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Technologically innovative teaching and learning strategies in contexts of crises: lessons from COVID-19 in selected primary schools in Masvingo District, Zimbabwe

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Many developing countries, especially in Africa, depended on the traditional form of teaching and learning, which was reconfigured due to the restrictions that came with the management of the COVID-19 pandemic. In view of this, this study sought to explore technologically innovative teaching and learning strategies that can be employed by teachers in Zimbabwe to ensure that teaching and learning processes persist despite constraining circumstances, such as pandemics. A qualitative and instrumental case study design with in-depth interviews and focus group discussions was employed. The independence and autonomy theory was used to provide a grounding base for understanding effective technologies that can be used in the context of crises. The study sample of 12 general teachers, two information and communication technology teachers, two educational psychologists, and 24 learners was drawn from the target population through a purposive sampling process. It was revealed that the adoption of e-learning, the use of mobile learning, the use of social media, and the use of virtual classrooms could allow teaching and learning processes to continue in the context of crises. The study recommends that learning institutions should formalise the use of various electronic platforms in education. The research also recommends the adoption, control, and management of various platforms, such as e-learning, mobile learning, social media use, and the use of virtual classrooms in the teaching and learning process.

KEYWORDS

crises, COVID-19, innovative teaching and learning, primary school, technological strategies

Introduction

The COVID-19 pandemic necessitated a rapid shift in the teaching and learning practices globally, with learning institutions being forced to migrate from traditional face-to-face teaching and learning mode to online mode. This study examines the technologically innovative teaching and learning strategies adopted by selected primary schools in the Masvingo District, Zimbabwe, in response to the disruptions caused by the COVID-19 pandemic, highlighting key lessons learned. During the peak of the COVID-19 crisis, many

developing countries, such as Zimbabwe and many others, experienced excessive disruptions in teaching and learning processes due to a lack of technological innovations and interventions (Harris, 2020). Saavedra (2020) asserts that conventional classroom teaching and learning, in the contexts of developing countries, were abandoned as face-to-face teaching and learning were suspended. The COVID-19 pandemic is potentially one of the greatest threats to global education in our lifetime, causing a severe educational crisis (Saavedra, 2020). This implies that teachers and learners globally were affected by the social and economic effects of the pandemic. The forced closure of schools and other learning institutions to curb the spread of COVID-19 to learners and teachers greatly disrupted teaching and learning processes. More importantly, the forced closure of schools also threatened Zimbabwe's commitment to achieving the Sustainable Development Goals of Equality Education (SGD4) (Shava et al., 2021). There is much that could have been done to soften the blow and ensure the continuation of effective teaching and learning (Harris, 2020).

When the COVID-19-induced lockdown was at its peak, traditional teaching and learning methods were suspended, and teachers had to devise new innovative ways to perpetuate the teaching and learning process. This study, therefore, sought to explore innovative strategies that can be employed by teachers in Zimbabwe to ensure that teaching and learning processes continue despite constraining circumstances such as pandemics.

While developed countries such as Britain, America, China, and Australia have adopted new technologies in everyday socio-economic activities, developing countries, including Zimbabwe, are lagging. The case of developing countries qualifies the adoption of technology as the basis for sustainable industrialisation and socio-economic development. Many ministries of education in developing countries, especially in Africa, depended on the traditional form of teaching and learning, but these had to be reconfigured as a result of the restrictions that were implemented in attempts to manage the COVID-19 pandemic. It follows, therefore, that the same innovative strategies deployed by developed countries could inform possible strategies that could be employed in developing countries such as Zimbabwe to ensure efficacy and sustainable teaching and learning processes during crisis situations.

The COVID-19 pandemic prompted extensive research into its impact on the role of new communication technologies in teaching and learning within developing countries (e.g., Haleem et al., 2020; Muchabaiwa and Gondo, 2022; Antón Sancho et al., 2023; Tadesse and Muluye, 2020; Zinyemba et al., 2021). While this growing body of literature has illuminated broad trends and challenges, further focused inquiry into specific contexts and stakeholder experiences, such as those of primary school teachers in Zimbabwe, remains valuable.

Shaikh et al. (2022) carried out a research in Pakistan to find out the perspectives of instructors and learners on the feasibility of online learning adoption in Pakistan. The researchers found out that it was not easy to smoothly adopt online learning during the COVID-19 pandemic period, as instructors and learners were from different fields and backgrounds. The researchers sought to understand the flaws, gaps, and limitations of online learning from instructors' and learners' perspectives. Shaikh et al. (2022) found that online learning was found to be very dangerous for the health of participants, as physical activities were drastically reduced in online sessions while screen time was riskily increased, with continuous sitting in front of the computer screen also affecting body posture and the spine. The researchers saw online learning as a serious threat to the health of teachers and learners.

