Using Technology at Community Colleges to Equip Adult Learners for Employment: Digital Divide a Challenge

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The European Conference on Education 2023
Official Conference Proceeding

Abstract
The world has entered the fourth industrial revolution (4IR) and South Africa is no exception. In order not to be left behind, everyone needs to embrace 4IR. This study emanates from the Adult Community Education and Training (ACET) programmes that are offered at community learning centres in the rural area of Limpopo Province whereby, facilitators (practitioners/adult educators) have raised concerns on how they can incorporate technology in their teaching and learning. These community learning centres cater for those who are not in employment, education or training (NEET) and serve as the safety net for this group of people. The purpose of the study was to establish whether technology is used in the teaching and learning of ACET programmes. Qualitative approach was adopted with case study design. Individual interviews and focus groups, were used for collecting data. The findings of the study were that technology is not used in the teaching and learning of ACET programmes due to the digital challenges. In conclusion, this study indicates that ACET practitioners should use technology in their teaching and learning in order to equip adult learners for employment. Therefore, adult educators at community learning centres need to be empowered with technological skills.

Keywords: Adult Learners, Facilitators, Technology, Digital Divide, ACET Programmes, Employment

Introduction

The fourth industrial revolution (4IR) has begun in the world, and South Africa is no exception. Everyone must adopt 4IR if they do not want to fall behind. This study was inspired by the Adult Community Education and Training (ACET) programmes that are provided at community learning centers in Limpopo Province's rural areas, where facilitators (practitioners/adult educators) have voiced concerns about how they can use technology in their teaching and learning. The production of qualified teachers who can provide online education and high-quality training has long been a difficulty for South Africa (Hofmeyr & Draper, 2015). According to Zoch and Myers (2017), professional development is a crucial tool for assisting in-service teachers in incorporating technology into their daily interactions with students. Since community learning centres (CLCs) provide as a safety net for persons who are not currently enrolled in any type of job, education, or training (NEET), it is imperative that adult educators be empowered in the use of technology in their teaching and learning of ACET programmes. This can assist them in equipping adult learners for employment through using technology in their daily teaching and learning. The study's goal was to determine whether technology is employed in ACET programme teaching and learning in order to equip adult learners for employment in the digital era. The study is a component of the 2022 thesis. The importance of technology literacy in enabling teachers to apply a blended learning approach throughout their teaching and learning has been highlighted in a significant amount of literature (Goodwin-Jones, 2000; Blau & Shamir-Inbal, 2017; Mutohar, 2012). Mhlanga and Moloi (2020) noted in their study the detrimental effects on teaching and learning brought on by the incapacity to employ technology, particularly in the face of unforeseeable events like the Covid-19 pandemic. In addition, Brown-Martin (2017) noted in his research the significance of digital literacy in assisting students in growing their capacity for adaptation to engage in the global digital society.

The examination of technical gaps at community colleges and the methods used to bridge such gaps have received less attention in the literature. By examining how community colleges use technology to prepare adult learners for work and how a digital divide might be a difficulty, this study aims to fill that gap in the body of literature. The study can assist adult education practitioners, academics and government representatives in realising how crucial it is to use technology at community colleges to prepare adult learners for jobs in the digital era. This study is indirectly a response to a call for research (Kayembe and Nel, 2019) that encourages the creation of online training programs, particularly in Community Learning Centers (CLCs) that are located in areas of extreme poverty.

The research question formulated for the study was:

How is technology employed in community colleges to equip adult learners for employment?

The sub-questions for this study were:

- Which technology tools are employed at community colleges to prepare adult students for employment?
- What difficulties do community colleges have in using technology to prepare adult learners for the workforce?
- What approaches may be used to solve the problems with technology use at community colleges?

Aim

The purpose of the study was to establish whether technology is used in the teaching and learning of ACET programmes and to seek suitable approaches that can be used in mitigating the challenge of digital divide at community colleges.

Objectives

- To conduct research and data collection to identify the barriers faced by adult learners in accessing and effectively using technology, with a focus on the digital divide.
- To establish partnerships with technology companies to secure funding, equipment donations, and software licenses for community colleges.
- To advocate for policy changes and funding initiatives at the local, state, and national levels to support technology integration efforts in community colleges.

The article below is outlined as follows: the theoretical framework, the literature review, which are followed by the outlining of the sample and methods of collecting data. There is a discussion of the findings and as well as a summary with recommendations.

