

## Research Article

# Software preference for online learning of science and biology teachers under COVID-19 pandemic



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### ABSTRACT

As measure against the rapid spreading of coronavirus disease 2019 (COVID-19) which now has reached global level, Indonesian government established Large-scale Social Distancing (LsSD). As consequence, learning method used in junior and senior high school is substituted from face-to-face learning in class to online distance learning, including for science and biology. This study was conducted to know software preference used by science and biology junior and senior high school teachers for online learning during LsSD measure. A total of 189 science and biology junior and senior high school teachers from various area had given their response via questionnaire. Data was analyzed using quantitative descriptive method. About 57% respondents had never manage online learning before COVID-19 pandemic while the remaining 43% had experience in managing one before, however almost all managed online learning. Non-paid software used the most (81%) among respondents to manage online science/biology learning. Software types used were social networking (64%) especially WhatsApp, learning management system (LMS) (51%) especially Google Classroom, teleconference applications (12%), and assessment software outside of LMSs (15%). Software chosen were mostly non-paid, easily accessed by all people, already familiar among Indonesian, and its interface were easily mastered.



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## INTRODUCTION

A new infectious disease was identified in early January 2020, originated from its outbreak in Wuhan, China as, known as coronavirus disease 2019 (COVID-19) (Ciotti et al., 2020; Sun et al., 2020; Tang et al., 2020; Tian et al., 2020). The disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Pascarella et al., 2020; Phan, 2020; Singhal, 2020; Wu et al., 2020). WHO then declared it a pandemic because the transmission had spread to almost all countries (Cucinotta & Vanelli, 2020). Since its first report, SARS-CoV-2 has transmitted globally and infected almost 80 million people in the world with mortality number up to 1.7 million as of December 2020 (Sallam, 2021).

COVID-19 pandemic is also faced by Indonesia. Since the first report of COVID-19 emerged from Depok on March 2nd, 2020, the numbers of COVID-19 patients in Indonesia continue to rise every day. This situation resulted in the establishment of COVID-19 as public health emergency and Large-scale Social Distancing

(LsSD or *Pembatasan Sosial Berskala Besar/PSBB*) as measure to minimize transmission (Djalante et al., 2020; Setiati & Azwar, 2020). By October, the number of patients infected by COVID-19 in Indonesia had surpassed 300,000 and the number of new cases continued to rise daily (Sparrow et al., 2020).

Large-scale Social Distancing measure affected various social and economic activity in Indonesian community, including learning activity in junior and senior high school (Atmojo & Nugroho, 2020; Gandasari & Dwidienawati, 2020). Since March, most classical learning in classes at high school are substituted by online classes for distance learning, especially in area affected by COVID-19 (Churiyah & Sakdiyyah, 2020; Yulia, 2020). Consequently, high school teachers who are used to conduct learning activity in classical classes must change their methods into distance learning, most commonly via online, not exceptionally science and biology teachers.

In online learning, the educational process takes place via the internet. It provides access to learning experience relates to not only geographical distance, but also various other issues which prevent attendance in class (Kim, 2020), such as during LsSD measure establishment. Distance learning brings the element of flexibility to learning process through the use of technologies (Mahlangu, 2018; Tavukcu et al., 2011).

During critical time of pandemic, instructors are faced with various software options to be used in distance learning. Software as intermediary of instructors and learners in online learning have important roles, not only as communication medium of both sides, but also to maintain the continuity of learning process. In addition, current high school students are digital natives who have known and are familiar with online interaction since young, implying apt digital literacy. Attitude, digital literacy, and self-efficacy are necessary to support optimal online learning (Prior et al., 2016), **as technological readiness related a lot to students' learning** (Geng et al. 2019). Choosing the right software can not only support efficient and effective online learning environment, but also encourage positive response from learners.

