



**Olukayode Ayodele Oki,
Chinaza Uleanya,
Sanelisiwe Mbanga**

ECHOING THE EFFECT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY ON RURAL EDUCATION DEVELOPMENT

Information and Communications Technology (ICT) is crucial to teaching and learning as it has effect on such exercises in schools. However, ICT is limited in rural based compared to urban schools. In this study, the effect of the incorporation of ICT on the academic performance of rural secondary school students was investigated. Quantitative method was adopted for the study. The sample of the study comprised 34 matric learners and 14 teachers from three selected secondary schools in the rural Cofimvaba District of the Eastern Cape Province), South Africa. Questionnaire was used as the instrument for data collection. Excel was the software used to analyze the results. The findings showed that ICT use can indeed have a positive impact on learners' academic performance. Some teachers, however, suggested that certain measures be put in place through using ICT to encourage positive behaviour. The study recommends that all rural and urban secondary schools should have access to the relevant ICT and ICT device, as these aid teaching and learning.

Keywords: academic performance, Cofimvaba District, Information and Communications Technologies (ICTs), South Africa.

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1. Introduction

The impact of Information and Communications Technology (ICT) use on learners' academic performance has always been hard to measure [1]. Over the last two decades, the direct link between ICT and the academic achievement of learners has been the subject of extensive literature and many studies have attempted to explicate the role and effect of technology on the academic performances of learners. Some studies demonstrated that there was no evidence of a significant ICT role in higher institution learning situation. For instance, according to [2], there was no proof that ICT could improve the performance of learners. Authors of [2] further present a reliably negative and slightly important association between ICT use and learner lower achievement in some cases. Additionally, author of [3] following reviews of different studies relevant to ICT in schools, submits that ICT outcome on learning is unclear. Conversely, authors of [4] refer to the positive effect of ICT on learners' achievement. Authors of [5] advocate for technology use in education to increase classroom performance. Author of [6] supports new technology use in education stating that there are potential effects and benefits applying them to education. Author of [7] indicate that the application of technology in classroom may be used for different purposes such as record keeping, web-page production, word processing, grading, web-page presentation, among others. The incorporating

of ICT as an element into teaching and learning activities has positive effect on learners' abilities to learn and academic performances [8]. According to [9], ICT helps to promote a transition from a more teacher centred style of teaching to a more learner centred. This suggests the impact that ICTs in education can have in teaching and learning. According to the [10], an increase in the availability of ICT is useful for learners. This is based on the notion that ICT enables teachers in preparing apt tasks for specific needs and the whole class.

Authors of [11] explain that teachers are expected to control the effectiveness of technology in the classroom situation, the ease of the adopted technology, their current as well as speculated future use. Teachers can apply those ideas to the adopted technology employed in communicating with learners. Learners who cannot use technology in this present age are seriously disadvantaged [12]. Schools therefore need to help learners prepare for the future and develop abilities that will make them relevant in the workplace. Thus, if schools fail in ensuring access to technology, the chances of learners to learn such critical skills may be hampered. Author of [13] states that there is need for learners to be prepared for relevance in a digital society. As schools encourage technology and ICT use, learners can learn the skills necessary to be effective in an increasingly technological environment. Meanwhile, the work of [14] showed that ICTs have the potential of reinforcing positive or negative effects in the society.

This implies that ICT impact on learners' academic success remains somewhat difficult and open to debate. Thus, this study investigates the effectiveness of the use of ICT in teaching and learning in rural schools.

