**Problems and prospects of blended learning; Insights from the COVID-19 pandemic**

**Arun T. Ram1\* Sibu G. Netto2 and Syama M. Mohanan**

1Department of Botany, Nirmala College, Kizhakkekara, Ernakulam District, Kerala – 686 661, India

2School of Pedagogical Sciences, Mahatma Gandhi University, Kottayam, Kerala – 686 560, India

\*Corresponding author: aruntram@gmail.com

**Abstract**

As the world is affected by a pandemic disease, higher education institutions attempt to provide more flexibility in higher education through digitalisation and online and blended learning designs. During the COVID-19 pandemic, the government of India too supported several proposals for secondary and higher education through the MoE. During the lockdown, students used popular social media tools like WhatsApp, Teachmint, Zoom, WebEx, Google Meet, Telegram, YouTube Live, Facebook Live, etc., as online teaching-learning systems. However, e-learning is still a barrier for several rural and remote areas. They suffer major problems like limited access to proper devices, lack of digital illiteracy, deficiency of infrastructural support, domestic and financial issues, health and mental issues, stress and poor data connectivity. Henceforth, blended learning will be gaining momentum, as it is being considered neither more nor less effective than traditional classroom learning with less time spent in the classroom.

**Keywords:** Blended learning, digitalisation of education, innovations, COVID-19 pandemic

**Introduction**

In the near history, the COVID-19 pandemic has historically devastated the education systems on every continent worldwide. Nearly 1.6 billion students in over 190 countries face the curse of the pandemic in providing a proper education. 94 percent of the global student population has been affected by school closures, with up to 99 percent in low and middle-income nations. (United Nations, 2020). The shutdown of educational institutions has impacted many pupils, even though the lockdown and social isolation are the only means to halt the spread of COVID-19 by breaking the chain of transmission. Due to the indefinite closure of schools and colleges, educational institutions and students experimented with numerous strategies to fulfil their mandated curricula within the time frame set forth by the academic calendar.

With the spread of the COVID-19 pandemic, there is a growing trend toward online teaching as the only remaining alternative to closing schools, colleges and institutions indefinitely (Martinez, 2020). Therefore, this is the apt time to seriously reconsider, overhaul, and redesign our educational system, which is needed sorely due to the unprecedented situation. Non-formal education includes e-learning, distance education, and correspondence courses, but if current trends continue, it appears that it will eventually supplant the formal education system. Now the trend is to create more and more new online platforms that would change the entire scenario of the whole education system, and most universities and other institutions have shifted to the online world using WhatsApp, Teachmint, Microsoft Teams, Zoom, Webex, Google Meet, Google Classroom, Telegram, YouTube Live, Facebook Live and many more.

Even though both students and teachers were familiar with modern internet-assisted learning practices, the abrupt formalisation of online learning created many issues for both learners and teachers. Online-based learning was created to address stagnation in the current educational system but has raised concerns about the quality of education due to its problems (Shahriar et al., 2021).

Over the last decade, the emergence of online and distance learning (ODL) has created the prospect of flexible and boundaryless campuses and classrooms. (Dash, 2019). In the Open and Distance Learning (ODL) scenario, the challenges are providing technological infrastructure and mentoring and guidance on using digital resources to interact with teachers and colleagues anywhere, at any time (Xiao et al., 2019).

Under a comprehensive reform recommended by the UGC, EdTech companies will be allowed to cooperate with higher education institutions that offer online undergraduate and postgraduate degrees to help develop course content and assess students (Barman, 2022). Digital University is one of the most talked-about and popular initiatives announced by the union government. It envisages the mission of making higher education accessible to all. Digital universities will solve the seat shortage problem by providing unlimited seats for everyone (Pandey, 2022).

The primary purpose of digital pedagogy is to employ digital resources as educational tools to support and enable students to manage their learning (Sneed, 2016). The requirement for teachers to apply digital taxonomy skills, such as Bloom’s Digital Taxonomy has expanded even more in the era of the COVID-19 epidemic, which mandates the use of online assessment (Matore, 2021). Churches (2008) introduced “Bloom’s Digital Taxonomy (BDT)” and elucidated that digital taxonomy is not only limited to the cognitive domain but also provides the methods and tools for conceptual understanding. Bloom’s Digital Taxonomy (BDT) graphical representation is in Fig.1. Churches identified the digital tools and verbs linked with each level, i.e., lower to higher (Munzenmaier & Rubin, 2013).