Processes in science, especially in Biology, implies manner or scientific activity for natural phenomena to describe the product obtained in the form of science facts, principles, laws, or theories. Science (include biology) containing six elements, including active learning, discovery/inquiry activity approach, scientific literacy, constructivism, science, technology, and society, and the existence of truth (Sudarisman, 2015). Fundamentally, based on its content, science and biology learning has specific characteristics different from other subjects. In relation to learning about living things, environments, and the relation between the two, the knowledge content does not only relate to scientific concrete facts related to nature, but also related to various abstract concepts (Kampourakis & Stern, 2018), for example chemical metabolism inside the body, hormone and coordination systems. Thus, one of the main challenges of a biology/science teacher is to determine the correct software to optimize the learning of such concepts, so students can perform active learning just like in classical classes. During this period of social limitation, instructors are challenged to be able to train skills and give understanding as optimal as in classical classes. In addition, instructors are also required to be able to create learning atmosphere to train thinking skills important for science learning.

Up until now, study on software use for distance learning is still limited in Indonesia. Previous studies focused on the difficulty of using and adapting to software during online learning (Azhari & Fajri, 2021; Febrianto et al., 2020), while other was limited to the use of one type of software (Susilo, 2008). However, there are still no study examining software preferences during online learning in Indonesia. Along with the development of online learning with the establishment of ban in classical classes to limit COVID-19 transmission, the role of software as bridge in learning between instructors and students become important. Instructors using software in online learning expect outcome of students able to obtain information as optimal as in classical classes. As distance learning has still very limitedly performed in Indonesian high school in pre-pandemic period, study of software use during rapid development of online learning during LsSD establishment is necessary.

This study was conducted to know the software preferences of science and biology teachers conducting online distance learning in junior and senior high school during initial establishment of LsSD measure to minimize COVID-19 transmission. By knowing software preferences used by teachers, we can evaluate various factors affecting online learning in high school in Indonesia, especially from technology viewpoint, and models of interaction occurred between instructors and learners in distance learning, especially during LsSD period where distance learning started be more commonly applied as substitute. Result of study can be used for further consideration of software to be used or developed in online learning in Indonesia during the continued period of social interaction limitation.

## METHOD

This study was designed as quantitative descriptive research using random survey method. Survey was conducted online using Google Form sent via WhatsApp message at April 24-26th 2020. Respondents were 189 science and Biology teachers of junior and senior high school from various area who were affected by national-wide LsSD measure selected randomly not restricted to certain area. Instrument used was mixed questionnaire based on preliminary literature review. Point of questions are presented in Table 1.

Questions were formulated to evaluate experience in conducting online learning before and during pandemic, type of application chosen to conduct online learning, application source, and the use of teleconference application. Respondents were asked to choose one of the provided answers except for question number 5, where respondents could choose more than one answers and number 6 where respondents were asked to write the name of software they used. Data obtained was analyzed based on the quantitative descriptive approach. Data were analyzed with descriptive analysis by calculating the frequency and percentage. The respondents provided information on age, sex, teaching level, occupation and mailing address.

Table 1. Questions in instruments given to respondents

No	Questions	Response choice
1	Do you have experience in conducting online learning before pandemic?	a. Yes b. No
2	Do you conduct online learning during pandemic?	a. Yes b. No
3	What is the source of software you used to conduct online learning?	a. Free/non-paid software b. Provided by school
4	What types of software you used in online learning? (can choose more than one)	a. Social networking b. Learning Management System c. Assessment and evaluation d. Teleconference
5	Do you have experience to conduct teleconference for online learning during LsSD?	a. Yes b. No
6	What software do you use in conducting online learning?	Writing the name of software