Supporting the same sentiments, Shaikh et al. (2023) also carried out research in Pakistan on the effects of the online educational system on the personal health of students and teachers in COVID-19 crisis. The researchers sought to investigate the seriousness of health risks, diseases, and chances of being unhealthy after adopting online educational systems during COVID-19 times. Shaikh et al. (2023) found that the adoption of online educational systems eliminated physical classes, practical sessions, sports, and physical activities, which were traditionally key for good health, and promoted excessive screen time, continuous sitting, and weight gain, which are dire for the health of teachers and learners. Shaikh et al. (2023) viewed technology-based teaching and learning as health-threatening, whereas this current study advocates for the adoption of technological strategies to perpetuate the teaching and learning process during such times as the COVID-19 pandemic period.

Building on the insights from existing literature on COVID-19 and education in Zimbabwe (e.g., Nhengu, 2022; Muchabaiwa and Gondo, 2022; Zinyemba et al., 2021), this study seeks to make a specific contribution by exploring and identifying effective, contextually appropriate technology-based teaching and learning strategies that Zimbabwean primary school teachers can develop and employ. The aim is to enhance their preparedness to support learners effectively in the event of future prolonged school shutdowns due to pandemics or other crises, with a particular focus on teacher-led, practical approaches at the primary education level. While Nhengu (2022) and Muchabaiwa and Gondo (2022) carried out their research in Zimbabwe, their focus was different from the current study; Nhengu's (2022) research was mainly focused on the secondary school system and Muchabaiwa and Gondo's (2022) study generally discussed about remote learning accessibility in Africa, while research by Zinyemba et al. (2021) was focussed on experiences of learners and educators while conducting online lessons. Nhengu (2023) also carried a research study to investigate the challenges faced by the Zimbabwe education sector in integrating effective virtual learning practice into the secondary school system specifically in Harare Metropolitan province. The current study, focussing on identifying effective, contextually appropriate technology-based teaching and learning strategies that Zimbabwean primary school teachers can develop and employ, is therefore relevant.

Statement of the problem

The impact of COVID-19 on education has been devastating, with UNESCO reporting that over 1.5 billion students were affected due to school closures in 165 countries (Harris, 2020; Saavedra, 2020). Zimbabwe was not spared from the COVID-19 pandemic. Mandikiana (2020) explained that, in Africa, 297 million students were affected by the COVID-19 pandemic, with Zimbabwe having 4.6 million learners affected. Although the challenge points to the need for technological innovation, developing countries still need an edge and technological will to accept the new normal. Although many teachers in developed countries were prepared to move to online learning strategies, the institutional efforts and capacities need to be enhanced. In this light, this study was guided by the research question: What are the technologically innovative strategies that can be used to ensure effective teaching and learning in primary schools in contexts of crises?

Theoretical framework

Independence and autonomy theory (Wedemeyer, 1975) provides a useful framework for understanding technologically innovative strategies that can be used in primary schools during pandemics. Wedemeyer (1975) espoused a theory focusing on the independence of the distant learner and the potential for learner initiative through technology. In his 1981 book, Learning at the Back Door, Wedemeyer wrote that "teaching and learning are usually thought of as connected real time activities inseparable in space as well as time" (Wedemeyer, 1981, p. 32). This is an outmoded constraint left over from a time when education relied on face-to-face proximity between teacher and learner. Wedemeyer (1975) contends that the formal learning group as the preferred educational structure has been disintegrating gradually through history, beginning with the invention of writing and continuing through the application of telecommunications and programmed learning. This has given rise to the re-emergence of the independent learner for which technology-based learning is ideally suited. Teachers need knowledge of guided didactic conversation to heighten interactions through technology with learners.

Wedemeyer's independence and autonomy theory offers a robust theoretical lens for understanding the dynamics of teaching and learning, particularly in contexts where traditional physical interaction is not possible, such as during the COVID-19 crisis. Several core tenets of this theory hold significant relevance to the study's focus on technologically innovative teaching and learning strategies in the selected primary schools of Masvingo District, Zimbabwe. The theory's emphasis on learner freedom and autonomy, suggesting that learners should have significant control over their learning, is in line with the current study's thrust that disruption of traditional classrooms requires technologically innovative strategies to support learners' self-directed learning using technology. Another key aspect of Wedemeyer's theory is the separation of teaching and learning. In independent study, the instructor and the learner operate away from each other, with the learning process mediated by various forms of communication and instructional materials. The COVID-19 pandemic inherently imposed this separation as learning shifted from physical classrooms to remote environments facilitated by technology. This makes Wedemeyer's framework particularly suitable for examining the different technologies and strategies that facilitated learning in the primary schools under study. Wedemeyer also recognised the transformative potential of technology in education, particularly in overcoming geographical and temporal barriers and fostering learner independence. Given that the study specifically investigates technologically innovative teaching and learning strategies, this alignment with Wedemeyer's perspective underscores the framework's relevance.