Theoretical Framework

The study is about using technology at community colleges to equip adult learners for employment. It is therefore, underpinned by digital divide framework for online learning of Mathrani, Sarvesh and Umer (2021). They drew from digital divide framework from Pachler, Cook, and Bachmair's (2010) socio-ecological framework that separates out three analytical perspectives, namely structure, cultural practices and agency. Mathrani et al (2021) agree with Bannan, Cook, and Pachler (2016), that learning as a social phenomenon, does not take place in one location but also across communities, locations, time, social context and sites of practice. Figure 1.1 below shows Digital Divide Framework at Community Colleges.

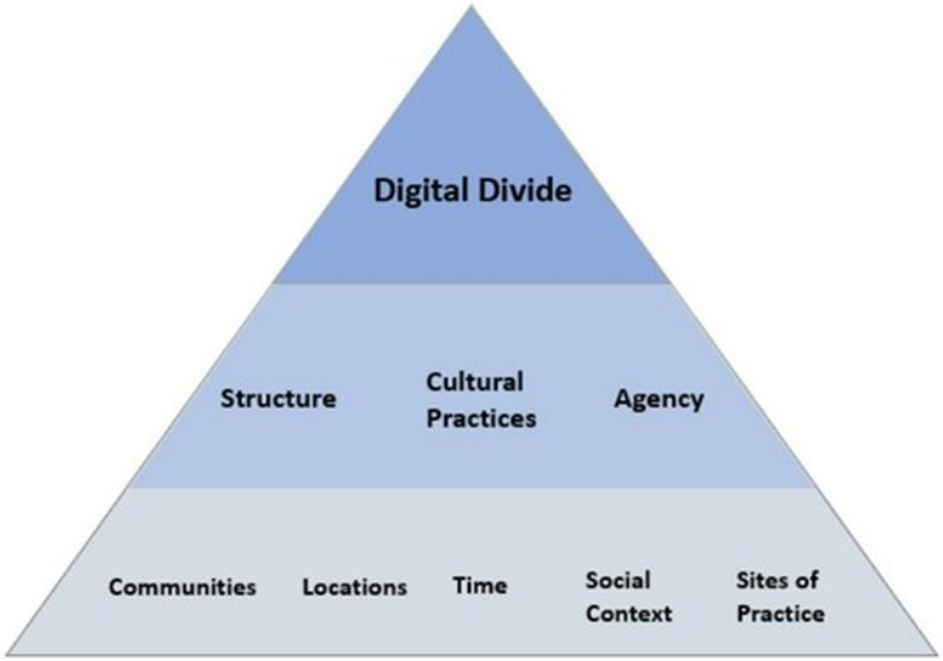

Figure 1.1 Digital Divide at Community Colleges
(adapted from Mathrani, Sarvesh, and Umer, 2021)

Digital divide framework examines the disparities in access to and usage of technology among different groups (Chowdhury, G., McLeod, J., Gillet, V., & Willett, P. (Eds.). (2018). The first layer in the figure1.1 above, shows that the community college exists in a community with its challenges regarding the resources available in the community, for instance limited or none existence of computers. The location of the community learning centres (as delivery sites) influences the connectivity in the sense that remote areas are hard to reach. The time of the day and the load shedding schedule of power supply affects the access to internet. The sites of practice, which are community learning centres without technology resources, for example, not a single computer can be found let alone for administrative purposes.

The next layer of challenges has the structure, which poses the risk of limited technological infrastructure. Community colleges in rural areas can experience unstable infrastructure whereby users can only opt for basic phones for network connectivity (Mathrani, Umer, Sarvesh and Adhikari, 2023). On the other hand, the socio-cultural norms can have influence in digital literacy whereby individual has to make choices in terms of learning. This study agrees with Pachler et al.'s socio-ecological outlook and Bannan, Cook, and Pachler's (2016) view that learning is framed within communities, locations, time, social context and sites of practice.

In the context of community colleges, this framework recognizes that adult learners may face various barriers such as limited access to technology resources, lack of digital literacy, and socio-economic factors. Addressing the digital divide requires interventions that promote equal access to technology, provide training and support for digital literacy, and consider the unique needs and challenges of adult educators.