## RESULTS AND DISCUSSION

A survey involving biology and science teachers to determine the software preferences they use in online learning has been carried out in this study. Most respondents in the current study were female (76%) and more than half (57%) taught in senior high school (Table 2). About 57% respondents had never conduct online learning before COVID-19 pandemic. As much as 94% respondents were conducting online classes during LsSD measure at the time of survey. Most respondents chose non-paid software as medium while the remaining used software specially provided by schools. The types of software used by most respondents for online learning were social networking (64%) and Learning Management Systems (LMSs) (51%). About 15% used assessment and evaluation software outside of provided by LMSs, while 12% used teleconference applications. However, only 27% respondents ever used teleconference to support online learning they conducted (Table 3). At the initial establishment of LsSD, most science and biology teachers chose WhatsApp as software medium to conduct their classes. In addition, Google classroom seemed to be the LMS most respondents used to manage their online classes, even though other LMSs were also used (Figure 1).

Table 2. Demographic characteristics of respondents

Category	Response	Percentage (%)
Sex	Male	24
	Female	76
Teaching on level	Junior high	43
	Senior high	57
Age	22-35 years	37
	36-50 years	47
	Above 51 years	17

Online learning has the possibility to be able to support learning processes, collaboration, flexibility, and distribution of education, as well as evaluation. Successful use of online learning is based on the combination of educational competence with contextual understanding into a strategy, including of how to use digital educational methods (Bhuasiri et al., 2012; Muresan & Gogu, 2013; Rensburg, 2018; Sonesson et al., 2017). However, there are several factors that potentially become barriers, for example administrative issues, academic ability, technical ability, learner motivation, time and support for learning, internet cost and availability (Muilenburg & Berge, 2005). In addition, to support flexible online learning, there are two important factors that affect response of learners; positive perception on ease of access and the usage of flexible learning material, and autonomic and innovative learning style (Drennan, et al., 2005). **There's also a concern that distance learning can compromise the quality of learning due to lack of interaction practices (Markova et al., 2017; Tan, 2017).**

Based on those elaboration, one of the factors that determine the effectiveness of online learning is choosing the right software as medium. Software acts as bridge and prop that facilitate interaction of instructors and learners, thus become an important in conducting and maintaining online learning. Using the right technology can enable learners to be more flexible despite various constraints that may arise (Bell et al., 2017).

Table 3. Response to questionnaire

Question	Response	Percentage (%)
Have experience in conducting online learning before pandemic	Yes	43
	No	57
Conducting online learning during pandemic	Yes	94
	No	6
Source of software used to conduct online learning	Free/non-paid software	81
	Provided by school	19
Software types used in online learning	Social networking	64
	Learning Management System	51
	Assessment and evaluation	15
	Teleconference	12
Have experience to conduct teleconference for online learning	Yes	27
	No	73