ICT in education. ICT includes, among others, computers, the internet, and any automated transmission system such as radio, television, and a projector. Authors of [15] suggested that the school is a significant environment in which learners participate in a wide variety of computer activities, whereas the home is a supplementary venue for daily involvement in a narrower selection of computer activities. This rapid relay of information is done using various ICTs, which involve television, radio, computers, and tablets as well as mobile phones. These are continually upgraded to make them faster and more effective while they often also become increasingly cheaper due to mass manufacturing. In education, ICT used to be restricted only to the written method of information exchange [16]. Nowadays, however, information is communicated to individuals in audio and video mediums [17]. Teaching and learning can thus with ICT use develop a multidimensional approach including objectives such as improving learners' academic performance. With traditional teaching approaches, it is often difficult to accomplish all the different learning objectives. Multiple approaches should ideally be combined when trying to accomplish several different objectives, and ICT may be of considerable benefit. Additionally, ICT offers variety in the way knowledge or content is delivered and allows learners to focus, better understand and therefore sustain the acquired information in the long term, something which can also play a vital role in increasing learners' academic success rate. There are many websites that teachers and learners can use to accomplish their objectives.

The implementation of ICT in education. The lack of formal integration and planning strategies may obstruct management's attempts to incorporate ICT into their educational activities [18]. For example, authors of [19] note that «the prevailing assumptions guiding policy on new technologies in schools are deeply flawed and in need of re-assessment». New curricular need to be developed and ICT integration must be maintained in compliance with the school culture [20].

ICT implementation in South African schools. Schools in South Africa started to use computers during the 1980s, at first mainly in private schools and a few well-resourced public schools in major urban areas. The educational framework had to be compatible with the curriculum of the international world, so emphasis was placed on technology-enhanced learning [21]. The initial reason for having computers implemented in schools was for keeping learners' records and creating school timetables; however, this evolved due to constant advances in ICT [22]. The birth of independence in South Africa in 1994 led to an improvement in the implementation of ICT in the school curriculum and administration by the Department of Education (DoE). The DoE tried to provide communication to strengthen teaching and learning, and to provide pedagogical instruction, assessment, managerial and administrative support services [23]. Following review of [24], the need for schools to adopt ICT in South Africa in an attempt to provide access to quality education for everyone is crucial. Authors of [24] consider access to internet as the only way forward for a national reset of education to be experienced in South Africa. However, [25] reports that «It must be noted that

ICT was not the solution, but instead a means to the solution». Moreover, some schools with ICT enabled access tend to make limited use and mainly focus on learning about computers or attainment of ICT skills rather than the integration of ICT into the classroom [26].

School culture and ICT implementation. Author of [27] citing [28] states that «School culture encompasses the vision, plans, norms and values that are shared by school members». The effectiveness of ICT implementation is more dependent on the perception(s) of school leaders than the skills of teachers responsible for ICT [29]. Suffice to state teachers' beliefs, actions, and attitudes towards teaching and learning are greatly influenced by school culture. In order for teachers to incorporate technology into their classes, [30] state that they must be confident in their ability to promote student learning through technology. Generally, for teachers to adopt technology effectively, there needs to be an improvement of their skills level, values and the school culture in this regard [31].

School policies and ICT implementation. In some countries the implementation of computers in the classroom was driven by government policies [32]. A government policy acts as a notification to the general public that new, updated, or expedited programmes of action on specific issues are scheduled within a specific time period [32]. A government policy becomes a public policy as it acts as a warning to people about the government's plans for them [33]. ICT regulation, according to author of [34], will serve a number of purposes. It will, for example, offer a justification, a collection of priorities, and a roadmap on how education systems can improve due to the implementation of ICT, as well as how pupils, teachers, parents, and the general public can benefit from its use in schools. According to [35], educational policymakers should rely more on measures that enable teachers to integrate ICT more effectively. Authors of [36] emphasize that successful ICT implementation occurs when a school develops ICT implementation strategies and its teachers «share the values expressed within a school policy and understand their implications».

The challenges schools face when implementing ICT. Some of the identified challenges schools faces are as highlighted and explained below:

- *Language barriers.* While English is officially the most widely spoken language in the world, with an estimated 80 percent of content on the internet in English, review of [37] suggests that there are still several countries where people are less proficient in English. This suggests that there would be a communication gap if learners in these countries use ICT. It is critical that all teaching and learning materials meet the specifications of the school curriculum and also provide locally relevant content, ideally produced in local languages.