**Fig.1**

*Mind map of Bloom’s Revised Digital Taxonomy (adopted from Churches, 2008)*



Nikolic and Dabic (2016) described that ‘verbs’ used in digital environments differ due to their academic practice and are named ‘digital verbs’. Editing, creating, sharing and interacting are at the heart of many digital activities proposed in BDT (Cardoso, 2019). Lightle (2011) states that BDT helps us make decisions about learning experiences by navigating through the vast pool of digital tools. However, there are two drawbacks to using digital verbs in the academic context. First, classifying digital tools and assigning them to the right level is difficult as the tools cannot be confined to attending to any one task. Second, the popularity of the tools varies depending on the circumstance (Hart, 2015).

The nomenclature and hierarchy of levels of the digital taxonomy are from Bloom’s revised taxonomy proposed by Anderson and Krathwohl (2001). Collaboration is a distinct element, as some elements got shared. Collaboration at present is considered a 21st Century skill that is becoming increasingly important and widely used during the teaching-learning process; in some forms, it is an element of Bloom’s taxonomy, and in others, it is just a mechanism that facilitates higher-order thinking and learning. You don't have to work together to learn, but it often improves your learning (Churches, 2008). Amin and Mirza (2020) suggested that even though students in the digital age are already heavily involved with digital tools, adopting Bloom’s Digital Taxonomy in teaching-learning processes, that is, curriculum, instructions, and assessments for educators, may motivate online and traditional higher education institutions to adopt digital pedagogy for instructional purposes.

**Education through blended learning**

‘Blended Learning’ is mostly used interchangeably with hybrid, mixed-mode, or flexible learning. In this digitalised society, online technologies are mainly utilised for virtual, synchronous and asynchronous learning, whereas blended learning connotes a mixture of online and face-to-face classroom training (Muller & Mildenberger, 2021). Any academic intervention or rehabilitation technique that combines proper teaching and learning methods with technology or online resources to enable dynamic learning experiences and the achievement of educational goals is named blended learning (Mirriahi et al., 2015). Blended learning systems combine classroom instruction with computer-based instruction with online learning experiences (Graham, 2006; Garrison & Kanuka, 2004); and since all universities currently use online teaching management systems through which at least teaching-learning materials are made available; blended learning is now considered as ‘new traditional model’ (Dziuban et al., 2018).

The flipped classroom is quite a simple strategy for delivering learning resources such as articles, pre‑recorded videos and YouTube links before starting a lesson (Pokhrel and Chhetri, 2021). Online classroom time is then employed to deepen understanding through conversation with teachers and peers, and it also emphasises that different subjects and age groups require different methods of online learning (Doucet et al., 2020). The Government of India, during the lockdown, took several initiatives with the support of MHRD (Ministry of Human Resource Development), renamed MoE (Ministry of Education) in August 2020, to not hamper the academic activities of schools, colleges and universities. DIKSHA, e-Pathshala and the National Repository of Open Educational Resources (NROER) are digital initiatives for secondary education, whereas Swayam, Swayam Prabha and e-PG Pathshala are for higher education.

DIKSHA (Digital Infrastructure for Knowledge Sharing) (<https://diksha.gov.in> or <https://www.india.gov.in/spotlight/se-shagun-school-education-shagun>) is a national platform for the school education initiative of the NCERT. This portal contains curriculum-aligned e-Learning content for parents, teachers and students aligned to the curriculum, including video lectures, assessments, textbooks and worksheets.

The e-Pathshala (<http://epathshala.nic.in> or <http://epathshala.gov.in>.) is an NCERT e-learning initiative for standards 1 to 12 in multiple languages. The portal contains books, videos, audio files, etc., aimed at students, educators and parents in multiple languages, including Hindi, Urdu, and English.

SWAYAM (<https://swayam.gov.in/>) is a programme initiated by the Government of India, designed to realise the three basic principles of Education Policy: access, equality, and quality. This effort aims to make the best teaching-learning resources available to all, including the disadvantaged. SWAYAM seeks to surpass the digital divide for students who have been unaffected by the digital revolution and have not been able to fit into the mainstream of the knowledge-based economy.

