

# Technology and Pedagogical Factors to be Considered when Building a Resilience Framework for Integrating and Using Mobile Technologies in South African Rural Schools

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**Abstract:** The global spread of corona virus has had a significant impact on the basic education systems across the world. Nation states and various government departments had to invent means for remote schooling particularly to ensure continuation of learning amidst the pandemic. One of the widely used means of teaching and learning adopted across the world was the use of mobile technologies for remote learning and content sharing. This directly tested the teachers and learners' resilience in using mobile technologies for teaching and learning. A scoping literature review was conducted to identify technology and pedagogical factors which affected the use of technology for teaching and learning during 2020 school closure. The findings of the literature review identify access to mobile technologies, pedagogical factors like effective usage of technology for teaching and learning, and connectivity as the main barriers for schools in rural areas. Findings from this exercise are used as factors to be considered when building a resilience framework for introducing and using mobile technologies in South African rural schools. The purpose of undertaking such a task is to complete a continuous evaluation of the need to develop a resilience framework and guidelines for the introduction and use of mobile technologies in South African rural schools.

**Keywords:** Resilience, Mobile Technologies, COVID-19, Lockdown, Rural Schools

## 1. Introduction

The short notice and unplanned closure of schools around the world due to the coronavirus left millions of students out of schools, leading to the reliance on mobile technologies for learning and completion of school tasks[1-4]. In early 2020, following an outbreak in China in December 2019, the World Health Organization (WHO) identified SARS-CoV-2 as a new type of coronavirus [5-7]. This virus rapidly spread around the world leading to millions of people succumbing to the disease. Different nation states, through the guidance of the WHO and other international organisations adopted various approaches to deal with the widespread of the virus. According to the United Nations (UN) [8] and the World Bank (WB) [9], one of the commonly used approaches was the implementation of lockdowns. The lockdown approach advocated for stay-at-home instructions, limited movement, avoiding gatherings of large amounts of people, curfews, quarantines, and encouragement of personal hygiene including constant sanitisation [8-12]. By April 2020, it was evident that the virus had spread throughout the continent and a rapid response to curb the spread

had to be implemented [9]. About 3.9 billion people in more than 90 countries around the world were ordered by their governments to stay at home to minimise person to person contact which was believed to be the main spreader of the virus [8]. According to the information obtained from The United Nations Educational, Scientific and Cultural Organisation (UNESCO) [13, 14] it was estimated that at least 195 countries had enforced the closing of schools by the first week of April 2020. On the evening of 23<sup>rd</sup> of March 2020 the president of South Africa Mr. Cyril Ramaphosa announced that South Africa will be implementing a 21 days lockdown from March 26 to April [15]. The purpose of the lockdown was to curb the spread of the virus while the government was increasing the capacity of the health system to deal with the pandemic.

These lockdown restrictions had a knock-on effect to number of sectors, particularly basic education. Since the restrictions prevented personal contact, schools around the world had to create means to follow curricula while using other means other than the classroom learning environment. The use of ICT's and mobile technologies was one of the widely adopted approaches [8, 16]. However, the approach of closing schools imposed a challenge to these in rural environments, particularly in South Africa where such schools do not have teachers with required pedagogical competencies to teach using technologies. This was worsened by not having enough ICT resources to implement online learning. The closing down of schools and the reliance on mobile technologies for teaching and learning exposed the low resilience levels of South African rural schools. Most rural schools were unable to use mobile technologies for teaching and learning and this was a major setback for students in these communities. It is because of these challenges that this study investigated the technological and pedagogical factors to be considered when building a resilience framework for introducing and using mobile technologies in South African rural schools.

This paper is structured as follows: Section 2 outlines the research question followed by section 3 which presents the research methodology and the rationale for undertaking this exercise. Section 4 explains the role of ICT in education and section 5 outlines the challenges experienced by learners in rural schools during the 2020 school closure due to COVID-19 lockdown. Section 7 explains the need to build resilience of using mobile technologies in South African rural schools. Section 7 outlines the opportunities presented by COVID-19 and explains the limitations of this study. Section 8 concludes the paper and points out areas for future research

## **2. Research Question**

This study is guided by one research question which is: what are the technological and pedagogical factors to be considered when building a resilience framework for integrating and using mobile technologies in South African rural schools? The focus is specifically on rural schools in resource constrained environments as these are the ones which were greatly affected by the closure of schools in 2020 due to the COVID-19 lockdown in South Africa.

## **3. Research Methodology**

For the purpose of this paper, a scoping literature review was conducted. The reason for choosing this method to identify technology and pedagogical factors to be considered when building a resilience framework is that scoping reviews provides an overview of a broad topic unlike systematic literature review which typically focus on a well-defined question where appropriate study designs are identified in advance [17, 18]. An added benefit with the scoping review is that the definitions are often clarified using different methodologies to give a broader context, something which a systematic review never does[19-21].