Research methodology

A qualitative approach with a case study design was used to facilitate the data collection via multiple methods (Baxter and Jack, 2008). Two primary schools in Masvingo District were purposively sampled, resulting in a sample of 24 learners, 12 general teachers, two educational psychologists, and two information and communication technology (ICT) teachers, comprising a total of 40 male and female participants. Selection of the general teachers was based on teaching experience, where only teachers with more than 5 years at the school and who had at least a first degree were selected. Five male and seven female teachers were selected. As for ICT teachers, those with at least a first degree in computer science or a related field were purposively selected. The different settings of the schools meant that learners were exposed to different educational environments, fulfilling the need for participant representation from all types of schools within the district (Magwa and Magwa, 2015, p. 132). The selection of these primary schools allowed individuals from diverse backgrounds and experiences to engage in the research, resulting in a comprehensive knowledge of technology that can be used to ensure effective teaching and learning in the context of crises in schools (Yin, 2011, p. 90).

Participants

This section presents the different participants that were selected to form the representative sample for this study. The participants comprised of 24 learners, 12 general teachers, two ICT teachers, and two psychologists, as shown in the pie chart below. The representative number of each participant category is shown on the pie chart (Figure 1).

Demographic details of teachers

The table below shows the demographic details of teachers where details such as gender, academic qualifications, and age range are shown.

Table 1 shows the demographic details of teachers selected in the study. Of the 14 teachers, including two ICT teachers and 12 general teachers, eight (57.1%) were female, while six (42.9%) were male. Concerning the academic qualification of teachers, five teachers (35.7%) had Diplomas, seven teachers (50%) had First Degrees, while two (14.3%) had Master's Degrees. The educational level of teachers is key as it has the potential to influence the teacher's perception of technology use in education. Table 1 also shows the age ranges of teachers. One teacher (7.1%) fell into the 25–30 years category, three teachers (21.4%) were in the 31–35 years, six teachers (42.9%) fell into the 36–40 years category, and four teachers (28.6) were in the more than 40 years category. The majority of teachers (71.5%) were in the above 35 years category. This points out the fact that most teachers selected were mature and seasoned in the teaching profession. Selection of the teachers was based on teaching experience, where only teachers with more than 5 years at the school were selected. As for ICT teachers, those with at least a first degree in computer science or a related field were purposively selected. The selection criteria were based on the participants' potential to contribute rich and valuable information to the study.

Age ranges for teachers

Figure 2 also shows the age ranges of teachers. One teacher (7.1%) fell into the 25–30 years category, three teachers (21.4%) were in the 31–35 years, six teachers (42.9%) fell into the 36–40 years category, and four teachers (28.6) were in the more than 40 years category. The majority of teachers (71.5%) were in the above 35 years category. This

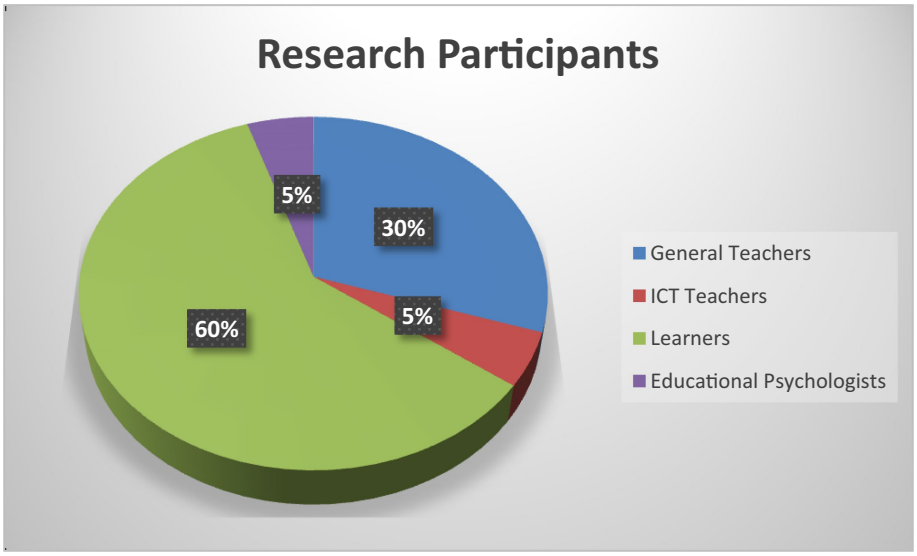


FIGURE 1
Composition of research participants showing the percentage contribution of each category.

TABLE 1 Demographic details of teachers [*N* = 14].

Variable	Type	Frequency	Percentage (%)
Gender	Male	6	42.9
	Female	8	57.1
	Total	14	100
Academic qualification	Diploma	5	35.7
	Degree	7	50.0
	Master's	2	14.3
	Total	14	100.0
Age range	25–30 years	1	7.1
	31–35 years	3	21.4
	36–40 years	6	42.9
	More than 40 years	4	28.6
	Total	14	100

points out the fact that most teachers selected were mature and seasoned in the teaching profession. In most cases, the age range of the teacher corresponds to the experience one has in the teaching profession.

The selection criteria were based on the participants' potential to contribute rich and valuable information to the study. Grade 7 learners were selected. It was also assumed that grade 7 learners had cognitive maturity and could examine the effectiveness of technology in ensuring effective teaching and learning in the context of crises. Regarding the selection of general teachers, preference was given to teachers who had been at the school for longer, implying experience in that context. According to the researchers, ICT teachers were more likely to provide rich information on technological innovations in contexts of crises. Finally, the educational psychologists were purposively selected as the only psychologists in the province. They were assumed to have knowledge and experience in dealing with learners' psychological issues impacting learning and development and could offer unique insights into the investigated problem.

