# Is this an e-School? e-Learning Using Information Communication Technologies in South Africa

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**Abstract**: The study reported on in this paper reviewed the readiness of a specific high school in the township of Soweto to the south of Johannesburg, South Africa, to deliver the curriculum by using Information and Communication Technologies (ICTs), as well as to find the barriers and limitations thereto. For the empirical research, a quantitative mode of inquiry was adopted. A sample of learners and teachers was selected to answer the research questions, using two different questionnaires. The principal responded to a questionnaire on the ICT infrastructure available to establish what the school had in this regard, as well as the skills available to implement pedagogy using ICTs. Data analysis was carried out using a common spreadsheet application and multiple criteria, and the findings are discussed to provide value to, and should be of use to, the stakeholders involved for development purposes. The work discussed in this study covered curriculum topics, as well as lesson planning and reporting. In other words, it covered the process of teaching and learning up to reporting for teachers. A summary of the findings of the research conducted at the high school showed that the school does not have a stable internet connection and more technical support is needed from the government to strengthen the ICT infrastructure to enable the school to fully implement the curriculum using ICTs, compared to using traditional or hybrid methods. These strengthening recommendations include a stable internet connection, ICT staff, to support both e-teachers and e-learners with ICT problems, as well as software to deliver the curriculum. The findings also showed that learners are more comfortable with mobile devices and a little uncomfortable using computers for learning, which means that some aspects of e-learning requirements are not met, and it is very difficult to achieve some of the curriculum goals using mobile devices.

**Keywords**: Information and Communication Technologies, e-Learning, e-School.

## 1. Introduction

According to the then South African (SA) national Department of Education (DoE, 2004, p. 9), the "lack of developed infrastructure for" Information and Communication Technologies (ICTs) "are widening the gap between Africa and the developed world". Africa being a developing continent is still faced with little to no resources in some countries and had to upscale their ICT standards so that they are able to integrate strategies using ICT-enabled teaching and learning to meet the standards of the world. *e-Learning* is the ability to use information and communication technology tools to teach and learn. Having learning and teaching through ICT resources had become one of the most popular platforms across the world. The challenge of ICT resources use in schools remains a limitation for some school districts in some areas of the world, especially in developing countries across Africa. ICTs in education are aimed at improving teaching and learning, administration and management in schools, ICT education in general and ensuring better understanding of ICTs for use in communities (Mpungose, 2020). As the years go by and research is conducted, more ICTs emerge for teaching and learning. However, there are still areas that still use and prefer the 'traditional' models of teaching and learning. It is noted that the quality of teaching and learning can be improved by using ICT tools, which also enables understanding and easy adaptation to this information age (Mqina and Goosen, 2021). An ideal e-school is considered to be one where computer hardware and software, as well as connectivity and sufficient skills, are available, and where teachers and learners are confident enough to implement the curriculum using ICT resources. However, according to Abegbenro, Gumbo, and Olakanmi (2017), in many parts of the world, teachers are still faced with challenges when using basic technologies to deliver educational activities to school children.

Tonui, Kerich and Koross (2016) identified ICTs at least five levels of education, namely presentation, demonstration, drill, practice, as well as interaction and collaboration. The different levels can each be used collaboratively to reach the next. In order to reach their full potential in terms of confidently using ICTs to deliver teaching and learning in schools, both learners and teachers are required to integrate all levels of ICTs daily.

ICTs had proven to have a huge impact on education through research and practice. Developed countries had reached over 90% of schools having computer-based learning in the early 2000s. Some African countries had also been in favour of introducing computer-based learning. The then national Department of Education (DoE, 2004) in South Africa (SA) also undertook to introduce ICT-based pedagogy in the country.

ICTs have different components, namely hardware, software and networks that work together to execute the different outcomes for humans. Computers are still considered by many to be the most important device that enables all the components to communicate and provide the platform to practise ICT education (Tonui, et al., 2016), even though the latest developments have shown other devices that provide similar features, like tablets and smartphones. However, these other devices are often limited to certain supported software and functionalities.

