   M. B. Schaefer, S. S. Abrams, M. Kurpis, M. Abrams, and C. Abrams, "'Making the Unusual Usual:' Students' Perspectives and Experiences of Learning at Home during the COVID-19 Pandemic.," *Middle Grades Review*, vol. 6, no. 2, p. 8, 2020.

[23]   Q. Zhang *et al.*, "The evaluation of online course of Traditional Chinese Medicine for MBBS international students during the COVID-19 epidemic period," *Integrative Medicine Research*, vol. 9, no. 3, p. 100449, 2020, doi: 10.1016/j.imr.2020.100449.

[24]   A. B. Newcomb, M. Duval, S. L. Bachman, D. Mohess, J. Dort, and M. R. Kapadia, "Building Rapport and Earning the Surgical Patient's Trust in the Era of Social Distancing: Teaching Patient-Centered Communication During Video Conference Encounters to Medical Students," *Journal of Surgical Education*, vol. 78, no. 1, pp. 336–341, 2021, doi: 10.1016/j.jsurg.2020.06.018.

[25]   R. Hilburg, N. Patel, S. Ambruso, M. A. Biewald, and S. S. Farouk, "Medical Education During the Coronavirus Disease-2019 Pandemic: Learning from a Distance," *Advances in Chronic Kidney Disease*, vol. 27, no. 5, pp. 412–417, 2020, doi: 10.1053/j.ackd.2020.05.017.

[26]   Z. Zayapragassarazan, "COVID-19: Strategies for Online Engagement of Remote Learners," *F1000Research*, vol. 9, no. 246, pp. 1–11, 2020, doi: 10.7490/F1000RESEARCH.1117835.1.

[27]   Z. Zayapragassarazan, "COVID-19: Strategies for Engaging Remote Learners in Medical Education," *F1000Research*, vol. 9, no. 237, pp. 1–18, 2020, doi: 10.7490/F1000RESEARCH.1117846.1.

[28]   K. J. Dickinson and S. L. Gronseth, "Application of Universal Design for Learning (UDL) Principles to Surgical Education During the COVID-19 Pandemic," *Journal of Surgical Education*, vol. 77, no. 5, pp. 1008–1012, 2020, doi: 10.1016/j.jsurg.2020.06.005.

[29]   T. Jowsey, G. Foster, P. Cooper-Ioelu, and S. Jacobs, "Blended learning via distance in pre-registration nursing education: A scoping review," *Nurse Education in Practice*, vol. 44, no. 102775, pp. 1–10, 2020, doi: 10.1016/j.nepr.2020.102775.

[30]   A. M. Gabr *et al.*, "Diagnostic and Interventional Radiology Case Volume and Education in the Age of Pandemics: Impact Analysis and Potential Future Directions," *Academic Radiology*, vol. 27, no. 10, pp. 1481–1488, 2020, doi: 10.1016/j.acra.2020.07.014.

[31]   F. J. de O. Araújo, L. S. A. de Lima, P. I. M. Cidade, C. B. Nobre, and M. L. R. Neto, "Impact of Sars-Cov-2 And Its Reverberation in Global Higher Education And Mental Health," *Psychiatry Research*, vol. 288, no. 112977, pp. 1–2, 2020, doi: 10.1016/j.psychres.2020.112977.

[32]   C. McGuinness, "Educating at a Distance: A Redistribution of Roles," pp. 1–6, 2020.

[33]   N. N. Luu, C. M. Yver, J. E. Douglas, K. K. Tasche, P. G. Thakkar, and K. Rajasekaran, "Assessment of YouTube as an Educational Tool in Teaching Key Indicator Cases in Otolaryngology During the COVID-19 Pandemic and Beyond: Neck Dissection," *Journal of Surgical Education*, vol. 78, no. 1, pp. 214–231, 2021, doi: 10.1016/j.jsurg.2020.06.019.