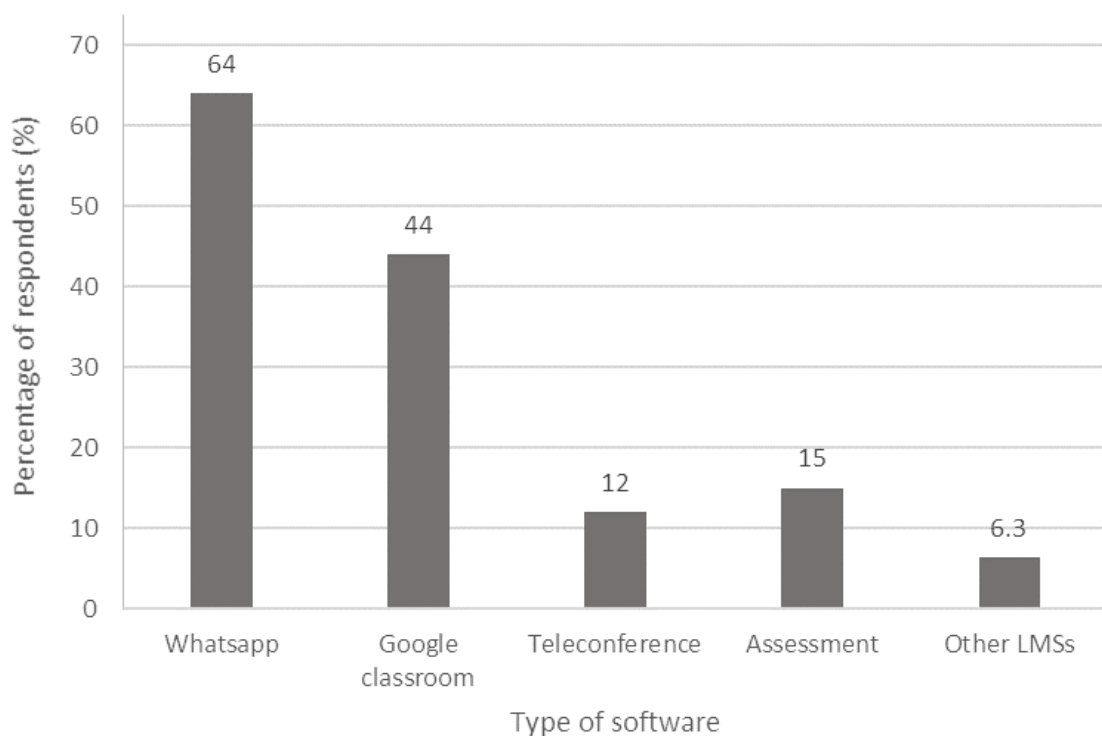


Figure 1. Software used by science/biology teachers in junior and senior high schools to conduct online learning during LsSD measure.

In the current study, about 57% of respondents had never manage online learning activity, but as much as 94% of them was conducting online learning during pandemic. This implied on somewhat low experience of science and biology instructors in high schools in managing online learning before pandemic. Their low experience could consequently affect their preparation when classical classes were temporarily stopped in most schools during the establishment of LsSD measure. It could also affect the fluency and continuity of online learning during the continued ban on classical classes.

About 81% of respondents chose to use non-paid software, while the remaining 19% used application provided by school. This proportion showed that ease of access to software became quite an influencing factor in choosing software. Software which are easier to be accessed support its users to familiarize themselves faster, thus consequently affect the continuity of learning process. As previously reported, ease of access of the technology used in online learning is one of factors that can determine the success of online learning (Parsazadeh et al., 2013).

On the types of application used for distance learning, most of respondents preferred to use social networking application (64%) and LMSs (51%). Various LMSs provide learners a comprehensive environment to communicate with instructors, submit tasks, review learning goals, download materials, participate in discussions, and view their learning progress (Thoms & Eryilmaz, 2014). With its array of features, LMS can substitute most activity and interaction occurs in classical classes. However, collaborative interaction among

learners is still limited in the most LMSs available. This can be covered by the utilization of social networking application. The use of social networking software can solve the limited communication and eliminate the need for shared time and place in the learning environment among learners (Rachtham & Firpo, 2011). Most respondent participate in the survey used both LMS and social networking in tandem for their online classes.

In addition of LMS and social networking software, other application types used by science and biology teachers were teleconference (12%) and assessment software outside LMS (15%). The use of teleconference in online learning was still limited among respondent; only 27% had conduct teleconference to support their online classes. In its implementation for online learning, teleconference can ensure real-time interaction between instructors and learners, in addition to prominent social presence, unlike in LMS or social networking applications, almost mirroring classical classes in synchronous learning (Basilaila & Kavadze, 2020). As previously studied, social presence still become a key element that affects the quality of online learning (Cobb, 2009). Better sociability in online learning also found to support students satisfaction in learning (Richardson et al., 2017; Weidlich & Bastiaens, 2019). However, other than interaction and social presence, teleconference software is still hindered by its cost and limited access to internet.