Data were gathered using semi-structured interviews with educational psychologists and ICT teachers (see Appendix A). Focus group discussions were conducted with learners and general teachers (see Appendix A). The primary author conducted the interviews and focus group discussions in English. The length of each interview ranged from 45 to 60 min, and the focus group discussions lasted between 70 and 90 min. The coding process was conducted manually. The researchers read through the transcripts and interview notes multiple times, identifying outstanding statements and patterns related to the research questions. These were then assigned descriptive codes, which were iteratively refined and grouped. All the authors participated independently in the coding process and jointly developed the themes.

We used Braun and Clarke's (2006, p. 87) six phases of thematic analysis. Interview transcripts were read and re-read to align with the first step of familiarisation of the data. In the second step, the data were coded, with coding schemes used to simplify the correlations between the data. In the third step, patterns and repetitions in the data sets were recorded. In the fourth step, the emerging themes were reviewed to check if they worked in relation to the coded extracts. Themes were then refined to generate clear names in the fifth step, and finally, in the sixth step, selected extracts were analysed in relation to the research questions to produce a scholarly report. All the authors independently coded the data and jointly developed the themes.

Ethical considerations

Before entering research sites, permission was sought from the Ministry of Primary and Secondary Education in Zimbabwe. The purpose of the study was explained to the participants and included

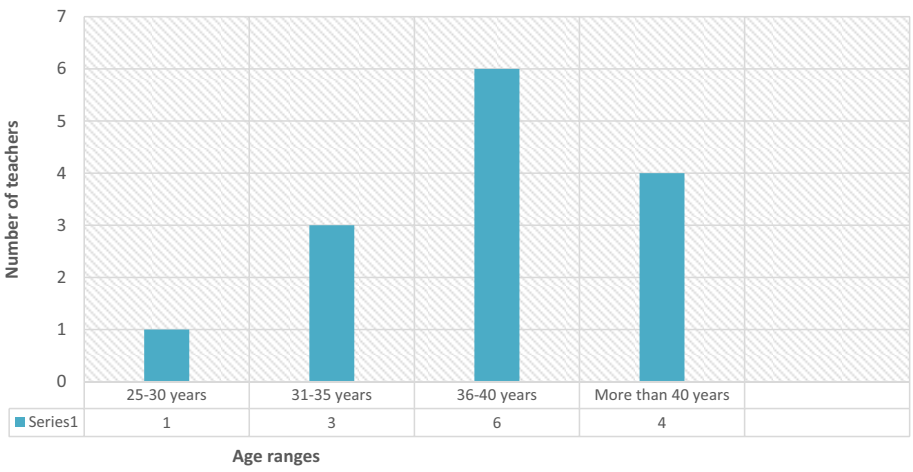


FIGURE 2
Age ranges for teachers.

the fact that they could withdraw from the study at any time without consequences. Member checking processes contributed to the rigour and trustworthiness of the findings, and the quality assurance criteria of dependability, conformability, transferability, and credibility were employed.

Data presentation and analysis

The purpose of this section is to provide a comprehensive and detailed account through a qualitative lens of the data collected and analysed. The researchers aimed to answer the research question: "What are the technologically innovative strategies that can be used to ensure effective teaching and learning in primary schools in contexts of crises?" This section will include quotations, excerpts, and other forms of evidence to support the claims made by the researchers.

Results and data analysis

When learners, teachers, and educational psychologists (research participants) were asked the question "What are the technologically innovative strategies that can be used to ensure effective teaching and learning in primary schools in contexts of crises?," their responses mainly pointed to four main themes. These included the adoption of e-learning, the use of mobile learning, the use of social media, and the use of virtual classrooms in the teaching and learning process.

Adoption of e-learning in the teaching and learning process

When ICT teachers, general teachers, and educational psychologists were asked about the technologically innovative strategies that could be used in primary schools during crisis times, such as the COVID-19 pandemic, they all mentioned the adoption of e-learning as the critical measure that helped in the continuation of teaching and learning during the pandemic. One of the ICT teachers had this to say:

> *"When government ordered for the closure of schools and implement lockdown to try and contain the spread of Covid-19, schools had no option but to migrate from traditional face-to-face teaching methods to electronic platforms. E-learning adoption was no longer an option but a must."*

The general teachers also highlighted that they managed to continue teaching through the use of e-learning platforms. One of the teachers said:

> *"I only learnt about Google Classroom as a very important innovation during the Covid-19 pandemic period. It helped me to keep in touch with my learners though we could not physically meet because of Covid-19-induced lockdown. I was able to assign work to my learners and prepare and share learning materials with them."*

To gain more insight, learners were asked about how the COVID-19 pandemic affected their education. The focus group discussion with the learners brought about the following response:

> *"The Covid-19 pandemic affected our education in a number of ways. It caused a lot of problems including death of loved ones, stress, depression, isolation, illness, forced closure of schools, increased school dropouts, single parent families, child headed families and even divorce of parents and guardians. All these challenges in turn affected our education in one way or another" (Focus group 1, 2023).*

Learners' responses were a testament to the effect that the COVID-19 pandemic had put learners in difficult situations. Stresses and depressions were common among most learners who were supposed to engage in learning activities under such harsh conditions.