[34]   T. Favale, F. Soro, M. Trevisan, I. Drago, and M. Mellia, "Campus traffic and e-Learning during COVID-19 pandemic," *Computer Networks*, vol. 176, no. 107290, pp. 1–9, 2020, doi: 10.1016/j.comnet.2020.107290.

[35]   Y. M. Ng and P. L. P. Or, "Coronavirus disease (COVID-19) prevention: Virtual classroom education for hand hygiene," *Nurse Education in Practice*, vol. 45, no. 102782, pp. 1–2, 2020, doi: 10.1016/j.nepr.2020.102782.

[36]   E. L. Pollom *et al.*, "Continuing Medical Student Education During the Coronavirus Disease 2019 (COVID-19) Pandemic: Development of a Virtual Radiation Oncology Clerkship," *Advances in Radiation Oncology*, vol. 5, no. 4, pp. 732–736, 2020, doi: 10.1016/j.adro.2020.05.006.

[37]   N. R. Wijesooriya, V. Mishra, P. L. P. Brand, and B. K. Rubin, "COVID-19 and telehealth, education, and research adaptations," *Paediatric Respiratory Reviews*, vol. 35, pp. 38–42, 2020, doi: 10.1016/j.prrv.2020.06.009.

[38]   J. Millán Núñez-Cortés, "COVID-19 due to SARS-Cov2 has also affected Medical Education," *Educacion Medica*, vol. 21, no. 4, pp. 261–264, 2020, doi: 10.1016/j.edumed.2020.06.001.

[39]   R. Elledge, R. Williams, C. Fowell, and J. Green, "Maxillofacial education in the time of COVID-19: the West Midlands experience," *British Journal of Oral and Maxillofacial Surgery*, vol. 58, no. 6, pp. 1–6, 2020, doi: 10.1016/j.bjoms.2020.07.030.

[40]   A. S. Haider and S. Al-Salman, "Dataset of Jordanian university students' psychological health impacted by using e-learning tools during COVID-19," *Data in Brief*, vol. 32, p. 106104, 2020, doi: 10.1016/j.dib.2020.106104.

[41]   N. Kapasia *et al.*, "Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India," *Children and Youth Services Review*, vol. 116, no. 105194, pp. 1–25, 2020, doi: 10.1016/j.childyouth.2020.105194.

[42]   E. Gomez, J. Azadi, and D. Magid, "Innovation Born in Isolation: Rapid Transformation of an In-Person Medical Student Radiology Elective to a Remote Learning Experience During the COVID-19 Pandemic," *Academic Radiology*, vol. 27, no. 9, pp. 1285–1290, 2020, doi: 10.1016/j.acra.2020.06.001.

[43]   O. N. Akande, T. A. Badmus, A. T. Akindele, and O. T. Arulogun, "Dataset to support the adoption of social media and emerging technologies for students' continuous engagement," *Data in Brief*, vol. 31, no. 105926, pp. 1–7, 2020, doi: 10.1016/j.dib.2020.105926.

[44]   Y. K. Dwivedi *et al.*, "Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life," *International Journal of Information Management*, vol. 55, no. 102211, pp. 1–20, 2020, doi: 10.1016/j.ijinfomgt.2020.102211.

[45]   E. M. White, M. P. Shaughnessy, A. C. Esposito, M. D. Slade, M. Korah, and P. S. Yoo, "Surgical Education in the Time of COVID: Understanding the Early Response of Surgical Training Programs to the Novel Coronavirus Pandemic," *Journal of Surgical Education*, vol. 78, no. 2, pp. 412–421, 2021, doi: 10.1016/j.jsurg.2020.07.036.

[46] A. Balhareth, M. A. AlDuhileb, F. A. Aldulaijan, and M. Y. Aldossary, "Impact of COVID-19 pandemic on residency and fellowship training programs in Saudi Arabia: A nationwide cross-sectional study," *Annals of Medicine and Surgery*, vol. 57, pp. 127–132, 2020, doi: 10.1016/j.amsu.2020.07.025.