In addition of LMS and social networking software, other application types used by science and biology teachers were teleconference (12%) and assessment software outside LMS (15%). The use of teleconference in online learning was still limited among respondent; only 27% had conduct teleconference to support their online classes. In its implementation for online learning, teleconference can ensure real-time interaction between instructors and learners, in addition to prominent social presence, unlike in LMS or social networking applications, almost mirroring classical classes (Basilaila & Kavadze, 2020). As previously studied, social presence still become a key element that affects the quality of online learning (Cobb, 2009). However, in Indonesia, the use of teleconference software is still hindered by its cost and limited access to internet. High cost of communication and information still continues to be challenge in distance learning (Mahlangu, 2018).

Based on response given by participants, two of the most popular software for online learning of science and biology teachers in high school to conduct their classes were WhatsApp and Google Classroom. WhatsApp as social networking software is easily accessed, non-paid, and familiar among communities in Indonesia. WhatsApp was also the software popular to be used in online learning in Biology department, Universitas Negeri Surabaya due to its ease of access and use in communicating with students (Faizah, et al., 2021). WhatsApp was also used as online classes platform during COVID-19 pandemic in West Bengal, India, mainly to share materials and evaluate students (Kapasias et al., 2020). It was also the most popular platform to be used by lecturers in Mataram to conduct their classes (Gunawan, et al., 2020). In the other hand, Google Classroom is a non-paid LMS with simple interface that is easy to be mastered and can be accessed by everyone. Google Classroom has also been used by Department of Biological and Chemical Sciences in Lebanese International University to shift from classical to online learning in the wake of COVID-19 pandemic (Hallal, et al., 2020).

One of the most important point of features of each software is in the ease of giving or deliver visualization to students. Scientific visualization has long played an essential role in biology education, especially in communicating concepts of phenomena difficult to be seen by naked eyes. Visualization can play a critical role in transforming the way students think about scientific realm (Jenkinson, 2018). The use of software and technology has supported the delivers of certain visualizations to students and increase the effectiveness of learning. Other important point is that both software can facilitate both synchronous and asynchronous learning, supporting the flexibility of students in online learning.

All in all, this study is still limited based on the number of small respondents. Results might be largely affected by situation in respective region in where the respondents resided. Further study is needed to review the current condition of online learning and software used by instructors with larger number of respondents and more representative area distribution of respondents.

## CONCLUSION

Based on results, most science and biology teachers in junior and senior high school had little experience in managing online learning before COVID-19 pandemic occurred, but most of them did conduct online learning during LsSD. The types of software mostly chosen to conduct online learning during initial establishment of LsSD measure in COVID-19 pandemic were LMSs (89%) dan social networking (51%) software, which most participants used in tandem. Software chosen were mostly non-paid, easily accessed by all people, already familiar among Indonesian, and its interface easily mastered. Further study can be performed to evaluate the effectiveness of learning based on software choices used by biology/science teacher. Based on result of study which implied on low preparation in preparing online learning, we



recommend establishment of certain program to support instructors in understanding and optimizing software used in online learning to increase the effectiveness of learning during pandemic period.