That called for teaching and learning strategies that were learner-centred and engaging to get the attention of already depressed learners. The adoption of e-learning and mobile learning were very appropriate strategies during such trying times. This was in line with what Mavengere et al. (2021) mentioned in their research findings that "This approach of e-learning provides a platform that makes the process of education more student-centred, creative, and flexible."

Responses given by ICT teachers showed that their adoption of e-learning in the teaching and learning process was inevitable. They showed no hesitation in adopting e-learning as an innovative strategy during a crisis situation. This was probably due to the fact that ICT teachers were already conversant with such e-learning platforms way before the COVID-19 pandemic. The responses given by ordinary teachers showed that they were not conversant with the e-learning platforms used in the teaching and learning process. They said that they only learned about such platforms as Google Classroom during the pandemic period. This confirms the skills gap that exists between ICT teachers and non-ICT teachers in terms of technology use in education. The availability of ICT teachers at the selected schools, however, eased the e-learning adoption process issues because ICT teachers were there to provide support.

Some previous research (Shaikh et al., 2022; Shaikh et al., 2023), however, have revealed a contrary perception of e-learning adoption among both learners and teachers. These researchers intended to find out the negative effects of online learning adoption during the COVID-19 period. They found out that COVID-19 necessitated the migration to online educational systems, which eliminated physical and outdoor activities required to keep people in good health. They pointed out that the adoption of online educational systems during COVID-19 promoted excessive screen time, weight gain, and continuous time sitting in front of the computer, resulting in a lot of health issues, including spine problems. Such a viewpoint is parallel to the purpose of the current study, which sought to find out the technological strategies that can be adopted by teachers and learners to continue with the teaching and learning process, even in crises times like the COVID-19 pandemic period.

When learners were asked about the technologically innovative strategies to be used in primary schools during times of crisis, the majority of them mentioned the use of the Google Classroom platform as a very important strategy that helped them continue their education even during lockdown times. One of the learners had this to say:

> *"When schools closed, and we were forced to go under lockdown, our hope for learning was dying every day. We thought that was the end of it all. Thanks to our innovative schools and teachers who created and helped us to join Google Classroom where learning content was uploaded. Some teachers would even upload downloadable videos for us. E-learning helped us to continue learning although we were not able to physically meet with our teachers and classmates."*

This participant acknowledges the value of independence and autonomy while achieving the learning goals through distant learning, in line with Wedemeyer's (1975) independence and autonomy theory. According to Muwanguzi and Lin (2010), e-learning is defined as the various forms of interaction among people using computer networks as the transmission medium. E-learning encompasses a variety of media and technologies. Kinash et al. (2012) also defined e-learning as the teaching and learning that take place through the use of web-based computer resources and the internet. In this study, e-learning can be defined as the delivery of a learning, training, or education programme via electronic means involving a variety of applications and platforms.

The e-learning platform mostly used in primary schools during the COVID-19 pandemic period was Google Classroom, a learning media that enhances instructors' workflow by creating, collecting, grading, and returning learners' assignments purely online using Google applications (Mbasera, 2018). According to Iftakhar (2016), Google Classroom is widely used in learning institutions because of its ability to save time, keep classes organised, and improve interactions between instructors and students. Apart from enabling instructors to prepare learning material, Google Classroom is also able to add more than one instructor. This helps to further improve instructor–student interactions that are leveraged on the framework of Google Docs, Google Forms, Google Drive, and other applications (Okmawati, 2020).

Pisira (2021) holds a contrary viewpoint, explaining that the Google Classroom learning medium demands rapid internet connectivity to participate, and that its sophistication causes students to fail to upload their work in the majority of situations. This was in line with what most learners said regarding challenges to their education caused by the COVID-19 pandemic. The majority of the learners also indicated that the high cost of data for online lessons was a major blow. Internet connectivity challenges coupled with power challenges made learning very difficult for most of the learners, especially those in rural areas. This suggests the need for financial support and for mobile companies to be partners in ensuring sustainable development in education, with a long-term vision of the future return on investment that comes with the economic growth from the digital support they may currently be providing to education.