Literature Review

The application of technology in the teaching and learning environment and the teachers' successful integration of technology in their classrooms has been the center of vigorous debates in the field of teacher education (Lee, & Lee, 2014). This study agrees with the existing literature (Vongkulluksn, Xie, & Bowman, 2018; Zheng, Warschauer, Lin, & Chang, 2016; Gray, Thomas & Lewis, 2010) that there is increasing use of computers by teachers and students in European countries.

Digital Divide in Community Colleges

The digital divide refers to the unequal distribution of technology resources and access among different groups. Studies have shown that adult learners in community colleges often face barriers such as limited access to computers, internet connectivity, and lack of digital literacy skills. The digital divide can exacerbate existing socio-economic disparities and hinder adult learners' ability to acquire the necessary technological skills for employment.

In South Africa, there is an increase in the use of digital devices amongst the haves than the have nots (Chisita, Enakrire, Durodolu, Tsabedze, Ngoaketsi, 2021). The truth is, at community colleges that are in remote areas just like in the rural schools of developing countries, technology is less practiced due to the digital divide caused by lack of infrastructure and access to Information Communication Technology (ICT) facilities (Koirala, 2019).

Integration of Technology in Community Colleges

Researchers have explored various approaches to integrating technology in community colleges to enhance adult learners' employability. These approaches include implementing computer-based instruction, online learning platforms, and mobile applications. Studies have found that technology integration can provide flexible learning opportunities, improve engagement, and foster digital literacy skills among adult learners.

Concerns about unsuccessful practice of teacher education programs for technology integration were raised (Lee, & Lee, 2014). The reason being that traditionally teacher training courses for the use of technology dealt with mastering technical skills of using computer software and neglected how to link these technology skills to curriculum and teaching methodology and this left many teachers with lack of confidence to apply technology in their day-to-day teaching (Ertmer & Ottenbreit-Leftwich, 2010; Goktas et Yildirim & Yildirim, 2008).

Benefits of Technology Usage for Employment

The literature emphasizes the potential benefits of technology usage for employment outcomes among adult learners in community colleges. Technology-enhanced learning can equip adult learners with relevant digital skills, enhance their problem-solving abilities, and improve their overall employability. Studies have reported positive correlations between technology usage and job attainment, career advancement, and higher earnings.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) 2014, sees the application of ICT as one way of reaching students with poor or no access (especially those in rural and remote regions) by providing them with new skills sets to enhance learning. The ICT skills acquired, not only make teaching and learning activities more meaningful and efficient (Koirala 2019), but they also help students relate school experience to work practices and create economic viability for tomorrow's workers (Dulal, 2019). Dulal (2019) further postulated that technology use of technology helps achieving the following namely, linking the learning to information and education, help the learners to visualize the problem, link the learner to learning tools and track the progress, increase the productivity of teachers in terms of time management, acquire the accurate information quickly, produce materials and keep the record. According to Assche, Rifon, Griffiths, Liwin and McNicol (2015), all the above advantages of using technology will be made possible only when pedagogical innovation exists that is, when teachers modify approaches in teaching and learning.

Challenges and Barriers

Researchers (Vongkulluksn, Xie, & Bowman, 2018, Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012, Ertmer and Ottenbreit-Leftwich, 2010) have identified several challenges and barriers associated with using technology to bridge the digital divide. These include limited infrastructure, inadequate funding, lack of technical support, and resistance to change. Additionally, studies have highlighted the importance of addressing digital literacy gaps, ensuring accessible technology, and addressing socio-cultural factors that may affect technology adoption among adult learners.

On the other hand, Dulal's (2019) findings indicated that most teachers from developing countries are not familiar with the use ICT tools, something that warrants capacity building and development by ICT experts.

Strategies, Policy and Institutional Support

Research (Danai, 2022; Bruno, 2019) affirms that educational institutions and organizations are resorting to the use of mobile technologies for an example use of cellphones as the new learning medium. This suggests that incorporating technology into pedagogical practices can enhance adult learners' motivation, engagement, and knowledge acquisition. A wide range of literature (OECD, 2004, 2005; Tomte & Hatlevik, 2011) affirms that the governments of developed countries are investing in ICT integration in their schools in order to improve the education quality of their teaching systems. This study advocates for comprehensive policies that prioritise technology infrastructure development, funding initiatives for technology resources, professional development for instructors, and collaboration with industry partners can assist in addressing the digital divide at community colleges especially in rural areas.