SWAYAM PRABHA (<https://www.swayamprabha.gov.in/index.php/home>) is a 34 DTH channel broadcasting 24/7 high-quality educational programming via the GSAT-15 satellite. Each day there is a minimum of 4 hours of new content repeated five more times a day, permitting students to choose the time that suits them best. The INFLIBNET Centre maintains the web portal.

The e-PG Pathshala (<https://epgp.inflibnet.ac.in/>) is an initiative of the MoE (formerly MHRD) as part of their National Mission on Education through ICT (NME-ICT) implemented by the UGC. The content and its quality are the key components of an education system. Subject experts at universities in India and other research and development institutes across the country create high-quality curriculum-based, interactive e-contents in nearly all disciplines, including Social Sciences, Arts, Fine Arts, Humanities, Science, Mathematics, Linguistics, and Languages. Principal investigators, work coordinators, content writers, language editors, reviewers, and a multimedia team were all assigned to each subject.

Certain studies on online education found that most students prefer to use smartphones for online learning, and they prefer recorded classes with quizzes after each class to enhance learning effectiveness (Muthuprasad et al., 2021; Mishra et al., 2020).

**The positive impact of the COVID-19 pandemic on education**

During the pandemic, the education system got an opportunity to transform from a traditional system to a digitalised one. The use of online platforms has improved significantly. The pandemic has led to a massive increase in teleconferencing, virtual meetings, webinars, and e-conferencing opportunities. People had to learn and use digital technologies, which finally led to an increase in digital literacy. Most students prefer Open and Distance Learning as it encourages self-learning, offers opportunities to learn from diverse resources and adapts learning according to their needs (Jena, 2020). The most important factor is that the traditional method of the teaching-learning system got replaced by blended learning. Educators in schools, colleges, and universities adopt the blended learning approach. It is a big possibility that face-to-face delivery and online modules will become ‘the new normal’ (Dziuban et al., 2018). Teachers had to adapt quickly to technology and be ready for this learning method.

As blended learning is the future learning format, there will be new ways of designing and delivering high-quality content, especially given that the usage of learning management systems will lead to more openness and transparency in academia. Blended learning can also provide opportunities for curriculum development and pedagogy, facilitated by the innovative method of delivery and assessment of learning outcomes. It is also an opportunity for curriculum designers to improve the quality of the learning material.

According to Rajab et al. (2020), hurdles to online medical education during COVID-19 included issues concerning communication, 59 percent, student assessment 57.5 percent, use of tools based on technology 56.5 percent, the online experience 55 percent, pandemic-related anxiety or stress 48 percent, time management 35 percent, and technophobia 17 percent. These were among the challenges to online medical education during the COVID-19 pandemic. According to recent research, COVID-19 had a mainly positive impact on online education.

**The negative impact of the COVID-19 pandemic on education**

Even though online education signatures the concept of ‘education for all,’ students in rural areas proved that e-learning is not for all (Reddy & Ramesh, 2020). It is important to see the accessibility of accurate devices for each student to avail of the digital content. The COVID-19 pandemic has posed many issues for school administrators. Schools, particularly in rural areas, face financial impact and the digital divide challenges. Conducting online classes in a rural area poses certain challenges, and many students who do not have gadgets like smartphones or internet access are left out (Dube, 2020; Jena, 2020). Students in rural and remote areas face challenges accessing their online courses due to poor data connectivity, a shortage of computers and smartphones, and power issues (Naik & Rao, 2020).

Also, the data packages and their prices tend to discourage both teachers and students from proceeding with live classes. Another key factor for the further development of digital education is the insufficient competence of rural teachers to operate digital platforms. The lack of training to use digital platforms makes teachers reluctant to adopt these teaching methods. Civil society organisations, legislators, and the government must work together to establish a user-friendly digital interface that enables teachers and students to learn without interruption.

Digital illiteracy and lack of infrastructural support are the main issues encountered in rural or remote areas. A large section of the rural populace still lacks access to the internet and the ability to recognise devices and digital terminologies. Another major problem concerns the lack of supporting infrastructure facilities such as a stable flow of electricity and the unavailability of high-speed internet.