Use of mobile learning (m-learning) in the teaching and learning process

When teachers, educational psychologists, and learners were asked about the technologically innovative strategies that could be used to ensure effective teaching and learning in primary schools in contexts of crises, they all mentioned the intensive use of mobile devices in the teaching and learning process as a key strategy. With more than 75% of the Zimbabwean population currently possessing a mobile phone, mobile learning became the basic technology used in education during the COVID-19 pandemic. Teachers all concurred that mobile phones were the basic technology that helped the continuation of teaching and learning during the COVID-19 pandemic. One of the teachers said:

> *"Mobile phones were the basic gadgets that were commonly and most importantly used to continue the teaching and learning process during the Covid-19 pandemic. The mobile phone was the most affordable device usable for electronic learning. Almost every home has at least a mobile phone and that was the one used by learners to be able to join online lessons. To cater for those learners who could not afford to join Google Classroom, WhatsApp groups were also*

> *created and used as a convenient platform to continue the teaching and learning process."*

Mac Callum et al. (2014) reiterated that mobile devices were preferred in educational contexts because they offer multiple features and capabilities, such as making phone calls, recording audio or video, taking pictures, storing data, and accessing the internet. According to the learners, mobile learning (m-learning) was preferred because it enabled learners to have access to learning material anytime, anywhere. The ability of mobile devices to support multimedia content, such as videos, texts, educational apps, and interactive simulations was a key benefit of m-learning. One of the learners said:

> *"Before the Covid-19 pandemic, WhatsApp was mostly used for social interactions and funny. I never thought WhatsApp could be so important to education. When our teachers created WhatsApp groups for us, it became a very important platform to learn. WhatsApp data was a bit affordable. That made it the most common platform used in the teaching and learning process. WhatsApp was also easy for most of us because we have been using it, unlike Google Classroom which was a new technology altogether."*

Responses from the learners also point to an important issue in digital literacy. Learners confirm that Google Classroom was a new technology altogether. This shows that there is a need for support and training on digital literacy so that technology adoption and use in education is enhanced. Echoing the learners' views on mobile learning, one educational psychologist shared:

> *"The socio-psychological dilemmas brought by Covid-19 pandemic among learners, parents and guardians was eased when learning was shifted to mobile devices. Families were stressed to have learners at home while time was ticking away. No one knew how long it was going to take before learners could be back to school again."*

M-learning refers to the use of mobile devices, such as smartphones and tablets, to support and enhance teaching and learning experiences (Peng et al., 2009). M-learning can also be defined as electronic learning using mobile devices and wireless transmission (Chang et al., 2003; Hoppe et al., 2003). It leverages the ubiquity, mobility, and portability of mobile devices to deliver educational content, facilitate communication, and provide access to learning resources anytime and anywhere. The major difference between e-learning and m-learning is that e-learning is mostly dependent on desktop personal computing (PC) technology, while m-learning is dependent on mobile devices (Orr, 2010).

Seliaman and Al-Turki (2012) carried out research on the adoption of m-learning in Saudi Arabia, where they sought to find out about the use of mobile phones and tablets for learning purposes among university students in Saudi Arabia. This included the use of these devices for accessing course materials, searching the web for information related to their discipline, sharing knowledge, and conducting assignments. Iqbal and Qureshi (2012) also carried out research in Pakistan on the adoption of m-learning and reiterated that the reason behind the increased use of m-learning was the increase in the number of mobile devices, as well as the general decrease in the cost of mobile devices, in recent times. This was supported by teachers in the current research who emphasised that mobile learning became popular during the COVID-19 pandemic as a result of the general affordability of mobile phones. All the participants concurred that mobile phones were the most common technological devices used in the teaching and learning process during the COVID-19 pandemic period. This was mainly due to the fact that mobile phones are affordable and are found in most homes in the Masvingo District, where this research was carried out. WhatsApp was the most used social media platform in the teaching and learning process. This was probably because of the affordability of WhatsApp data bundles, as alluded to by learner participants.

Use of social media in education

The focus group discussion with the teachers generated the following responses:

> *"Covid-19 pandemic was scaring. It caused a lot of fear and panic in the education system. Schools, institutions and even the Ministry of Primary and Secondary Education were not prepared to handle the pandemic. At first, all learning institutions closed with no room for continued teaching and learning. Teachers did not have adequate resources to conduct online learning. Parents too were not able to support online learning for their children, even if some teachers would manage to conduct some remote teaching. Many teachers who defied the call to suspend physical lessons died due to Covid-19. A lot of teachers got into depression and stress as a result of the effects of Covid-19 pandemic. It was not easy to reach out to all learners in your class and therefore online lessons were kind of discriminatory to those that were not able to attend online lessons. Due to financial constraints, parents were not able to buy phones that support social media platforms like WhatsApp, which teachers ended up using to reach out to their learners" (Focus Group 2, 2023).*

The response from the teacher shows that the use of social media in education during the COVID-19 pandemic period was discriminatory. Due to financial constraints, some parents were not able to buy gadgets and data bundles for their children. This raises an important aspect of access and equity of the innovation and technologies to be adopted in education. Although technologically innovative teaching and learning strategies were necessary, their adoption and implementation must be reconsidered to make sure every learner is taken on board. Dhawan (2020) confirmed this when he carried out research in India on "Online learning: A panacea in the time of COVID-19 crisis." The researcher reiterated that ensuring digital equity is crucial in times of crisis because not all teachers and students have access to all digital devices, internet, and Wi-Fi connectivity to support online learning.