The capacity building initiatives will help adult educators at community colleges to keep abreast of changes in their profession by adopting modern technological means, such as computerization, multi-media devices, mobile phones, audio-visual applications, and social media, to optimize their teaching instruction (Alqahtani, 2019). Educators will then start to plan more effective lessons, provide learning opportunities and prepare students to compete in communication, collaboration, critical thinking, and creativity with the help of ICT (Bhandari, 2020).

Methodology

This study employed a qualitative case study research design to gather comprehensive data on the use of technology at community colleges for equipping adult learners for employment. This approach used qualitative data collection and analysis techniques to provide a more holistic understanding of the digital divide challenge and potential solutions.

A group of 10 participants was purposefully selected 10 from four community learning centres (CLCs) in the rural village of Limpopo Province. The semi-structured individual interviews as well as focus group discussions were used to harness data and the two methods allowed adult practitioners as well as adult learners to provide the facts of the matter as well as their opinions about the integration of technology (Yin, 2009).

An interview guide was prepared before conducting the interview. The individual interviews took place telephonically and lasted between 35-40 minutes each. We conducted one face-to-face interview with ten participants. A focus group discussion took place in one of the centres and lasted for an hour each. Before commencing with the focus group discussion, participants were given a paper to list all technological tools they employ in their teaching and learning of ACET programmes. They were also asked to list the challenges they are faced with regarding using technology in their daily teaching and learning. There after discussions commenced based on what was on the list. Probing questions were asked to get more information. Data were analysed using a thematic data analysis approach from Bricki and Green (2007). Using this method, the researcher looked across all the data and identified the common issues that recurred, thereafter, the main themes that summarise all the data collected were summarised.

Themes that emerged from this study were: Lack of access to technology resources infrastructure, Lack of digital literacy, and socio-economic factors.

Limitations

It is important to acknowledge potential limitations of the study. The findings may be influenced by the specific context of the selected community colleges and may not be generalizable to all community colleges. The sample selection may introduce bias, and the self-reported nature of data collection methods may be subject to response biases. However, efforts were made to mitigate these limitations through rigorous data collection, analysis, and triangulation of findings.

Research Ethics

This study was part of the thesis produced by the researcher in 2022. The ethical clearance certificate was obtained from the institution, as well as from the Department of Higher Education and Training (DHET), from principals and managers of the selected Community Education and Training (CET) colleges and Community Learning Centres (CLCs), respectively, before the research project commenced. The participants were informed about the purpose of the research study (Nijhawan, Janodia, Muddukrishna, Bhat, Bairy, Udupa, & Musmade, 2013) and also requested to voluntarily sign consent forms. They were informed that their willingness to participate in the study was voluntary and they were free to withdraw from it at any time they wished to do so.

Participants provided written informed consent to declare their voluntary participation. For anonymity purpose, especially of facilitators and l managers, I did not use the names of the selected colleges. Furthermore, I used pseudonyms to label all participants. I maintained the principles of confidentiality, trust, and protection from harm for my participants (Surmiak 2020).

Findings

Technological Devices Employed by Adult Educators

Adult educators (facilitators) were given a paper to list technological devices that they used during their teaching and learning, and it became evident that only a few devices were used namely, computer, data projector, and cell phones. Out of the ten participants only five reported to have used technological tools and the other five did not use them.

When those who were using the technology devices were asked, what they used them for:

Participant A said: The centre does not have computers and I use my personal laptop to do lesson preparations, set monthly tests and record learners test marks.

Participant B added: we have no computer lab at this centre. I sometimes visit the clinic to ask the nurse for clarity on certain topics of Ancillary Health Care. Some of the topics are challenging.

Participant C remarked: I use my computer at home download videos and will play such videos using the data projector. Learners like the videos and they understand better.

Participant D supported participant C: I compile notes using my personal laptop on topics that have many diagrams e.g. Mathematical diagrams Using a projector makes my teaching easier because I am not good in drawing.

The findings indicated that WhatsApp was commonly used by almost all educators, out of ten eight of them used it for various purposes namely.

Participant E declared: I use WhatsApp for communication and information sharing. Participant B on the other hand remarked: I use WhatsApp for sharing knowledge and giving the learners activities. I also use it for revision- sending learners question papers for revision. During the lockdown, the use of WhatsApp was so important because I gave learners work while they were at home.

The use of the technology devices was not frequent- educators used the tools once in a while. When participants were asked how often they used the tools, this is what **participant D** said. I only use projector to teach some topics which have more diagrams- I use it once per quarter.