### 1.1 Objective

Information and communication technologies are used in various ways to help in pedagogy for both teachers and learners. Using ICTs goes beyond the basic skills acquired from training provided by teachers or during teacher training provided by government (Ghavifekr and Rosdy, 2015). Daily use of ICTs improves not just in-education delivery but also decision making and creativity. Electronic game playing is also another method to increase learners' interest in using ICTs, which in turn makes is easier to use these tools for learning.

This report is focused on attempting to solve the problems related to ICTs used for teaching and learning, as well as access to ICT resources at this high school. The researchers explored different methods used by others, who had conducted research on similar topics and/or used suitable and effective methods that will assist in solving the problem at hand.

### 1.2 Research problem and questions

Based on the characteristics of an e-school provided by the DoE (2004, p. 18), the research questions are to establish to what extent a particular school is characterised as an institution that has:

- "learners who utilise ICTs to enhance learning"?
- "qualified and competent teachers who use ICTs to enhance teaching and learning"?
- "access to ICT resources that support curriculum delivery"?

### 1.3 Purpose

The purpose of this report was to investigate ways to strategically assist teachers interested in using ICTs for teaching and learning, and ultimately, learners, to utilise the ICTs in their learning processes (Abegbenro, et al., 2017). This should improve the delivery of the curriculum in schools, as well as the use of these tools in more detail.

## 2. Literature review

### 2.1 Early development

In the earlier stages of the introduction of modern teaching and learning in SA by the DoE (2004), the strategies for and importance of ICTs in education were explained and most importantly, introduced to many of the countries' schools. Due to the digital divide, research cited in by the DoE (2004, p. 8) showed that "only 6.4% of South Africans" had access to and used the Internet. A set of development areas that needed to form part of the process in its entirety had been set aside with strategies on how to achieve each of the stages of the development strategy. The DoE (2004) also introduced a teacher development course including eleven modules to introduce teachers to the use of ICTs in schools.

### 2.2 Adoption and integration

The integration of ICT use in schools by the DoE (2004) had a lot of broad information that needed to be conceptualized, implemented, reviewed and maintained regularly over a period of time to continue to monitor the evolution of the use of ICTs in schools to deliver curriculum (Wilson-Strydom, Thomson, & Hodgkinson-Williams, 2005). At this point, teachers were assisted with their integration of pedagogical practices into modern ones that included the use of ICTs.

### 2.3 Type of research

Most of the research previously conducted used mixed methods. Quantitative research methods use questionnaires to collect opinions, behaviours, beliefs and other types of information to draw conclusions using

the supplied answers, whilst in qualitative research, they use case studies that enable them to analyse the data to obtain a deeper understanding and come to informed conclusions in their research. Yunus and Suliman (2014) indicated that attitudes towards the introduction of ICT tools in literature lessons for both learners and teachers were what guided the success of the adaptation and integration of the use of ICTs in learning. Designing effective *e-learning* environments in Gweru, Midlands Province, Zimbabwe led to both teachers and learners understanding the role of ICTs and the benefits of these, not just in school but also for the broader community (Farikayi and Goosen, 2022).

## 2.4 Limitations of Current Literature

There were also limitations in current literature regarding the age, gender, location, and years of experience of teachers (Abegbenro, et al., 2017). Findings from Fu (2013) revealed that age plays a huge role in learning faster and converting interest in the technological aspects of ICT devices, which makes it easier to attract learners' attention. In terms of exploring teachers' acceptance of *e-learning* technologies, if their self-efficacy is low, it becomes difficult to even try to attempt to use the educational resources or they think such tasks are beyond their capabilities (Abegbenro, et al., 2017; Yuen and Ma, 2008).

Li and Wong (2008) mentioned the issue of questionnaires asking 'personal' questions, so that the respondent would question their self-efficacy with respect to the use of ICTs in general. This means that there may be ethical issues with respect to the content of research questions, as it seems to invade participants' privacy. However, privacy and confidentiality should be maintained at all times. According to the SA Protection of Personal Information (POPI) Act (Republic of South Africa, 2013), information available to participants should include the purpose of the research, the type of data to be collected and where the data is going to be used (Adams, et al., 2021). If there is any additional use of the data that was not included in the original consent form, further consent should be obtained, outlining the changes involved.