In support of social media adoption in education, another teacher said:

> *"During the Covid-19 pandemic, use of social media in education became an invaluable technology that helped us to restore the lost hope in learners and parents. The Covid-19 induced lockdowns prompted the closure of many institutions including schools, leaving social media as one of the common platforms on which learners interact with their teachers."*

Another focus group discussion with learners showed how important social media was during the COVID-19 pandemic. One learner said:

> "*The Covid-19 pandemic taught us great lessons. We learnt about online learning because of the pandemic. It was during the Covid-19 pandemic that we learnt how to use social media platforms for academic purposes. The technological innovations and strategies that can be utilised nowadays include the use of social media platforms like WhatsApp, Zoom, Twitter, Facebook, YouTube, Find Your Homework, Instagram etc. We first learnt about these as academic platforms during the Covid-19 pandemic and we discovered the power behind all such technologies to support teaching and learning. With Google Classrooms, teachers are able to record their lessons and upload them for us to use and re-use them as per need. Materials uploaded on Google Classroom can be used over and over again. WhatsApp's recording facility also helps teachers to clarify concepts to us better. Educational videos can also be uploaded onto YouTube channels and played and replayed several times until a learner understands the concept. The use of computers and smart phones to support education is also key. Technology use makes information sharing very convenient" (Focus group 1, 2023).*

Social media platforms, such as Facebook, YouTube, Twitter, LinkedIn, and WhatsApp, were commonly used to share academic materials during the COVID-19 pandemic period. The lockdown affected all institutions, including libraries.

During the focus group discussion, commenting on social media platforms relevant to the teaching and learning process, one teacher said:

> *"Facebook allows teachers to provide learning materials and updates, provide announcements, photos and videos to learners despite physical location. Facebook as a social media platform also creates a space for learners to ask and answer questions globally. Schools also had to create Facebook pages to be able to link up with learners during lockdown period."*

Sharing the same sentiments, one of the learners said:

> *"Use of Facebook was also adopted by the National Broadcaster, ZBC, to provide learning to learners during the Covid-19 pandemic period. Even these days, platforms like WhatsApp are used on radio to facilitate learning in primary schools."*

The power of social media use in education was also reiterated by educational psychologists who emphasised that the ubiquity of social media platforms makes them very flexible tools to deliver educational content.

Discussion

This research sought to explore an understanding of how education survived the COVID-19 pandemic in Zimbabwe. This study has shed some light on the resilience that was enabled by technology. While classroom learning was perceived to be an activity that only occurs face-to-face between four walls, attempts to ensure teaching and learning during the pandemic have demonstrated Wedemeyer's (1973) independence and autonomy theory. Using this theory, we understand that during the pandemic, classrooms were disbanded, learners and teachers were separated, and face-to-face teaching and learning ceased to happen. However, distance education took over and learning occurred independently and autonomously in terms of space and time using technology.

This research highlights the innovative spirit of teachers and learners in Zimbabwe to ensure the sustainability of teaching and learning for the current generation of children using technology, e-learning, and m-learning. Whether the teachers were conscious of the sustainable development goals (SDGs), they inevitably worked towards achieving the SDG4 on Quality Education, the goal that contributes to Education for Sustainable Development (ESD) (Shava et al., 2021).

Diga and Kelleher (2009) define social media platforms as technologies that facilitate interactions and networking among people. Such technologies allow the sharing and interaction of users to form an online community. Zhou et al. (2017) explain that social media platforms can broadly be referred to as social media websites, infrastructure, and communication technology. When teachers, educational psychologists, and learners were asked about the technologically innovative teaching and learning strategies to be used to ensure effective teaching and learning during crisis situations such as pandemics, they all concurred that the use of social media platforms such as WhatsApp, Zoom, Google Classroom, Twitter, Instagram, Facebook, YouTube, Find Your Homework, and My Quizzes was a key development.

The participants also appealed to the government and school authorities to intervene by purchasing such devices as laptops and smartphones for teachers and learners. Regarding the use of social media in education, Boahene et al. (2019) conducted research in Ghana and discovered that people had different sentiments with regards to social media use in education. According to these researchers, people had mixed feelings about social media use and its effects on education, with some saying it has little to no effect, while others say it has both negative and positive effects on academic performance. To support this idea, Seechaliao (2015) carried out a study at Mahasarakham University in Thailand in the faculty of education and discovered that social media was used to facilitate learning activities, with Facebook being the most common social media site used. A study by Gruzd et al. (2018) on social media use in educational institutions reveals an increase of 68 and 80% in the adoption of social media for teaching and learning activities in some institutions in the United States and Canada, respectively.

To get a clear picture of the technologically innovative strategies used during times of crises, teachers were asked a question about the challenges brought about by the COVID-19 pandemic to the teaching and learning process. According to Chiang and Sumell (2019), social media provides the opportunity for students to actually talk to and connect with people in far-away places, regardless of distance, alluding to Wedemeyer's (1973) autonomy and freedom theory. This removed the need for students to visit academic libraries physically. Dhume et al. (2012) explained that academic libraries in Ghana have embraced the use of Web 2.0 and social networking sites to enhance sharing of academic materials.