[47] M. Rizun and A. Strzelecki, "Students' acceptance of the covid-19 impact on shifting higher education to distance learning in Poland," *International Journal of Environmental Research and Public Health*, vol. 17, no. 18, pp. 1–19, 2020, doi: 10.3390/ijerph17186468.

[48] E. M. Mulenga and J. M. Marbán, "Is covid-19 the gateway for digital learning in mathematics education?" *Contemporary Educational Technology*, vol. 12, no. 2, pp. 1–11, 2020, doi: 10.30935/cedtech/7949.

[49] M. Mpalanyi, I. D. Nalweyiso, and A. G. Mubuuke, "Perceptions of radiography students toward problem-based learning almost two decades after its introduction at Makerere University, Uganda," *Journal of Medical Imaging and Radiation Sciences*, vol. 51, no. 4, pp. 639–644, 2020, doi: 10.1016/j.jmir.2020.06.009.

[50] A. Anwar, C. Seger, A. Tollefson, C. A. B. Diachun, P. Tanaka, and S. Umar, "Medical education in the COVID-19 era: Impact on anesthesiology trainees," *Journal of Clinical Anesthesia*, vol. 66, no. 109949, pp. 1–2, 2020, doi: 10.1016/j.jclinane.2020.109949.

[51] J. Zimmett, "Redesigning (virtual) learning with a 'love ethic' in the wake of COVID-19," *Education for Information*, vol. 36, no. 2, pp. 207–209, 2020, doi: 10.3233/EFI-200004.

[52] J. D. Chertoff, J. G. Zarzour, D. E. Morgan, P. J. Lewis, C. L. Canon, and J. A. Harvey, "The Early Influence and Effects of the Coronavirus Disease 2019 (COVID-19) Pandemic on Resident Education and Adaptations," *Journal of the American College of Radiology*, vol. 17, no. 10, pp. 1322–1328, 2020, doi: 10.1016/j.jacr.2020.07.022.

[53] K. D. Plancher, J. P. Shanmugam, and S. C. Petterson, "The Changing Face of Orthopaedic Education: Searching for the New Reality After COVID-19," *Arthroscopy, Sports Medicine, and Rehabilitation*, vol. 2, no. 4, pp. e295–e298, 2020, doi: 10.1016/j.asmr.2020.04.007.

[54] S. M. Durfee, R. P. Goldenson, R. R. Gill, S. P. Rincon, E. Flower, and L. L. Avery, "Medical Student Education Roadblock Due to COVID-19: Virtual Radiology Core Clerkship to the Rescue," *Academic Radiology*, vol. 27, no. 10, pp. 1461–1466, 2020, doi: 10.1016/j.acra.2020.07.020.

[55] Z. I. Almarzooq, M. Lopes, and A. Kochar, "Virtual Learning During the COVID-19 Pandemic," *Journal of the American College of Cardiology*, vol. 75, no. 20, pp. 2635–2638, May 2020, doi: 10.1016/j.jacc.2020.04.015.

[56] C. H. Li *et al.*, "Virtual Read-Out: Radiology Education for the 21st Century During the COVID-19 Pandemic," *Academic Radiology*, vol. 27, no. 6, pp. 872–881, 2020, doi: 10.1016/j.acra.2020.04.028.

[57] S. Konrad, A. Fitzgerald, and C. Deckers, "Nursing fundamentals – supporting clinical competency online during the COVID-19 pandemic," *Teaching and Learning in Nursing*, vol. 16, no. 1, pp. 53–56, 2021, doi: 10.1016/j.teln.2020.07.005.

[58] S. Rose, "Medical Student Education in the Time of COVID-19," *JAMA - Journal of the American Medical Association*, vol. 323, no. 21, pp. 2131–2132, 2020, doi: 10.1001/jama.2020.5227.