- *Lack of infrastructure.* In South Africa, there is a need for appropriate infrastructure in especially rural schools for them to be able to implement ICT. Authors of [38] suggest that the shortage of facilities and the Department of Education's failure to fund ICT initiatives are some of the challenges hindering the implementation of ICT in South African schools. In addition, review of the work of author [39] shows that although there is generally a positive picture painted of ICT implementation in schools it should be kept in mind that the provision of facilities needed for the adoption of

ICT in teaching and learning is of crucial importance. Concerning infrastructure in the South African context, authors of [40] mention some challenges affecting the successful adoption of ICT in rural and some urban schools as lack of electricity, inadequate storage facilities, and lack of telecommunication infrastructure. Authors of [41] hold the view that one key requirement for the introduction of ICT in rural schools is having access to high quality electricity which many rural schools do not have, making the implementation of ICT a challenge.

– *Insufficient technical support.* Technical support specialists are also needed in all primary and secondary schools for the installation, as well as the operation and maintenance of all technology related equipment, software, network security and administration. The shortage of technical assistance for primary and secondary school teachers was described by [42] as a hindrance to the effective implementation of ICT in schools. On the other hand, author of [43] argues that ICT services and maintenance contracts in schools enable teachers to make use of ICT in teaching without having to waste time in having to address issues of fixing software and hardware problems. Without on-site technical support, lots of money and time may be lost due to technical breakdowns.

– *Inadequate teacher training.* Author of [42] found that teachers did not receive sufficient training in how to use ICT in the school. In addition, skilled teachers able to use the ICT tools for teaching and learning are still in short supply. The absence of training in the use of technology in science-specific areas has always been challenges in classroom practice [44]. Meanwhile, not only is absence of/or ineffective training a challenge but also the shortage of qualified teachers who are able to use the technology with confidence [44]. Thus, inadequate teacher training was a hindrance in teachers' usage of ICT in their classrooms [35]. Some teachers find it difficult to make use of general software applications such as Microsoft Excel and Word. Although the majority of learners are keen to learn how to use these resources, many learners are also hampered by the lack of experienced teachers. Author of [45] suggests the need for teachers not only to be computer literate but also develop skills adequate for the incorporation of computer use in teaching and learning programmes. Author of [35] concluded that insufficient or ineffective training results in teachers not being adequately trained or confident enough to carry out complete ICT integration in the classroom.

– *Teachers' lack of confidence.* Research has shown that teachers' lack of confidence is a major problem in their use of ICT. Author of [32] notes that teachers' lack of confidence is detrimental to their implementation of ICT in the classroom. Numerous studies have been undertaken to find reasons for teachers' lack of confidence when it comes to using ICT. Authors of [46] explain that weaknesses in teachers' understanding of ICT made them feel nervous about using it in the classroom. Teachers' abilities and expertise are significant factors to be considered [42]. One of the key obstacles to ICT usage in education in both developed and developing countries is teachers' lack of awareness and expertise [47].

Africa's economic recession due to COVID-19 threatens countries' willingness to invest in secondary education at a time when demand is rising. This is envisaged to have a long-term effect on the future of the African labour force, which needs to adapt their skills learned through ideally high-quality and appropriate secondary education to a digitized, increasingly evolving, and globalized world of employment [48]. Meanwhile, following the outbreak of the COVID-19 pandemic, it became obvious that many South Africans lack access not only to the internet but also to digital devices that would enable them to function remotely and continue with various aspects of their lives through online channels [49]. This can be alluded to how people were restricted to work/study from home, the impact of the novel coronavirus pandemic underlined the importance of ICTs in South Africa now more than ever [50]. The President's announcement of the initial nationwide lockdown resulted in a five-week school closure. To compensate for the disruption in the curriculum, mid-year school holidays were shortened by a week.