Online teaching and learning can create a digital divide among students since many students have limited or no internet connection and many students may not be able to purchase a computer, laptop, or supportive mobile phone at home. According to various reports, the lockdown has disproportionately harmed underprivileged pupils in India, who cannot access online learning. Therefore, the online teaching-learning method may widen the gap between rich/poor and urban/rural during the COVID-19 pandemic. Students lost an academic year as a result of the lockdown, exacerbating the lack of educational continuity. Students would face great difficulties returning to school after a large gap, and thus continuity in educational activity may get hampered (Jena, 2020).

The rapid transition of all teachers and students from traditional to online learning was a major crisis. Proper orientation classes to organise online classes were absent, students and teachers lacked technical knowledge, and the beginning of online teaching and learning was very difficult. Without a dedicated platform, most lecturers conduct lectures via video platforms like Zoom, Google Meet, and others, which may not represent true online learning. Later, online teaching became familiar to all, and sharing materials like PPTs, PDFs, teaching notes, etc., made the online sessions more enriching.

During the lockdown, most parents got unemployed. They found it difficult to pay the fees of their wards for that period, which harmed private institutions in the wake of the COVID-19 outbreak, forcing school closures and a shift to online classes; the Honourable Supreme Court has ruled that educational institutions must reduce fees as their overhead costs have reduced, as various on-campus facilities have remained closed. Educational administrators should be aware of the challenges individuals face due to the pandemic and support the students and their parents during these difficult times. It found that requesting payment for services not rendered to students is profiteering, and institutions must avoid such practices (Choudhary, 2021).

Chakraborty et al. (2020) studied Students’ opinions on online education during the pandemic and reported that they thought that students learned improved in physical classrooms (65.9 percent) and by attending Massive Open Online Courses (MOOCs) (39.9 percent). On the other hand, students believe that professors’ online teaching skills have improved since the pandemic (68.1%) and that online education is beneficial (77.9 %). The software and online teaching-learning materials that enabled online education were well received by the students. Students, on the other hand, believe that online classes are stressful and that they have an impact on their physical and mental health as well as their social lives.

**Innovations in online learning in the new normal era**

A fundamental component of educational innovation is educator training and student and educator learning (Wadmany & Melamed, 2018). Students' interest in the learning process can also be increased through the usage of innovative media since it creates a more effective and efficient learning atmosphere process (Islam et al., 2018). Innovations in teaching-learning media in education are increasing and there is a paradigm shift in learning that requires the role and technological sophistication of knowledge transfer without affecting individual mobility (Zamroni et al., 2020; Rozi et al., 2020). To improve interactive, effective, efficient and cost-effective learning models in the 21st century, innovative educators may have the opportunity to combine face-to-face and digital learning methods (Pavlik, 2015). Innovative media focuses on the teaching-learning process, creatively and dynamically designed, developed and managed through the application of a multi-directional approach to improvement and the latest media are used to create an atmosphere and learning process that is conducive to the students (Bali et al., 2021).

Massive Open Online Courses (MOOCs) have developed as a new method of disseminating educational content to a large audience, but they have so far been unable to keep students' interest for an extended period (Davis et al., 2018). Utilising adaptive learning strategies, online learning platforms personalise each student's learning process (Li et al., 2021). These systems use data analysis and algorithms to identify learners' strengths and weaknesses and adjust course material accordingly. The development of Virtual Reality (VR) and Augmented Reality (AR) technologies have been increasingly used to create immersive learning experiences. These technologies allow students to explore virtual environments, manipulate objects, and participate in simulations, encouraging a more interactive and hands-on approach to learning (Baabdullah et al., 2022). With the widespread use of smartphones and tablets, mobile learning has become a prominent trend. Learning materials are optimised for mobile devices, allowing learners can access learning content anytime, anywhere, making learning more accessible and flexible (Criollo-C et al., 2021). AI-powered tools are used to enhance online learning experiences. Intelligent tutoring systems can provide learners with personalised feedback and guidance, while AI algorithms can analyse vast amounts of data to improve learning outcomes and recommend customised learning paths (Kuleto et al., 2021). With the help of Artificial Intelligence (AI), Learning Management Systems (LMSs) can be versatile and figure out how to adapt their projects to individual students. These customizations improve the feasibility of the modules by tailoring them to the individual abilities, inclinations and needs of each student (Laxmaiah et al., 2022).