[59] S. Krishnamurthy, "The future of business education: A commentary in the shadow of the Covid-19 pandemic," *Journal of Business Research*, vol. 117, pp. 1–5, 2020, doi: 10.1016/j.jbusres.2020.05.034.

[60] K. H. Pang *et al.*, "The Impact of COVID-19 on European Health Care and Urology Trainees," *European Urology*, vol. 78, no. 1, pp. 6–8, 2020, doi: 10.1016/j.eururo.2020.04.042.

[61] E. Riley, L. Haggard-Duff, and C. R. Long, "Using an online learning module to teach nursing students about food insecurity as a social determinant of health," *Teaching and Learning in Nursing*, vol. 15, no. 4, pp. 241–244, 2020, doi: 10.1016/j.teln.2020.04.007.

[62] J. B. Stambough *et al.*, "The Past, Present, and Future of Orthopedic Education: Lessons Learned From the COVID-19 Pandemic," *Journal of Arthroplasty*, vol. 35, no. 7, pp. S60–S64, 2020, doi: 10.1016/j.arth.2020.04.032.

[63] R. C. Chick *et al.*, "Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic," *Journal of Surgical Education*, vol. 77, no. 4, pp. 729–732, 2020, doi: 10.1016/j.jsurg.2020.03.018.

[64] T. Hodges, C. Kerch, and M. Fowler, "Teacher Education in the Time of COVID-19: Creating Digital Networks as University-School-Family Partnerships," *Middle Grades Review*, vol. 6, no. 2, p. 4, 2020.

[65] M. Devlin and G. Samarawickrema, "The criteria of effective teaching in a changing higher education context," *Higher Education Research and Development*, vol. 29, no. 2, pp. 111–124, 2010, doi: 10.1080/07294360903244398.

[66] B. Little, "Effective and efficient mobile learning: Issues and tips for developers," *Industrial and Commercial Training*, vol. 44, no. 7, pp. 402–407, 2012, doi: 10.1108/00197851211267983.

[67] C. Berger, L. Alcalay, A. Torretti, and N. Milicic, "Socio-emotional well-being and academic achievement: Evidence from a multilevel approach," *Psicologia: Reflexao e Critica*, vol. 24, no. 2, pp. 344–351, 2011, doi: 10.1590/S0102-79722011000200016.

[68] J. Delahunty, I. Verenikina, and P. Jones, "Socio-emotional connections: Identity, belonging and learning in online interactions. A literature review," *Technology, Pedagogy and Education*, vol. 23, no. 2, pp. 243–265, 2014, doi: 10.1080/1475939X.2013.813405.

[69] R. J. Krumsvik, "Situated learning and teachers' digital competence," *Education and Information Technologies*, vol. 13, no. 4, pp. 279–290, 2008, doi: 10.1007/s10639-008-9069-5.

[70] A. S. M. Sayem, B. Taylor, M. Mcclanachan, and U. Mumtahina, "Effective use of Zoom technology and instructional videos to improve engagement and success of distance students in Engineering," *Australasian Association for Engineering Education (AAEE 2017)*, 2017, pp. 1–6.

[71] A. Beetz, "Socio-emotional correlates of a schooldog-teacher-team in the classroom," *Frontiers in Psychology*, vol. 4, no. Nov, 2013, doi: 10.3389/fpsyg.2013.00886.

[72] N. Guzacheva, "Zoom Technology as an Effective Tool for Distance Learning in Teaching English to Medical Students," *Bulletin of Science and Practice*, vol. 6, no. 5, pp. 457–460, 2020, doi: 10.33619/2414-2948/54/61.

[73] J. Cohen, "Teaching effectively with Zoom: A practical guide to engage your students and help them learn," *Journal of Public Affairs Education*, vol. 27, no. 2, pp. 260–262, 2021, doi: 10.1080/15236803.2020.1834676.