Time and financial resources are also a limitation in conducting this kind of research (Setati-Legodi and Goosen, 2022). The researcher may need more time and resources to work on finding in-depth ways of achieving the proposed research aim. However, these may not be available. Furthermore, the availability of respondents during specified times may also be a problem, as they are busy with their daily tasks and may have other commitments when they may not be available (Wilson-Strydom, et al., 2005). This means that some respondents may not be able to complete all research activities.

During the COVID-19 pandemic, Farikayi and Goosen (2022) looked at a school in Gweru in the Midlands province of Zimbabwe to see how ready the school was with regard to using ICTs in teaching and learning. In that period, *e-learning* progress was in the limelight, seemingly taking over education and ensuring that it continued, even during the difficult time (Al-Abed Al-Haq, 2022). One limitation found is that the findings will only come from that school and cannot be used across other schools (Farikayi and Goosen, 2022). Another factor affecting the successful implementation of an e-education policy and community engagement towards acquiring 21st century skills through *e-learning* was the lack of accessibility of resources in the schools (Muzambi and Goosen, 2022). Jones (2004) asserted that ICTs need to be of good and effective quality to offer adequate throughput.

## 2.5 Possible Solutions

Hill (2018) suggested several possible solutions for learning using ICTs as part of having both learners and teachers ready to use the technological environment to learn. Bui (2020) also recommended gamification as part of learning using ICTs as a fun and more engaging process. The government can focus more on rural schools without resources and little exposure to technologies, rather than the already equipped areas (Patel, 2018). Tapscott and Tascott (2017) further proposed introducing blockchain technologies into pedagogy and learning, as these are more collaborative and livelier in terms of content exchange and innovation, which anyone would want to be part of. Wepner, Tao and Ziomek (2006) further aimed at providing more ICT services that will not only teach but also bring interest for learning through ICTs around the world through the global web.

## 2.6 Future Possibilities

As research continues to take place in different areas of the world, now particularly in developing countries, more research needs to be conducted on blockchain technologies with respect to teaching and learning, which will lead to interest from different genders and age groups (Buabeng-Andoh, 2022). The India Today Web Desk (2022) suggested finding ways that will provide for the evolution that develops together with the current

technological trends, while providing for optimal education. One should strategize towards providing more action learning that is more engaging and globally competitive using technologies, that takes place, even outside the classroom, which makes it even more about self than the curriculum. Such a shift in methodologies was presented by Goosen (2018) as it presented action research as a research paradigm that produce research with more in-depth understanding of the directions that *e-learning* is taking. Future research also needed to shift from the stereotype that a learner is a recipient and the teacher is the expert, who is responsible for information dispensing (Tong and Triniada, 2005).

### 2.7 Project Scope

The use of technologies had evolved and taken over teaching and learning in different ways, including, but not limited to, formal internet teaching, videos and sometimes gaming, compared to more traditional forms or methods of teaching. This project aimed at investigating how conversant learners, teachers and the management of a high school based in the east of a township in the south of Johannesburg, SA, were with using ICTs to deliver the school curriculum and manage lesson plans, as well as for management to administer the school in general. This project ran from July 2022 after the semester recess until the end of 2022 and depended on the availability of learners and teachers. The population of the school was mainly black disadvantaged South Africans.

The limitations expected when the study was undertaken included the availability of participants, because of school times and the different grades selected, and only one school taking part in this project with a small sample size (Mqina and Goosen, 2021). In this project, the researchers also compared the current skills and attitudes of learners and teachers at the school so that the investigator was able to plan, based on the current skill basis at the school.

Research limitations further included that the research only involved one school. The number of learners and teachers limited "the transferability of the study to other learners" and teachers (Mqina and Goosen, 2021, p. 170). This meant that only the selected sample received the benefits related to the study being carried out. As small as the sample size was, it still had benefits for the chosen participants.

## 3. Research Methodology

Setati-Legodi and Goosen (2022) perceived methodology as providing a systematic method to solve real-life problems through research. The process was controlled to ensure that responses were valid and verifiable. The more controlled a process is, the more accurate it will be; the inquiry will be more valid and will take the research in the right direction towards improving any limitations at the school.