Rationale for this study and research questions. The rationale for this study which was undertaken in the rural district of Cofimvaba in the Eastern Cape Province of South Africa was to examine the significant relationship between ICT and the academic performances of learners in rural education. Thus, the study was guided by the following research questions:

- Does ICT enhance teaching and learning in schools in the Cofimvaba District, Eastern Cape Province, South Africa?
- Does ICT help the teachers in the Cofimvaba District, Eastern Cape Province, South Africa to better deliver their lessons?
- How can ICT use in teaching and learning be improved in the Cofimvaba District?
- How do teachers and learners in the Cofimvaba District, Eastern Cape Province, South Africa view ICT use during teaching and learning in improving learners' academic performances?

2. Materials and Methods

Case study design was used for this study. Authors of [51] state that case study designs are useful in addressing a wide range of research questions. In the context of this research, case study design was adopted because it was specific and provided a way to generate accurate information on the impact of ICT on the academic performance of secondary school learners focusing on three selected rural secondary schools in Cofimvaba District: Arthur Mfebe, Siyabalala and Kwahza. The researchers preferred to use quantitative research to get the best understanding of the different stakeholders' views on the adoption of ICT in these schools. Random sampling was used in selecting respondents, while observing COVID-19 protocols. The study sample comprised 8 female and 6 male educators, as well as 19 female and 15 male learners from the 3 selected rural secondary schools. Thus, in brief, the study comprised a total of 48 respondents: 14 educators and 34 learners across 3 secondary schools in the Cofimvaba district of Eastern Cape Province, South Africa. The biographic data of respondents are shown in Table 1.

Table 1

Bio data for the sample data

Category	School A		School B		School C		Total
	Female	Male	Female	Male	Female	Male	
Teachers	3	2	3	2	2	2	14
Learners	6	5	7	5	6	5	34

Data collection method. Questionnaires were e-mailed to selected teachers and students in the Cofimvaba District at the three schools that were chosen. This e-mail approach was chosen in line with COVID-19 regulations to reduce physical contact and to also prevent a poor response rate. This is in congruence with the work of [52], who supports the use of email for data collection in times of crisis such as the COVID-19 pandemic.

Developing the questionnaire. The researchers used a standardized questionnaire with Modified Likert answers. These varied from Strongly Agree (SA) with a numerical value of 4 to Strongly Disagree (SD) with a numerical value of 1, as seen below: SA=4, A=3, D=2, SD=1.

Validity of questionnaire. After the instrument had been designed by one of the researchers, it was sent to other researchers who are expert in the field. Following comments made by the experts in the field, adjustments were made to the questionnaire before it was administered.

Data analysis. Data was analysed using the mathematical software programme Excel. This was done using descriptive and inferential statistics. Descriptive statistics summarize raw data in such a way that it can be visualized, allowing the researcher to view the data in a more meaningful way and allowing for easier data analysis. The researchers could determine the average score of a participant on a given study scale. The mode, median, and mean are ways of defining the central point of a frequency distribution for a set of results. Tables were used to reflect data analysis, so outliers were easy to spot. Cross tabulation was also useful for comparing the relationships between nominal variables like programming expertise and teaching.

Ethical considerations. The researchers first applied for ethical clearance from the supporting university, thereafter adhered to the principles of ethics as stated in the ethical clearance certificate. Teachers' and learners' participation in the study was entirely voluntary. Thus, participants in the study were not forced at any point to take part in the study and were made to understand that they could withdraw anytime they felt uncomfortable. Also, anonymity was ensured, hence, the names of participants were not included in the questionnaire or report.

3. Results and Discussion

As already said, there were 48 participants of which 14 were teachers: 5 teachers each from two of the schools and the other 4 teachers from the remaining school. Thirty-four learners were selected, 11 learners each from two of the schools and 12 from the remaining school for confidentiality purposes the schools were called A, B, and C. Frequency tables were included in the data presentation. The responses of respondents are presented using frequencies. Data presentation, analysis and perception or debate was in the form of detailed explanations using narratives. The findings of the data are also summarized and presented

using tables. Appropriate charts were used to illustrate the data performance.