The reason for undertaking this exercise is to strengthen building a resilience framework for introduction and use of mobile technologies in South African rural public schools. This

scoping review directly contributes to the PHD study by strengthening the understanding of factors that affect successful introduction and use of mobile technologies in rural schools.

#### **4. The Role of ICT in Education**

Information and Communication Technologies have globally shaped the journey of development [9, 22-24]. According to Velez et al. [25] for more than four decades, ICT's have become the agents of transformation and they continue to become important in societies. ICT's and mobile technologies in particular have been used in the education sector for more than two decades and their role keeps increasing[9]. In the education sector, the use of ICT's was introduced for the purposes of aiding both teachers and learned in the learning process [26]. Through using various mobile technologies, learners can gather and disseminate educational content, and such a practice is beneficial for their growth. The benefit of the use of mobile technologies in schools is not only important for the learners, but teachers can also search for a range of teaching materials to suit the learners needs [25]. Schools adopt various technologies to use for teaching and learning, but the shared rationale behind the increasing adoption of these ICT's is typically centred around its potential to develop and transform the learners learning experience, pedagogical improvement and to foster the development of digital literacy, including the 21st century skills [27-30]

#### **5. Lock-down Challenges Experienced by Learners in Rural Setting**

This section aims to highlight the challenges experience by learners in South African rural schools during the lock-down implemented by the South African government in 2020.

##### *5.1. The Technology*

The challenges for introducing and implementing mobile technologies for teaching and learning is not only limited to the availability of the IT infrastructure, but its effective use for teaching and learning [31, 32]. The use of mobile technologies in any given environment can only thrive when it is applied to foster transformation and development. One of the conditions is that the school, teachers, and the learners need to embrace the technology and make it work for them [11, 32, 33]. The embracement of the technology needs to be coupled with pedagogical transformation and training which enables the teachers to teach using technologies [34]. This notion is supported by Khalid [32] who advocates that (for technologies to work in rural schools) teachers have to be encouraged by their peers to complete training on how to teach using mobile technologies and how to integrate ICT in the classroom context. The successful implementation of technologies in the classroom is, according to Khalid [32] dependent on the following factors: the affordability and usability of ICT hardware, software, technological assistance, and motivation from co-workers and administrators. Closing of schools in South Africa during lockdown required both the teachers and learners to use mobile technologies for teaching and learning while at home an this posed a great challenge for the learners who do not have access to such technologies at home. Furthermore, the availability of technologies at home does not automatically translate to learners being able to use it for completion of school tasks. The learner needed to have ICT skills that enable them to use technology constructively for learning, completion and submission of tasks for assessment. For learners in rural schools the challenge was two-fold: the availability of technology at home and the knowledge of how to use the technology for learning purposes.

##### *5.2. Context and Resource Availability*

The use relevant pedagogy for ICT based learning and online education is strongly dependent on the previous exposure. The expertise and exposure to information and communications technology for both educators and the learners depend on the context to

which they find themselves and how technology is introduced to them. Learners in rural schools often have less exposure to relevant technologies compared to their urban counterparts. Some of the online platforms used by schools during the lockdown include unified communication and collaboration platforms such as Microsoft Teams, Google Classroom, Canvas and Blackboard, which allow the teachers to create educational courses, training and skill development programmes [4]. Pedagogical training and teacher's enthusiasm to use technology can only benefit the schools if there is technology available for use and that the context allows for the use of technology for teaching and learning. Mobile technologies in schools require support and an enabling environment which enables both the teachers and the learners to use the technology successfully. What was mainly a big challenge for schools in the rural areas was not only about the availability of mobile technologies to use, but connectivity was a challenge. Many rural schools do not have internet access [32]. Even in cases where internet connectivity is available the quality of the internet is poor or the cost of staying connected is very high[11, 27, 35]. Connectivity and cost of connectivity was another challenge for learners in rural areas. In the context where most learners live, availability of technology and internet access at home is not guaranteed. If learners had to complete task and submit them to the teachers, they would need an IT platform where the teachers can send tasks to complete and thus the learners would have to download the task, complete them and use the same platform to submit them To do this, both the teacher and the learner would require access to a technological device, knowledge on how to use the device, the platform for downloading and submission of tasks and connectivity to support the interfacing.

## **6. Build Resilience for Using Mobile Tech in South African Rural Schools**

There is a need to build resilience of rural schools for using mobile technologies for teaching and learning. The global spread of COVID-19 and the closure of schools has exposed the vulnerability of learners in rural communities where access to resources is a challenge. If schools can build the required level of resilience for using mobile technologies, then both the teachers and learners will have the required technological and pedagogical skills to use online platforms for teaching and learning.

This section aims to identify all the technology-based factors that affected the learners in rural areas during the lockdown in 2020. The reason for identifying these is to expand on the factors that should be considered when building the resilience framework and guidelines for introducing and using mobile technologies in South African rural schools.