New Normal is the move to speed up the teaching-learning process during the pandemic. It must be possible to combine face-to-face and virtual learning methods, as face-to-face classes are not crowded as usual and teachers therefore need to be creative and innovative to be able to use the short face-to-face time effectively and efficiently.

**Educational research during the COVID-19 pandemic**

Many difficulties arose at the school level and in the research fields during the pandemic. Many exams like UGC-NET, CSIR-NET, and GATE got postponed. Many universities failed to complete PhD and MPhil courses on time, and the universities extended the duration to six months following the recommendation of UGC. But the fellowships have not been extended in proportion to that. They could not find other employment or financial resources. Thus, universities and the government failed to do justice to the researchers. During the lockdown, researchers were devoid of the hostel and other facilities available at the universities and university-affiliated research centres; this was a major blow to further research.

Although the lockdown did not significantly affect research in subjects like the Arts and Humanities, it significantly impacted practical subjects like Life Sciences. Due to the absence of appropriate monitoring of laboratory experiments on the required topics, they relied on online platforms for other research discussions. Research in Arts subjects has largely relied on online platforms such as Google Forms, Google Meet, and WhatsApp for data collection. However, this is not practical for Life Sciences as they always need to conduct experimental research. As a result, research in the Life Sciences has almost come to a near standstill. Moreover, the researchers who lost time and money on experiments must find funds to resume these research activities. This situation also hinders the progress of further research.

Although seminars, symposiums, and conferences shifted to an online platform, engaging the attendees throughout the entire programme was not easy. The significant thing to be noted is that various seminars were held almost simultaneously in many colleges and universities during the said period. And the pertinent issue was that in such seminars, participants were to do the paper presentation only during the allotted time, making attending other technical sessions an option. Those interested in attending seminars easily participated in many at a sitting by just switching over to various online platforms the organisers were using; the participants received a good collection of certificates; but whether these seminars served their real purpose remains unanswered.

**Conclusion**

In India, taking education to every nuke and corner of the nation via digital platforms is not an easy task. The priority should be utilising digital technology to create advantageous positions for millions of young students in India. The urgency is the betterment of millions of young Indian students with digital technologies. Educational institutions must enhance their knowledge and information technology infrastructure and prepare for COVID-19-like situations.

The concept of ‘work-from-home’ has more relevance in such pandemic situations to reduce the spread of the disease, and at the same time, it need not compromise the spread of education. To ensure adequate education, India needs a policy to engage diverse people from different backgrounds, including remote regions, the marginalised and minority groups. In the case of research scholars, the universities and allied research institutes must provide financial support to researchers for the smooth running of their research. Since online practice benefits students immensely, it may be recommended long after the pandemic. The curriculum should be redesigned based on Bloom’s Digital Taxonomy and implemented to achieve the academic and educational purposes of the digital era. In conclusion, various studies have implied that blended learning is neither more nor less effective than traditional classroom learning.

**References**

Amin, H., & Mirza, M.S. (2020). Comparative study of knowledge and use of Bloom’s digital taxonomy by teachers and students in virtual and conventional universities. *Asian Association of Open Universities Journal*, *15*(2), 223-238. <https://doi.org/10.1108/AAOUJ-01-2020-0005>

Anderson, L.W., & Krathwohl, D.R. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives*. Allyn & Bacon. Boston, MA (Pearson Education Group).

Baabdullah, A. M., Alsulaimani, A. A., Allamnakhrah, A., Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2022). Usage of augmented reality (AR) and development of e-learning outcomes: An empirical evaluation of students’e-learning experience. *Computers & Education*, *177*, 104383. <https://doi.org/10.1016/j.compedu.2021.104383>

Bali, M. M. E. I., Baharun, H., Madanibillah, A., Muali, C., Lukman, N. K. A., & Bon, A. T. (2021). Innovative learning media based on e-learning in the new normal era. *Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management*, 6987-6993.