The teachers who were participants in the study were all qualified with an education degree and/or diploma and/or a higher certificate in their field of specialization. Table 2 shows the range of years of teachers' service in the education sector.

Table 2

Teacher participants' teaching experience in years

Institution	1 to 3 years	4 to 10 years	11 to 20 years	20 to 30 years	>30 years	Total
School A	2	1	0	1	0	4
School B	3	2	1	0	0	6
School C	2	0	2	0	0	4

Table 2 shows that more than 50 % of the teachers had between 3 and 20 years of experience in teaching, three implying that the data was collected from experienced teachers.

The responses of each of the research questions guiding the study are subsequently presented. The responses of the educators are presented first, followed by the responses of the learners.

Research question 1: Does ICT enhance the learning in schools in the Cofimvaba District?

Table 3 displays the responses of 14 educators giving their views about ICT use at their respective schools. Most of the 14 teachers responded positively. Thus, in total 81 % of positivity was obtained from the teachers' responses to this question, implying that ICT as a pedagogical tool enhances their teaching. The finding is in corroboration with one of the findings of the work of [53] who opine that the use of technology in teaching and learning enhances the learning abilities of learners.

Table 3

Teachers' responses on ICT enhancing learning in schools in the Cofimvaba District

Questions	Schools						Total
	A		B		C		
	Yes	No	Yes	No	Yes	No	
1. Does your school provide teachers with laptops (or tablets, PCs, desktop computers, netbooks, notebooks) for their own use?	4	0	4	1	5	0	14
2. Do teachers often use these ICT devices?	4	1	3	2	3	1	14
3. Are learners motivated by the use of ICT in teaching and learning?	4	2	3	1	4	0	14

Educators were further asked to respond to questions on the availability and use of ICT in teaching and learning exercises. The results are presented in Fig. 1.

The results presented in Fig. 1 shows that the majority of the educators indicated that their schools had ICT devices and that these were used for teaching and learning. This finding contradicts the work of [54] who state that rural institutions of learning are usually under-equipped, hence, the use of ICT devices in teaching and learning exercises is limited.

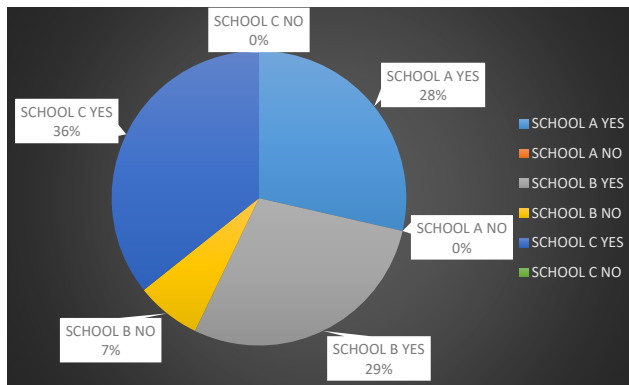


Fig. 1. Availability and use of ICT

Learners' responses on research question 1: Does ICT enhance the learning in schools in the Cofimvaba District, Eastern Cape Province, South Africa? are presented in Table 4.

Table 4

Learners' responses on ICT and learning

Questions	Schools						Total
	A		B		C		
	Yes	No	Yes	No	Yes	No	
1. Do you have access to any ICT equipment such as computers, laptops or tablets at your school?	8	3	9	2	9	3	34
2. Do teachers often use any relevant software to support teaching and learning activities such as Microsoft PowerPoint, Microsoft Excel, Encarta, VLC for videos/Windows media player, Google earth, Physics Lab, etc.?	9	2	9	2	10	2	34
3. Are you finding the use of ICTs useful for learning purposes?	10	1	10	1	10	2	34

The majority of the learners (over 90 %) also said that ICT devices were available and being used at their respective schools and were making their studying more enjoyable. The majority of the learners also gave encouraging responses to their teachers' use of ICT, and also showed interest in using ICT to improve their learning and academic success. Suffice to state that the learners' responses to research question 1 mirrored those of their teachers, indicating that ICT devices and technology were available and accessible at their schools, and making learning more interesting. However, a limited proportion of teachers and learners disagreed that ICT devices and technology were accessible or being used to their full extent at their schools. The study thus found that all three schools had ICT and ICT devices available and used ICT as a pedagogical tool in their teaching and learning.