[74] L. Y. Muilenburg and Z. L. Berge, "Students Barriers to Online Learning: A factor analytic study," *Distance Education*, vol. 26, no. 1, pp. 29–48, 2005, doi: 10.1080/01587910500081269.

[75] V. A. Nguyen, "The Impact of Online Learning Activities on Student Learning Outcome in Blended Learning Course," *Journal of Information and Knowledge Management*, vol. 16, no. 4, 2017, doi: 10.1142/S021964921750040X.

[76] K. A. Magnuson, M. K. Meyers, C. J. Ruhm, and J. Waldfogel, "Inequality in preschool education and school readiness," *American Educational Research Journal*, vol. 41, no. 1. pp. 115–157, 2004, doi: 10.3102/00028312041001115.

[77] M. Nurtanto, N. Kholifah, A. Masek, P. Sudira, and A. Samsudin, "Crucial problems in arranged the lesson plan of vocational teacher," *International Journal of Evaluation and Research in Education (IJERE)*, vol. 10, no. 1, 2021, doi: 10.11591/ijere.v10i1.20604.

[78] L. Fitriana, A. Hendriyanto, S. Sahara, and F. N. Akbar, "Digital Literacy: The Need for Technology-Based Learning Media in the Revolutionary Era 4.0 for Elementary School Children," *International Journal of Progressive Sciences and Technologies*, vol. 26, no. 1, pp. 194–200, 2021.

[79] M. Martínez-Domínguez and I. Fierros-González, "Determinants of internet use by school-age children: The challenges for Mexico during the COVID-19 pandemic," *Telecommunications Policy*, vol. 46, no. 1, 2022, doi: 10.1016/j.telpol.2021.102241.

[80] M. A. Almaiah, A. Al-Khasawneh, A. Althunibat, and O. Almomani, "Exploring the Main Determinants of Mobile Learning Application Usage During Covid-19 Pandemic in Jordanian Universities," in *Emerging Technologies During the Era of COVID-19 Pandemic. Studies in Systems, Decision and Control,* vol 348. Springer, Cham, 2021.

BIOGRAPHIES OF AUTHORS

Awal Kurnia Putra Nasution is a lecturer in the field of learning technology at the Tarbiyah Faculty of Institut Agama Islam Negeri Takengon, Aceh, Indonesia. He has taught as a lecturer at IAIN Takengon since 2014, teaching various subjects such as educational technology, educational media, educational curriculum, and computer applications. He has a master's degree in educational technology, obtained in 2013 at the University of Bengkulu. His research focuses on educational technology and learning media. He can be contacted at email: awalkpn@gmail.com.

Mustafa Kamal Nasution is a lecture at Faculty of Tarbiyah of Institut Agama Islam Negeri Takengon, Aceh, Indonesia. His research focuses on science education, evaluation of science education, science and religion relation in education, professional development, teacher interpersonal behavior, and learning environment. He can be contacted at email: kamalnasution@gmail.com.

Muhammad Hasyimsyah Batubara is a lecturer in the Department of English Education, Faculty of Education, Institut Agama Islam Negeri Takengon, Aceh, Indonesia. His research interests are linguistics, literature, and Indonesian language education. His first degree in English language education at the State University of Medan Indonesia, and he continued his studies with a Master in linguistics at the State University of Medan, Indonesia. He is currently considering a Ph.D. in linguistics. He can be reached at email: muhammad.hasyimsyahbatubara@gmail.com.

Imam Munandar received the Master's degree in TESOL from Deakin University Melbourne, Australia in 2011. In addition, he had gained certification in English Language and American Culture from the University of California, Santa Cruz the United States of America in 2008. Since then, he has over 10 years of experience as an Academician with a number of universities, where he has been currently an Associate Professor at English Language Department, Faculty of Teacher Training and Education, Institut Agama Islam Negeri Takengon, Indonesia. His current research interest includes students' learning and development of English Language Learning. Her publication topics including Sociolinguistics, and, TESOL. He can be contacted at email: imameducator@gmail.com.