There are number of factors which needs to be considered when building the resilience of using mobile technologies in South African rural school. For the purpose of this exercise, the focus is given to technology and pedagogical factors that were deemed necessary for learners to participate in an online learning environment during 2020 lock-down. Technological and pedagogical factors included access to mobile technologies, pedagogical skills, and connectivity. Access to mobile technology is deemed essential as it the medium through which the learners were required to use for accessing content and completion of tasks. Pedagogical skills refer to the capacity to plan and execute tasks in both subject-specific and general point of departure. For teachers this required the knowledge of how to teach using technology while for the learner it was about executing the task using the available technology at home. Connectivity is also regarded as the technology-based factor as it was the platform to be used by both teacher and learner for interfacing purposes. Since COVID-19 lock-down regulations advocated for staying-at-home practices, access to the internet was the only resource available for connecting the teachers and learners. Figure 1 figure below presents the technological and pedagogical factors identified.

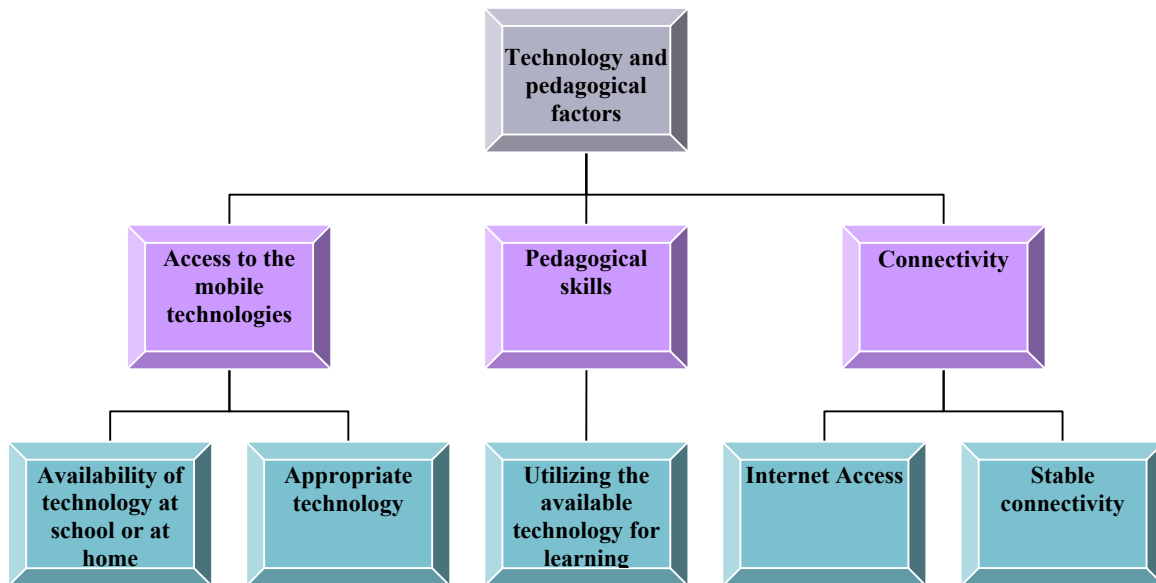


Figure 1: Technological and Pedagogical Factors Essential for Building Resilience

## 7. Opportunities Presented by COVID-19

The COVID-19 pandemic and lock-down regulations have presented an opportunity to test the resilience of the education systems around the world and South African rural schools. It is through the 2020 lock-down that we directly evaluated the readiness and the resilience of South African rural schools in using mobile technologies for teaching and learning.

There are number of factors which need to be considered when building the resilience framework for introducing and using mobile technologies in South African rural schools, however, for this exercise the focus has been given to the technological and pedagogical ones. According to Pokhrel [4], although there has been challenges for educators, schools, and the learners including government regarding online education, there were also opportunities presented by COVID-19. The pandemic attacked the education sector unprepared leading to both the teacher and the learner having to try to find measures that work. Some teachers and learners had to find themselves implementing e-learning environments unprepared [4]. There are also opportunities for parents in the rural areas to be more active in supporting the learners with e-learning and using mobile technologies for teaching and learning.

It is worth noting that this study has one identified limitation and that is, the technology and pedagogical factors identified in this study were not backed up by any visits to the schools of interviews with affected teachers or learners. The conclusion of this study are drawn mainly from a literature review

## 8. Conclusion

The closing down of schools in 2020 because of lockdown has exposed the lack of resilience of rural schools in using mobile technologies for teaching and learning. The challenge emanates on the fact that rural communities are known to have scarcity of resources compared to their urban counterparts. The literature review indicated that the scarcity of ICT's and the knowledge of using them was the biggest challenge for learners in rural areas. The study thus identified availability of mobile technologies, pedagogical skills, and connectivity as the factors to be considered when developing a framework for introducing mobile technologies for teaching and learning in South African public schools. The finding from this study is mainly drawn from the scoping literature review, there is

therefore a need for future research for validation of the identified factors and to test if there are any factors to be considered when developing the resilience work.

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