Research question 2: Does ICT help the teachers in the Cofimvaba District to better deliver their lessons? This research question looked at data on academic software readiness, internet service availability, and learner access to the internet to see whether ICT promoted lesson delivery.

Sequel to the analysis of the obtained data, all three schools had software academic applications that could be used in lesson delivery. According to [34], teachers can foster a culture of critical thought among their learners by

using academic software in lesson delivery. Hearing, seeing, and gesture capabilities can also be used with multimedia applications, which can help in lesson delivery. A spreadsheet kit that can be used for simulation or modelling is an example of this. Mathematical skills, for example, can be developed by make use of spreadsheet applications such as Excel. For topics such as physics, biology, chemistry, and geography, software is available that can provide learners with an in-depth view of things they are not necessarily able to see in the classroom. Furthermore, the software is usually appealing to learners.

Two of the three schools verified the use of an internet service, and learners at those schools confirmed the use of the internet for study purposes. Academic software for teaching and learning is widely available, ensuring that those who use it can readily benefit from it (Fig. 2).

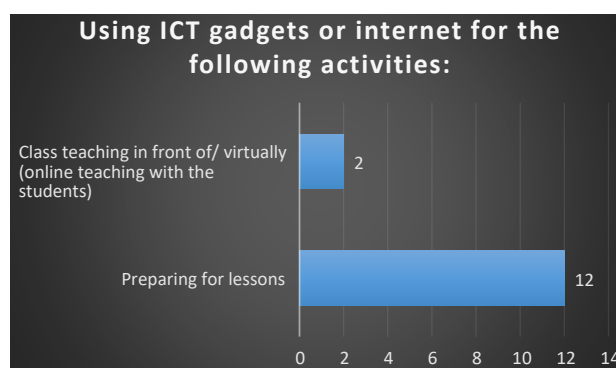


Fig. 2. Using ICT (including the internet) and ICT devices for the following activities

The analyzed data showed that the schools had academic applications that could be used in lesson preparation and delivery. However, while majority (86 %) of the teachers use ICT devices and internet for lesson preparation, only 14 % use same for lesson delivery. This implies that ICT devices and internet are commonly used for lesson preparation but not for lesson delivery. This finding corroborates one of the findings of the work of [55] who state that many South African schools for various reasons fail in using ICT tools for teaching and learning exercises. Meanwhile, from the finding of this present study, teachers and learners who used ICT academic tools and were linked to the internet confirmed that lesson execution by teachers and idea mastering by learners were faster and simpler. Learners with access to ICT learning resources have the keys to decrypt the hidden messages [56]. In other words, internet access offers a plethora of knowledge that can make teaching and learning simple and efficient. The finding of this study, suggests that lesson delivery will differ in schools with access to internet compared to those without. This is consistent with Bourdieu's cultural capital principle, which notes that «cultural capital entails the verbal skills, knowledge base, and ways of thought that make the learner grasp concepts better, simpler, and quicker» [57].

Research question 3: How can ICT use in teaching and learning be improved in the Cofimvaba District?

The respondents' responses to whether learners engage the same by using the traditional «chalk and chat» technique were negative. Most teachers agreed that learners were inspired by ICT as a pedagogical instrument and that ICT

appealed to students and motivated them. They stated that using traditional chalk and discussions could be monotonous for some learners who might even fall asleep during class, something which was nearly impossible when using ICT.