Participant C indicated: I like learners to watch the videos, but we have only one projector, so I use it twice in a year. Another thing is that these videos are too long and our periods are 45 minutes.

Educators who use WhatsApp, used it regularly and indicated this:

Participant F comment: I give learners extra activities almost every week via WhatsApp, but they do not do it because they do not have data.

Barriers to the Use of Technology in Institutions of Learning

Participants presented several challenges which hinder them from integrating technology into their teaching ranging from lack of resources, lack of skills and knowledge, inadequate time allocation, to no training.

Some of the participants indicated that they have lost interest in applying technology in the classroom because of a number of challenges they faced.

Participant G commented: I do not use technology because of even if I would want to there are no computers. My centre has few leaners, the government does not allocate enough funds to allow the Centre Manager to buy computers.

Participant H added: I always use my personal computer. The problem I face is that I run out of data and our centre do not have WIFI. So I normally avoid engaging in activities that require internet.

Participant I: shared the same sentiments with Participant H: At my centre we have internet, but the network is very poor. Sometimes I try to use data projector to teach learners, but network will fade and I stop in the middle of the lesson.

Findings indicated that some Centres have resources, and some do not and participants responded differently as far as resources are concerned. Those that have the resources indicated, **Participant J**: at our Centre, there are computers in the host school, WIFI and data

projectors but I do not use them because I do not have the know-how. The same sentiments were shared by **Participant E**: I want to use the computer, but I was not trained to use it at the college, our professional development meetings do not include computer training there is one educator who have the basic computer skill, but he is always busy, he cannot attend all of us. It has appeared from these findings that online tools such as emails and using TEAMS and or Zoom were not used by adult educators.

Participant B said I always hear principal in the host school asking the clerk to write emails, I did not have an idea of what they entail. I once asked the clerk to show me how it works but he is always busy and kept on promising me.

Participant J added. During the lock down it was difficult for me to connect to the link for TEAMS meeting, I was helped by my son at home.

Strategies to Mitigate the Digital Divide

Participant D suggested: I wish our government can supply us with computers.

Participant A supported: We also need training.

Participant F added: I think training us on computer literacy will be beneficial.

Participant C indicated: at our centre we do not have WIFI and the network is down most of the time and that made me not to attend some of the training.

Participant I added: First of all these, I think the department together with government should see to it that connectivity is sorted in our area.

Discussion

The data collected in response to the question about which technology tools were used by participants, revealed that prior to the intervention by the university team, participants have been using computers/laptops, data projectors and WhatsApp in their teaching and learning. But the three tools were used minimally, for an example computer were used for setting tests, planning lessons, recording marks, downloading videos and using them for projecting lessons. Even though these tools were not maximally used, participants affirmed that the use of technology enhanced their teaching. Participant C and D indicated that they use their computers at home to download videos and. The use of videos and data projectors which saved participants' time to draw sketches some as they used to do. This finding supports Dulal's (2019) study that the use of technology increased the productivity of educators in terms of time management. The results also confirmed that the use of WhatsApp was an efficient way of cascading information as well as sending learners content, activities, and questions in preparation for the final exam. The full use of WhatsApp by educators agreed with current research (Danai, 2022, Bruno, 2019, Yurdagül & Öz, 2018) that the use of WhatsApp, not only increased the use of technology but also promoted teaching outside the classroom as confirmed by participant B whose learners responded to activities on line away from school building.

While good experiences were reported by participants who integrated technology in their teaching, the findings indicated that all those who applied technology and those who did not

apply it experienced a variety of challenges. The results show that participants experienced challenges outside their control and some which were internal what researchers refer to as first order and second order barriers to the application of technology (Vongkulluksn, Xie, & Bowman, 2018, Ertmer, et al 2021, Ertmer, and Ottenbreit-Leftwich, 2010). The top challenge as mentioned by participant G was lack of support from the government to provide resources and create a conducive teaching and learning environment for the integration of technology. Generally, all centres where the 10 participants were teaching had few or no computers/laptops, data projectors, Wifi/internet and other essential tools to use technology. Data collected indicated that the government intervention was lacking to provide infrastructure as well as incorporating technology in the curriculum as posited by participant G who alluded to the fact that the use of ICT was not enforced in the CAPS policy document and that there was no professional development to empower them with technology skills.