## REFERENCES

- Atmojo, A. E. P., & Nugroho, A. (2020). EFL classes must go online! Teaching activities and challenges during COVID-19 pandemic in Indonesia. *Register Journal*, 13(1), 49–76. <https://doi.org/10.18326/rgt.v13i1.49-76>
- Azhari, B., & Fajri, I. (2021). Distance learning during the COVID-19 pandemic: School closure in Indonesia. *International Journal of Mathematical Education in Science and Technology*. <https://doi.org/10.1080/0020739X.2021.1875072>
- Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, 5(4), em0060. <https://doi.org/10.29333/pr/7937>
- Bell, S., Douce, C., Caeiro, S., Teixeira, A., Martín-Aranda, R., & Otto, D. (2017). Sustainability and distance learning: a diverse European experience? *Open Learning*, 32(2), 95–102. <https://doi.org/10.1080/02680513.2017.1319638>
- Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J. J., & Ciganek, A. P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, 58(2), 843–855. <https://doi.org/10.1016/j.compedu.2011.10.010>
- Churiyah, M., & Sakdiyyah, D. A. (2020). Indonesia education readiness conducting distance learning in COVID-19 pandemic situation. *International Journal of Multicultural and Multireligious Understanding*, 7(6), 491–507. <https://doi.org/10.18415/ijmmu.v7i6.1833>
- Ciotti, M., Angeletti, S., Minieri, M., Giovannetti, M., Benvenuto, D., Pascarella, S., Sagnelli, C., Bianchi, M., Bernardini, S., & Ciccozzi, M. (2020). COVID-19 outbreak: An overview. *Chemotherapy*, 64(5-6), 215–223. <https://doi.org/10.1159/000507423>
- Cobb, S. C. (2009). Social presence and online learning: A current view from a research perspective. *Journal of Interactive Online Learning*, 8(3), 241–254. <https://www.ncolr.org/jiol/issues/pdf/8.3.4.pdf>
- Cucinotta, D., & Vanelli, M. (2020). WHO declares COVID-19 a pandemic. *Acta Biomedica*, 91(1), 157–160. <https://doi.org/10.23750/abm.v91i1.9397>
- Djalante, R., Lassa, J., Setiamarga, D., Sudjatma, A., Indrawan, M., Haryanto, B., Mahfud, C., Sinapoy, M. S., Djalante, S., Rafliana, I., Gunawan, L. A., Surtiari, G. A. K., & Warsilah, H. (2020). Review and analysis of current responses to COVID-19 in Indonesia: Period of January to March 2020. *Progress in Disaster Science*, 6, 100091. <https://doi.org/10.1016/j.pdisas.2020.100091>
- Drennan, J., Kennedy, J., & Pisarski, A. (2005). Factors affecting student attitudes toward flexible online learning in management education. *Journal of Educational Research*, 98(6), 331–338. <https://doi.org/10.3200/JOER.98.6.331-338>
- Faizah, U., Ambarwati, R., & Rahayu, D. (2021). From offline to online learning: various efforts to secure the learning process during covid-19 outbreaks. *Journal of Physics: Conference Series*, 1747(1), 012002. <https://doi.org/10.1088/1742-6596/1747/1/012002>
- Febrianto, P. T., Mas'udah, S., & Megasari, L. A. (2020). Implementation of online learning during the COVID-19 pandemic on Madura Island, Indonesia. *International Journal of Learning, Teaching and Educational Research*, 19(8), 233–254. <https://doi.org/10.26803/ijlter.19.8.13>**
- Gandasari, D., & Dwidienawati, D. (2020). Content analysis of social and economic issues in Indonesia during the COVID-19 pandemic. *Heliyon*, 6(11), e05599. <https://doi.org/10.1016/j.heliyon.2020.e05599>
- Geng, S., Law, K. M. Y., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International Journal of Educational Technology in Higher Education*, 16(1), 1–22. <https://doi.org/10.1186/s41239-019-0147-0>
- Gunawan, G., Suranti, N. M. Y., & Fathoroni, F. (2020). Variations of models and learning platforms for prospective teachers during the COVID-19 pandemic period. *Indonesian Journal of Teacher Education*, 1(2), 61–70. <https://journal.publication-center.com/index.php/ijte/article/view/95>
- Hallal, K., HajjHussein, H., & Tlais, S. (2020). A quick shift from classroom to Google Classroom: SWOT analysis. *Journal of Chemical Education*, 97(9), 2806–2809. <https://doi.org/10.1021/acs.jchemed.0c00624>
- Jenkinson, J. (2018). Molecular biology meets the learning sciences: Visualizations in education and outreach. In *Journal of Molecular Biology* (Vol. 430, Issue 21, pp. 4013–4027). Academic Press. <https://doi.org/10.1016/j.jmb.2018.08.020>
- Kampourakis, K., & Stern, F. (2018). Reconsidering the meaning of concepts in biology: Why distinctions are