Cardoso, S. (2019). New technologies and new literacies in the English classroom: a study. *Revista Intersaberes*, *14*(3), 1168-186. <https://doi.org/10.22169/ri.v14i31.1523>

Chakraborty, P, Mittal, P., Gupta, M.S., Yadav, S., & Arora, A. (2021). Opinion of students on online education during the COVID-19 pandemic. *Human Behaviour and Emerging Technologies*, *3*(3), 357–365. <https://doi.org/10.1002/hbe2.240>

Choudhary, A.A. (2021). *Schools must reduce fees for online-only classes: Supreme Court*. Available at: <https://timesofindia.indiatimes.com/india/schools-must-reduce-fees-for-online-only-classes-supreme-court/articleshow/82377796.cms>

Churches, A. (2008). *Bloom’s digital taxonomy*, pp.1–44. Available: <http://burtonslifelearning.pbworks.com/f/BloomDigitalTaxonomy2001.pdf>.

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021). Mobile learning technologies for education: Benefits and pending issues. *Applied Sciences*, *11*(9), 4111. <https://doi.org/10.3390/app11094111>

Dash, BM (2019). Perception towards quality and effectiveness of social work education through open and distance learning, *Asian Association of Open Universities Journal*, *14*(1), 64-83. <https://doi.org/10.1108/AAOUJ-06-2019-0023>

Davis, D., Chen, G., Hauff, C., & Houben, G. J. (2018). Activating learning at scale: A review of innovations in online learning strategies. *Computers & Education*, *125*, 327-344. <https://doi.org/10.1016/j.compedu.2018.05.019>

Doucet, A., Netolicky, D., Timmers, K., & Tuscano, F. J. (2020). *Thinking about pedagogy in an unfolding pandemic (An Independent Report on Approaches to Distance Learning during COVID-19 School Closure)*. Work of Education International and UNESCO. <https://issuu.com/educationinternational/docs/2020_research_covid-19_eng>

Dube, B. (2020). Rural online learning in the context of COVID 19 in South Africa: Evoking an inclusive education approach. *REMIE: Multidisciplinary Journal of Educational Research*, *10*(2), 135-157.

Dziuban, C., Graham, C.R., Moskal, P.D., Norberg, A., & Sicilia, N. (2018). Blended learning: The new normal and emerging technologies. *International Journal of Educational Technology in Higher Education*, *15*(3), 1-16. <https://doi.org/10.1186/s41239-017-0087-5>

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, *7*(2), 95-105. <https://doi.org/10.1016/j.iheduc.2004.02.001>

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk, & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco: Wiley & Sons.

Hart, J. (2015). Top 100 Tools for 2015. *Preuzeto 2016 Sa Top 100 Tools for Learning*. available at: <http://c4lpt.co.uk/top100tools/>

Islam, S., Baharun, H., Muali, C., Ghufron, M. I., Bali, M. M. E. I., Wijaya, M., & Marzuki, I. (2018). To Boost Students’ Motivation and Achievement through Blended Learning. *Journal of Physics: Conference Series*, *1114*(1), 1–11. <https://doi.org/10.1088/1742-6596/1114/1/012046>

Jena, P. K. (2020). Impact of pandemic COVID-19 on education in India. *International journal of current research*, *12*(7), 12582-12586. <https://doi.org/10.24941/ijcr.39209.07.2020>

Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M., Păun, D., & Mihoreanu, L. (2021). Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability*, *13*(18), 10424. <https://doi.org/10.3390/su131810424>

Laxmaiah, B., Ramji, B., & Kiran, A. U. (2022). Intelligent and adaptive learning management system technology (LMST) using data mining and artificial intelligence. *ICCCE 2021: Proceedings of the 4th International Conference on Communications and Cyber Physical Engineering*, pp. 333-341. <https://doi.org/10.1007/978-981-16-7985-8_35>

Li, F., He, Y., & Xue, Q. (2021). Progress, challenges and countermeasures of adaptive learning. Educational Technology & Society, 24(3), 238-255. <https://www.jstor.org/stable/27032868>

Lightle, K. (2011). More than just the technology, *Science Scope*, Vol. 34, No. 9, pp. 6-9.