### 3.1 Research Approach

This study looked at exploring the current knowledge, skillsets and attitudes of learners and teachers at this school on the use of ICTs for curriculum delivery (Majumdar, 2006). This approach assisted in establishing the current state at the school and made it possible to draw up an action plan to improve on the lacking aspects. The respondents should be more motivated and have increased interest in using the provided skills in their pedagogy after the research.

This subsection provides the overall systematic step-by-step process followed towards finding a solution by choosing an appropriate research design. In this research project, mainly quantitative methods were used, and questionnaire surveys and interviews were developed for data collection aimed at statistical analysis (Farikayi and Goosen, 2022).

The questionnaires were distributed to the teachers and learners at the high school during an agreed-upon time slot and completed during the specified time. The questionnaires were short and precise to address the problem of ICT access and use for teaching and learning at the high school (Ghavifekr and Rosdy, 2015). The investigator was at the school during completion of the questionnaires to ensure that any questions participants had could be responded to if anything needed be clarified. This was done to ensure accuracy and understanding in the answering of the questions and avoid unwanted mistakes, which could interfere with the quality of the data. Surveys have been used for many years for conducting research (Setati-Legodi and Goosen, 2022).

The questionnaires were followed by structured interviews as used by Yunus and Suliman (2014), with the interviews taking place after the completion of the questionnaires to complement the content of the latter.

The method used by Yuen and Ma (2008) of questionnaire completion would not be possible in this research, as respondents might not remember to complete the surveys or be biased when completing the surveys. The method of collection used in this research was to ensure understanding of the questionnaire and provide support while completing the survey to ensure that the information provided was based on self-reported skills and attitudes toward the use of ICTs in pedagogy. The data collected should follow the pedagogical principles and support the delivery of the curriculum in return (Hill, 2018).

## 3.2 Sample

The respondents in the study were teachers and learners from the school. Specifically, a sample of fifteen learners from different grades and five teachers teaching different subject fields, inclusive of the principal, were selected depending on their availability and using the consent form (Yunus and Suliman, 2014). The learner respondents did not have any exclusion criteria, compared to the teachers, who should have had at least five years' experience at minimum, based on recommendations from previous research. The data collected investigated the self-reported skills of each respondent regarding the use of ICTs in learning.

The reason for using a small number of participants was to work along with the schedule of the school, due to school holidays in the country and examinations taking place during the research period.

## 3.3 Research instruments

Multiple research methods had initially been considered for the study. However, there was a time limitation as schools closed in September, and in the same month, there were preparatory examinations, which meant that the principal would not have agreed to the research being undertaken using extensive qualitative research methods. Informed consent had been obtained from the high school principal to allow the project to run at the school, which clearly stated how the respondents were ethically protected and what the project was about. The first author generated paper-based questionnaires for both the learners and teachers to explore their experiences and mindsets towards the use of ICTs for learning and teaching (Mpungose, 2020).

In order to unpack the "access to ICT resources that support curriculum delivery", there was an additional baseline questionnaire directed at the principal to answer as he had the details of the school inventory and knew where and how resources could be attained (DoE, 2004, p. 18). It enquired about the ICT infrastructure at the school, which was not limited to computer devices, the network and software, but also included continuous support from experts to enhance teachers' confidence in using ICTs for curriculum delivery.

The interviews did not take more than twenty minutes to complete and unpacked how the learners utilised ICTs to enhance learning and qualified and competent teachers used "ICTs to enhance teaching and learning".

The first section of both the learners' and teachers' questionnaires asked questions about the respondents' biographical details, and also contained a section on what they thought of/their attitude towards the use of technologies for curriculum delivery.

The learner questionnaire further contained sections on (Yunus and Suliman, 2014):

- Their use of ICT related tools, and
- What they thought about learning using ICTs.

The teachers' questionnaire also includes a section on their approaches to a literature lesson.

The questionnaires contained two types of questions: Some sections included Yes/No answers, while the others provided more options. However, participants were enabled to show their knowledge and understanding (DoE, 2004; Wilson-Strydom, et al., 2005).