All these sentiments by the research participants were in line with Mungofa and Tsvara (2014), who indicated that students can

connect with each other as well as with their teachers anytime, anywhere through the use of social media. Mungofa and Tsvara (2014) also explain that students are not restricted to the physical and geographical boundaries of their area whenever connectivity has been made possible through various social media sites. Ngonidzashe (2013) also conducted research on social media use in tertiary institutions with a focus on Solusi University. The researchers discovered that most teachers and learners adopted and integrated social media into their courses widely to facilitate teaching and learning activities.

The findings of this current research also confirm what Tadesse and Muluye (2020) found out in their research "Impact of COVID-19 Pandemic on Education System in Developing Countries" carried out in Ethiopia. The researchers found out that the arrival of COVID-19 pandemic resulted in school closures, which affected teachers, students, and parents. The researchers found out that distance learning became the solution to continuing education during the pandemic period. The researchers, however, noted that distance learning was hampered by a lack of network infrastructures, computers, and internet access. Their findings were in line with what teachers in this current study highlighted as challenges affecting the adoption of technologically innovative teaching and learning strategies, especially by learners.

The contrary viewpoint by Shaikh et al. (2023) in their research to find out the effects of online educational systems adoption on the health of teachers and learners is fundamental in paving the way for responsible and appropriate technology adoption in education. While technologically innovative strategies are necessary, policymakers and implementers of such technologies need to be aware of the negative effects of such innovations and technologies and be in a position to effectively combat the adverse effects.

Limitations of the study

One key limitation of our current study is that the findings from two primary schools in the Masvingo District may not be broadly generalised to other schools and learning institutions in Zimbabwe. However, the qualitative and instrumental case study design adopted in our research helped to achieve in-depth, rich, and contextual insights of the phenomena under investigation. Such insights offer a foundational understanding for other Zimbabwean schools and similar developing country contexts to consider on the technologically innovative teaching and learning strategies adopted to continue with the teaching and learning process during crisis situations. This aids in the generalisability and transferability of the research findings. Case study design is meant to achieve an in-depth understanding of the phenomenon within a specific context, rather than statistical generalisability to a wider population. Another limitation of the study is its reliance on self-reported data. The research relied more on self-reported data because of its qualitative nature. The study aimed to understand the experiences, perceptions, and suggestions of teachers, learners, and educational psychologists, which necessitated the use of methods like in-depth interviews and focus group discussions, which inherently yield self-reported data. This approach allowed researchers to gather rich, nuanced insights into the participants' lived experiences and perspectives on navigating education during the pandemic.

Recommendations

In light of the above findings, the following recommendations are made:

- Government must negotiate for partnerships with telecommunications companies to address ICT infrastructure and internet access and affordability issues, including subsidised data, and community ICT access centres in remote areas to enhance equity in accessing these technological solutions.
- The government should remove the duty on the importation of computers and related ICT tools by schools.
- Government should subsidise the purchase of data and internet connectivity by schools and school children.
- The Ministry of Primary and Secondary Education must implement targeted professional development programmess for teachers focusing on pedagogical strategies for effective use of mobile learning, social media, and virtual classrooms in resource-constrained settings.
- The Ministry of Primary and Secondary Education should draft clear policy guidelines at the institutional or national levels about technology use in schools to regulate and control how teachers and learners can effectively use social media in the teaching and learning process, including criteria for selection and quality assurance.
- Schools should create official social media platforms that are coordinated and controlled at the school level to make sure that social media platforms used are well-monitored, controlled, and coordinated.
- Parents and guardians should complement the efforts made by schools by making sure learners have ICT gadgets and data to be able to remotely interact with their teachers even after school hours.

Recommendations given above show that the study on technologically innovative teaching and learning strategies to be adopted in crises contexts, like the COVID-19 period, brought about some consequent issues that need the attention of government and policymakers to smoothen the technology adoption process in education. First, devices and platforms required to support e-learning and social media learning are expensive and require strong budgets, which can be beyond many primary schools' reach if there is no government intervention. The issue of health implications reiterated by Shaikh et al. (2023) calls for a planned adoption and implementation process with policymakers putting in place technology adoption guiding principles.

Conclusion

This current study discovers the technologically innovative strategies adopted by primary schools in the Masvingo District to continue the teaching and learning process during pandemic periods such as the COVID-19 era. The study underscores the significance of using e-learning, m-learning, social media, and virtual classrooms to allow teaching and learning processes to continue despite constraining circumstances such as pandemics. Teachers and learners adapted to technology use to cope with their teaching and learning requirements during a crisis, such as COVID-19 pandemic. The research also discovered that there was an increase in the use of mobile phones and

social media platforms, such as WhatsApp, in the teaching and learning process during COVID-19 pandemic in primary schools in the Masvingo District. The research informs policymakers and decision-makers in the field of education to be better prepared for unexpected disruptions like pandemics by leveraging the power of technological innovations.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study involved human participants and was therefore reviewed and approved by the University of South Africa, College of Education, Research Ethics Committee: 2017/03/15/55491901/31/MC. Written informed consent was obtained from all participants/participants' legal guardian/next of kin for their participation in this study.

Author contributions

LM: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. SM: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. IC: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2025.1591857/full#supplementary-material

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