Martinez, J. (2020). *Take this pandemic moment to improve education*. EduSource. Retrieved from [https://edsource.org/2020/take-this-pandemic-moment-to-improve- education/633500](https://edsource.org/2020/take-this-pandemic-moment-to-improve-%20education/633500)

Matore, MEEM (2021). Rasch Model Assessment for Bloom Digital Taxonomy Applications. *Computers, Materials and Continua*, *68*(1), 1235-1253. <https://doi.org/10.32604/cmc.2021.016143>

Mirriahi, N., Alonzo, D. & Fox, B. (2015). A blended learning framework for curriculum design and professional development, *Research in Learning Technology*, *23*, 1-14. <https://doi.org/10.3402/rlt.v23.28451>

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, *1*(100012), 1-8. <https://doi.org/10.1016/j.ijedro.2020.100012>

Müller, C., & Mildenberger, T. (2021). Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education. *Educational Research Review*, *34*(100394), 1-16. <https://doi.org/10.1016/j.edurev.2021.100394>

Munzenmaier, C., & Rubin, N. (2013). Perspectives Bloom’s taxonomy: what’s old is new again, *The eLearning Guild*, 1-47.

Muthuprasad, T., Aiswarya, S., Aditya, K. S., & Jha, G. K. (2021). Students’ perception and preference for online education in India during COVID-19 pandemic. *Social Sciences and Humanities Open*, *3*(1), 1-11. <https://doi.org/10.1016/j.ssaho.2020.100101>

Naik, G., & Rao, K. N. N. (2020). *Challenges of online education in Rural Karnataka*. Available at: <https://www.forbesindia.com/article/iim-bangalore/challenges-of-online-education-in-rural-karnataka/62349/1>

Nikolic, M., & Dabic, T. (2016). The Bloom’s taxonomy revisited in the context of online tools. *Sinteza 2016-International Scientific Conference on ICT and E-Business Related Research*. <https://doi.org/10.15308/Sinteza-2016-315-320>

Pavlik, J. V. (2015). Fueling a Third Paradigm of Education: The Pedagogical Implications of Digital, Social and Mobile Media. *Contemporary Educational Technology*, *6*(2), 113–125. <https://doi.org/10.30935/cedtech/6143>

Pokhrel, S., & Chhetri, R. (2021). A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*, *8*(1), 133-141. [https://doi.org/10.1177%2F2347631120983481](https://doi.org/10.1177/2347631120983481)

Rajab, M.H., Gazal, A.M, & Alkattan, K. (2020). Challenges to Online Medical Education During the COVID-19 Pandemic. *Cureus*, *12*(7), 1-8. <https://doi.org/10.7759/cureus.8966>

Reddy, D.S., & Ramesh, LSRCV (2020). Pros and cons of e-learning by children in rural areas during lockdown situation and ways to empower it. *International Journal of Innovative Technology and Research*, 7-9.

Rozi, F., El Iq Bali, M. M., Firdaus, S., Wijaya, M., Al Mursyidi, R. A., Haqiki, M. W., & Abidin, Z. (2020). Learning management; identifying learning styles of language learners in madrasah. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 3783–3790.

Shahriar, S.H.B., Arafat, S., Sultana, N., Akter, S., Khan, M.M.R., Nur, J.E.H. & Khan, S.I. (2021). The transformation of education during the corona pandemic: exploring the perspective of the private university students in Bangladesh. *Asian Association of Open Universities Journal*, *16*(2), 161-176.

Sneed, O. (2016), *Integrating technology with Bloom’s taxonomy*, available at: <https://teachonline.asu.edu/2016/05/integrating-technology-blooms-taxonomy/>

United Nations (2020). *Policy brief: education during covid-19 and beyond*, pp. 1-26. <https://www.un.org/development/desa/dspd/wpcontent/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf>

Wadmany, R., & Melamed, O. (2018). “New Media in Education” MOOC: Improving Peer Assessments of Students’ Plans and their Innovativeness. *Journal of Education and E-Learning Research*, *5*(2), 122–130. <https://doi.org/10.20448/journal.509.2018.52.122.130>

Xiao, J., Sun-Lin, H. Z., & Cheng, H.C. (2019). A framework of online-merge-offline (OMO) classroom for open education. *Asian Association of Open Universities Journal*, *14*(2), 134-146. <https://doi.org/10.1108/AAOUJ-08-2019-0033>

Zamroni, Ilyasin, M., & Tohet, M. (2020). Multicultural education in a religious life: Developing harmony among religions in southeast Asia. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 3791–3801.