## 3.4 Data analysis

The data collected from the collection instruments were aimed at answering the research questions by using data analysis and visualized in tables and graphs using Excel (Yunus and Suliman, 2014) to draw conclusion from the research (Setati-Legodi and Goosen, 2022). The former was due to the unavailability of other statistical software and license to run such analysis. Furthermore, the investigator included figures to make it easy for readers to understand (Farikayi and Goosen, 2022; Buabeng-Andoh, 2012).

## 4. Findings and Recommendations

The findings of the research conducted at the high school from July – November 2022 showed that the school does not have a stable internet connection and more technical support is needed from the government to strengthen the ICT infrastructure to enable the school to fully implement the curriculum using ICTs, compared to using traditional or hybrid methods. These strengthening recommendations include a stable internet connection, ICT staff, to support both e-teachers and e-learners with ICT problems, as well as software to deliver the curriculum. The findings also showed that the learners are more comfortable with mobile devices and a little uncomfortable using computers for learning, which means that some aspects of *e-learning* requirements are not met, and it is very difficult to achieve some of the curriculum goals using mobile devices. Table 1 provides further explanation on the results of the research.

**Table 1: Details for participating teachers**

| Gender | | |
|---|---|---|
| | **Frequency** | **Percentage** |
| Female | 4 | 67% |
| Male | 2 | 33% |
| Ages | | |
| | **Frequency** | **Percentage** |
| 20-40 | 3 | 50% |
| 41-55 | 2 | 33% |
| 56+ | 1 | 17% |
| Years of experience | | |
| | **Frequency** | **Percentage** |
| 0-3 | 2 | 33% |
| 4-7 | 2 | 33% |
| 8+ | 2 | 33% |

Some mental stimulating games or videos were made available to learners, to get them used to using computers and as a result, they were more comfortable using computers for learning. The teachers at the school are partly comfortable and confident using ICTs for teaching and administration. However, they need more capacitation to be able to cover the whole curriculum confidently. The learners in the school cannot tell which platform works better for learning and as such, they use their cell phones to access educational materials, which is disadvantageous in their learning using ICTs, as these have limitations. More computer literacy practice will enable the learners to use computers more confidently for learning than using cell phones. The school is faced with the challenge of teachers' and learners' confidence in using ICTs because of their attitudes and expectations (Shan Fu, 2013).

### 4.1 Discussion of results

The integration of information and communication technologies into curriculum delivery was also discussed by Wepner, et al. (2006). The latter authors emphasized that the attributes of what needs to be achieved should be clearly defined and assessed. Statistics on the expectations and responsibilities related to using ICTs in pedagogy from developed countries that already were already using ICTs to deliver teaching and learning were provided by Yuen and Ma (2008), who tested the significance of teachers' intention to use ICTs, and found significant direct positive effects for users to use the *e-learning* system.

## 5. Contribution of the Research to Theory and Practice

Three teaching environments were evaluated in the school, which uncovered that both e-learners and e-teachers prefer a hybrid approach. The research was significant to the school towards understanding their current base state regarding ICTs, as well as what is required for them to move along the way towards becoming an e-school.

The school will have to rethink their main objective with the learners with regard to strengthening especially learners' knowledge of ICT use. The research is also significant as it will assist the school to plan their year to include ICT infrastructure and personnel to support the school towards becoming fully ICT-enabled.

## 6. Future Research Directions

More research needs to be done on what characterizes an e-school in SA as a country in relation to the outside world, so that it is clearly defined and supported (Mqina and Goosen, 2021). Also, this being an information age, ways need to be found to ensure that e-learners are well-equipped to use ICTs, as these are now the preferred implementation method and they should be groomed from a young age to spark their interest. More research can be undertaken on the behaviours and interests relating to ICT use so that the curriculum can be implemented to cover the interests of more learners and teachers, towards choosing to use ICTs to learn and teach.

## 7. In Conclusion

The high school investigated in this project cannot be characterized as an institution utilizing ICTs to enhance teaching and *e-learning*, since, according to the findings of this research, it does not have all the required qualities.

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