The minimal application of technology in schools in this study differs from what the current literature reports about the use of technology by developed countries where there is a high utilization of technology (Vongkulluksn, et al, 2018; Zheng, et al 2016 et al 2010). To a larger extent the study agrees with Dulal's (2019) findings which posited that teachers from developing countries are not familiar with the use ICT tools, something that warrants capacity building and development by ICT experts. Lack of clear rules about how to teach using technology in the teaching and learning of ACET programmes (DBE, 2011) created a gap where only those that believed in technology could pursue it while those who did not see the need for applying it did not apply it. This gap was also widened at community colleges level where principals did not bother to buy technology tools (computers, data projectors, data etc.) or afford adult educators time to use technology in their daily teaching. Participant C's comment about lack of enough time to watch the videos also add to the fact that the school environment was not conducive for the application of technology. This also mean that the Department of Higher Education and Training did not prioritise the acquisition of skills on how to use technology as indicated by participant E and F- they said that they did not receive training and or professional development to use technology.

In as far as second order barriers are concerned which refers to the extent to which educators believe that technology can help fulfill instructional goals (Ottenbreit-Leftwich et al., 2010; Yu, 2013), findings of this study did not provide clarity since all educators hide behind lack of conducive environment for that practice.

Yet when participants responded to the question on how the challenge of digital divide can be mitigated, their fingers pointed at the government forgetting to mention other barriers such as being technophobia. The results of this study indicated that generally, all participants acknowledged the challenges they are faced with and welcomed the training on digital literacy. The outcome of this study indicated how educators' quest for how to integrate technology in their teaching and learning.

Conclusion

This article shed light on how adult educators use technology in their teaching and learning of ACET programmes at Community Colleges. Findings revealed that digital divide is still a challenge at Community Colleges especially at Community Learning Centres as they serve as delivery sites. Digital divide could be seen in unequal access to technology, Lack of digital literacy as well as socio-economic factors.

References

Alqahtani, A. M. (2019). The use of technology in English language teaching. Frontiers in Education Technology, 2(3), 168–180. https://doi.org/10.22158/fet.v2n3p168

Bannan, B., Cook, J., & Pachler, N. (2016). Reconceptualizing design research in the age of mobile learning. Interactive Learning Environments, 24(5), 938-953.

Bhandari, 2020 Bhandari, A. (2020). Study of ferrofluid flow in a rotating system through mathematical modeling. Mathematics and Computers in Simulation, 178, 290–306.

Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. Education and information technologies, 22, 769-787.

Bricki, N. & Green, J. (2007). A guide to using qualitative research methodology: Medecins sans frontieres.

Brown-Martin, G. (2017). Education and the Fourth Industrial Revolution. Available at: https://www.groupemediatfo.org/wp-content/uploads/2017/12/FINAL-Education-and-the-Fourth-Industrial-Revolution-1-1-1.pdf

Bruno, L. (2019). Journal of Chemical Information and Modeling. Peran Sistem Informasi Manajemen (Sim) Dalam Pengambilan Keputusan, 53(9), 1689–1699. Retrieved from http://jurnal3.stiesemarang.ac.id/index.php/jurnal/article/view/154/125

Chisita, C. T., Enakrire, R. T., Durodolu, O. O., Tsabedze, V. W., & Ngoaketsi, J. M. (Eds.). (2021). Handbook of Research on Records and Information Management Strategies for Enhanced Knowledge Coordination. IGI Global.

Chowdhury, G., McLeod, J., Gillet, V., & Willett, P. (Eds.). (2018). Transforming Digital Worlds: 13th International Conference, IConference 2018, Sheffield, UK, March 25-28, 2018, Proceedings (Vol. 10766). Springer.

Danai, R. P. (2022). The Effect of Covid-19 Pandemic on Teachers' Outdoor Learning. AMC Journal, 3(1), 142-159.

DBE (Department of Basic Education). (2011). Life Sciences. Curriculum and Policy Statement (CAPS). Pretoria.

Dulal, D. (2019).Competency of Teachers and Application of ICT in the Instructional Processes: A Case of Community Schools of Nepal. The International Journal of Educational Researchers 2019, 10(3): 37–48.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. CAE Computers & Education, 59(2), 423–435.

Goktas, Y., Yildirim, Z., & Yildirim, S. (2008). A review of ICT related courses in pre-service teacher education programs. Asia Pacific Education Review, 9, 168–179.

Goodwin-Jones, B. (2000). Emerging technologies: Literacies and technology tools/trends. Language Learning and Technology, 4(2), 11–18.