- so important. *BioEssays*, 40(11), 1800148. <https://doi.org/10.1002/bies.201800148>
- Kapasiasa, N., Paul, P., Roy, A., Saha, J., Zaveri, A., Mallick, R., Barman, B., Das, P., & Chouhan, P. (2020). Impact of lockdown on learning status of undergraduate and postgraduate students during COVID-19 pandemic in West Bengal, India. *Children and Youth Services Review*, 116, 1–5. <https://doi.org/10.1016/j.childyouth.2020.105194>
- Kim, J. (2020). Learning and teaching online during COVID-19: Experiences of student teachers in an early childhood education practicum. *International Journal of Early Childhood*, 52(2), 145–158. <https://doi.org/10.1007/s13158-020-00272-6>
- Mahlangu, V. P. (2018). The good, the bad, and the Ugly of distance learning in higher education. In *Trends in E-learning*. InTech. <https://doi.org/10.5772/intechopen.75702>
- Markova, T., Glazkova, I., & Zaborova, E. (2017). Quality issues of online distance learning. *Procedia - Social and Behavioral Sciences*, 237, 685–691. <https://doi.org/10.1016/j.sbspro.2017.02.043>
- Muilenburg, L. Y., & Berge, Z. L. (2005). Students barriers to online learning: A factor analytic study. In *Distance Education* (Vol. 26, Issue 1, pp. 29–48). <https://doi.org/10.1080/01587910500081269>
- Muresan, M., & Gogu, E. (2013). E-learning challenges and provisions. *Procedia - Social and Behavioral Sciences*, 92, 600–605. <https://doi.org/10.1016/j.sbspro.2013.08.724>
- Parsazadeh, N., Ali, R., Hematian, A., Megat, N., & Zainuddin, M. (2013). A review on the success factors of e-learning. *The Second International Conference on E-Technologies and Networks for Development*, 42–49. <https://www.semanticscholar.org/paper/A-REVIEW-ON-THE-SUCCESS-FACTORS-OF-E-LEARNING-Parsazadeh-Zainuddin/2ceb53cec54526ccd4d366d2ce36ba8eb38b3be5>
- Pascarella, G., Strumia, A., Piliego, C., Bruno, F., Del Buono, R., Costa, F., Scarlata, S., & Agrò, F. E. (2020). COVID-19 diagnosis and management: A comprehensive review. *Journal of Internal Medicine*, 288(2), 192–206. <https://doi.org/10.1111/joim.13091>
- Phan, T. (2020). Genetic diversity and evolution of SARS-CoV-2. *Infection, Genetics and Evolution*, 81(February), 104260. <https://doi.org/10.1016/j.meegid.2020.104260>
- Prior, D. D., Mazanov, J., Meacheam, D., Heaslip, G., & Hanson, J. (2016). Attitude, digital literacy and self efficacy: Flow-on effects for online learning behavior. *Internet and Higher Education*, 29, 91–97. <https://doi.org/10.1016/j.iheduc.2016.01.001>
- Ractham, P., & Firpo, D. (2011). Using social networking technology to enhance learning in higher education: A case study using facebook. *Proceedings of the Annual Hawaii International Conference on System Sciences*. <https://doi.org/10.1109/HICSS.2011.479>
- Rensburg, E. S. J. van. (2018). Effective online teaching and learning practices for undergraduate health sciences students: An integrative review. *International Journal of Africa Nursing Sciences*, 9, 73–80. <https://doi.org/10.1016/j.ijans.2018.08.004>
- Richardson, J. C., Maeda, Y., Lv, J., & Caskurlu, S. (2017). Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Computers in Human Behavior*, 71, 402–417. <https://doi.org/10.1016/j.chb.2017.02.001>
- Sallam, M. (2021). COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. *Vaccines*, 9(2), 160. <https://doi.org/10.3390/vaccines9020160>
- Setiati, S., & Azwar, M. K. (2020). COVID-19 and Indonesia. *Acta Medica Indonesiana: The Indonesian Journal of Internal Medicine*, 52(1), 84–89. <http://www.actamedindones.org/index.php/ijim/article/view/1426>
- Singhal, T. (2020). A review of Coronavirus Disease-2019 (COVID-19). *The Indian Journal of Pediatrics*, 87. <https://doi.org/10.1007/s12098-020-03263-6>
- Sonesson, L., Boffard, K., Lundberg, L., Rydmark, M., & Karlgren, K. (2017). The challenges of military medical education and training for physicians and nurses in the Nordic countries - an interview study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 25(1), 38. <https://doi.org/10.1186/s13049-017-0376-y>
- Sparrow, R., Dartanto, T., & Hartwig, R. (2020). Indonesia under the new bormal: Challenges and the way ahead. *Bulletin of Indonesian Economic Studies*, 56(3), 269–299. <https://doi.org/10.1080/00074918.2020.1854079>
- Sudarisman, S. (2015). Memahami hakikat dan karakteristik pembelajaran biologi dalam upaya menjawab tantangan Abad 21 serta optimalisasi implementasi Kurikulum 2013. *Florea: Jurnal Biologi Dan Pembelajarannya*, 2(1), 29–35. <https://doi.org/10.25273/florea.v2i1.403>
- Sun, P., Lu, X., Xu, C., Sun, W., & Pan, B. (2020). Understanding of COVID-19 based on current evidence. *Journal of Medical Virology*, 92(6), 548–551. <https://doi.org/10.1002/jmv.25722>
- Susilo, A. (2008). Use a Facebook for academic network learning in Universitas Terbuka - Indonesia. *Asian Association of Open Universities Journal*, 3(2), 99–114. <https://doi.org/10.1108/aaouj-03-02-2008-b003>