Gray, L., Thomas, N., & Lewis, L. (2010). Teachers' use of educational technology in US public schools: 2009. Washington, DC: National Center for Education Statistics.

Hofmeyr, J., & Draper, K. (2015). Teachers in South Africa: Supply and Demand 2013–2025. Johannesburg: The Centre for Development and Enterprise. Retrieved February 24, 2016, from http://www.cde.org.za/teacher-supply-and-demand-2013-2025

Kayembe, C., & Nel, D. (2019). Challenges and opportunities for education in the Fourth Industrial Revolution. African Journal of Public Affairs, 11(3), 79-94.

Koirala, K. P. (2019). Use of information and communication technology (ICT) in teaching and learning in Nepalese classroom: Challenge and opportunity. Journal of Education and Practice, 10(7), 1–5.

Lee, Y., & Lee, J. (2014). Enhancing pre-service teachers' self-efficacy beliefs for technology integration through lesson planning practice. Computers & Education, 73, 121–128.

Mathrani, Sarvesh, and Umer 2022 Mathrani, A., Sarvesh, T., & Umer, R. (2022). Digital divide framework: online learning in developing countries during the COVID-19 lockdown. Globalisation, Societies and Education, 20(5), 625-640.

Mathrani, Umer, Sarvesh, and Adhikari 2023 Mathrani, A., Umer, R., Sarvesh, T., & Adhikari, J. (2023). Rural–Urban, Gender, and Digital Divides during the COVID-19 Lockdown: A Multi-Layered Study. Societies, 13(5), 122.

Mhlanga, D. and Moloi, T. (2020). COVID-19 and the digital transformation of education: What are we learning on 4IR in South Africa? Education sciences, 10(7), p.180.

Mutohar, A. (2012). Identifying and bridging the gaps of ICT integration in primary and secondary education in Indonesia (Doctoral dissertation).

Nijhawan, L.P., Janodia, M.D., Muddukrishna, B.S., Bhat, K.M., Bairy, K.L., Udupa, N. & Musmade, P.B. (2013). Informed consent: Issues and challenges. *Journal of advanced pharmaceutical technology & research*, 4(3), 134.

OECD (2004). Marcos teóricos de PISA 2003. Conocimientos y destrezas en Matemáticas, Lectura, Ciencias y Solución de problemas. Madrid: Ministerio de Educación y Ciencia.

OECD (2005). Are students ready for a technology-rich world? What PISA studies tell us (programme for international student assessment). Paris.

Pachler, N., Cook, J., & Bachmair, B. (2010). Appropriation of mobile cultural resources for learning. International Journal of Mobile and Blended Learning (IJMBL), 2(1), 1-21.

Tomte, C., & Hatlevik, O. (2011). Gender-differences in self-efficacy ICT related to various ICT-user profiles in Finland and Norway. How do self-efficacy, gender and ICT-user profiles relate to findings from PISA 2006. Computers & Education, 57(1), 1416–1424. http://dx.doi.org/10.1016/j.compedu.2010.12.011

UNESCO (2014). Information and communication technology (ICT) in education in Asia: A comparative analysis of ICT integration and readiness in schools across Asia. Bangkok.

Vongkulluksn, V. W., Xie, K., & Bowman, M. A. (2018). The role of value on teachers' internalization of external barriers and externalization of personal beliefs for classroom technology integration. Computers & Education, 118, 70–81.

Yin, R.K. (2009). Case study research: Design and methods. (4th ed.). Los Angeles and London: SAGE.

Yu, L., & Yu, B. (2013). The Top-Down Approach to Providing ICT Access to Rural Communities in China: Opportunities for Community Informatics. Library Trends, 62(1), 34.

Yurdagül, C., & Öz, S. (2018). Attitude towards mobile learning in English language education. Education Sciences, 8(3), 142. https://doi.org/10.3390/educsci8030142

Zheng, Warschauer, Lin, Chang 2016 Zheng, B., Warschauer, M., Lin, C. H., & Chang, C. (2016). Learning in one-to-one laptop environments: A meta-analysis and research synthesis. Review of Educational Research, 86(4), 1052–1084.

Zoch and Myers, Zoch, M., & Myers, J. (2017). Teachers' engagement with new literacies as support for implementing technology in the English/language arts classroom. Contemporary Issues in Technology and Teacher Education, 17(1), 25–52.