- Tan, C. (2017). Constructivism and pedagogical reform in China: issues and challenges. *Globalisation, Societies and Education*, 15(2), 238–247. <https://doi.org/10.1080/14767724.2015.1105737>
- Tang, D., Comish, P., & Kang, R. (2020). The hallmarks of COVID-19 disease. *PLoS Pathogens*, 16(5), 1–24. <https://doi.org/10.1371/journal.ppat.1008536>
- Tavukcu, T., Arapa, I., & Özcan, D. (2011). General overview on distance education concept. *Procedia - Social and Behavioral Sciences*, 15, 3999–4004. <https://doi.org/10.1016/j.sbspro.2011.04.404>
- Thoms, B., & Eryilmaz, E. (2014). How media choice affects learner interactions in distance learning classes. *Computers and Education*, 75, 112–126. <https://doi.org/10.1016/j.compedu.2014.02.002>
- Tian, S., Hu, N., Lou, J., Chen, K., Kang, X., Xiang, Z., Chen, H., Wang, D., Liu, N., Liu, D., Chen, G., Zhang, Y., Li, D., Li, J., Lian, H., Niu, S., Zhang, L., & Zhang, J. (2020). Characteristics of COVID-19 infection in Beijing. *Journal of Infection*, 80(4), 401–406. <https://doi.org/10.1016/j.jinf.2020.02.018>
- Weidlich, J., & Bastiaens, T. J. (2019). Designing sociable online learning environments and enhancing social presence: An affordance enrichment approach. *Computers and Education*, 142, 103622. <https://doi.org/10.1016/j.compedu.2019.103622>
- Wu, D., Wu, T., Liu, Q., & Yang, Z. (2020). The SARS-CoV-2 outbreak: What we know. *International Journal of Infectious Diseases*, 94, 44–48. <https://doi.org/10.1016/j.ijid.2020.03.004>
- Yulia, H. (2020). Online learning to prevent the spread of pandemic corona virus in Indonesia. *ETERNAL (English Teaching Journal)*, 11(1), 48–56. <https://doi.org/10.26877/eternal.v11i1.6068>