ICT use as a pedagogical method was favoured by all the teachers from the three schools, as well as the 34 learners. This result is in line with [58] who state that ICT functions well where learners are taught capabilities in distinct classes and when educators in other subject(s) support learners in the application of ICT competence to improve learning in their specific subjects (Table 5, Fig. 3).

Table 5

Teachers' responses

Questions	Schools						Total
	A		B		C		
	Yes	No	Yes	No	Yes	No	
1. Are learners motivated by the use of ICT in teaching and learning?	5	0	5	0	4	0	14
2. Is there a marked improvement in the performance of learners as a result of the usage of ICT in teaching/learning?	4	0	5	1	4	0	14
3. Would you recommend the use of ICTs in teaching and learning?	5	0	4	0	4	0	14
4. Do students participate in a similar manner when using the traditional approach as with ICTs?	0	5	0	5	0	4	14

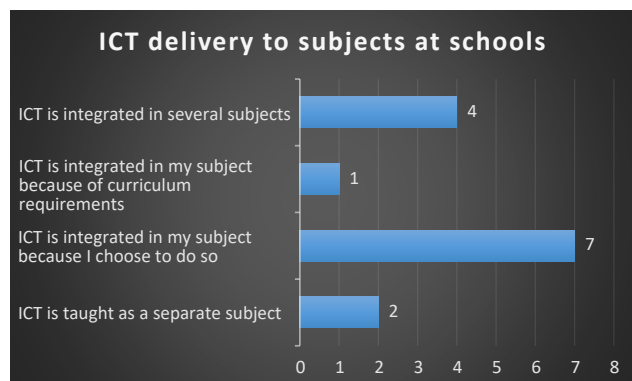


Fig. 3. ICT delivery to subjects at schools

The responses of the 14 educators showed that ICT use in the learning process inspired learners. ICT use in teaching and learning received strong positive feedback from all 14 educators with over 90 % agreeing with ICT use. This finding corroborates the work of [59] who posits that ICT is a catalyst for teaching and learning processes (Table 6).

Table 6 showed that all 34 learners responded positively on the two items, namely whether learners were motivated by ICT use in teaching and learning and whether there was a marked improvement in learners' academic performance as a result of the usage of ICT in learning. The finding from research question 3 further shows that with regards to learners' participation when traditional approach is put to use, six learners from school A and six from school C had positive response while the other six from school A and five from school C had negative response. However, eleven learners from school B responded negatively. This implies that in some schools whether ICT is used for

teaching and learning exercise or the traditional approach is maintained, learners' reactions remained similar. Meanwhile, in other schools, learners are strongly inspired by ICT use, especially being able to use the internet while studying. Suffice to state that the foregoing implies that what works in certain schools and for some learners may not work for others. Thus educators are enjoined to adopt a learner-centred approach, and not necessarily a school- or class-centred approach. In this regard, educators are expected to observe their learners and adopt whatever works best for each learner, while encouraging and motivating them to adopt ICT use.

Table 6

Learners' responses on steps to improve the use of ICT in teaching and learning

Questions	Schools						Total
	A		B		C		
	Yes	No	Yes	No	Yes	No	
1. Are learners motivated by the use of ICT in teaching and learning?	11	0	12	0	11	0	34
2. Is there a marked improvement in the performance of learners as a result of using ICT in teaching/learning?	12	0	11	0	11	0	34
3. Would you recommend the use of ICTs in teaching and learning?	12	0	11	0	11	0	34
4. Do learners participate in a similar manner when using the traditional approach as with ICTs?	6	6	0	11	6	5	34

Research question 4: How do learners and teachers in the Cofimvaba District view ICT use during teaching and learning in improving learners' academic performances?

Following the analysis from data collected from teachers, the result shows that fifty percent of the teachers agreed that ICT use and ICT devices by learners (whether online or in class) was a good thing and could play a big role in improving learners' academic performance. However, on the question of which subjects ICT should be implemented more, the respondents differed. Seven percent were in disagreement that ICT had led to a marked improvement in their learners' performance. These teachers claimed that ICT use and ICT devices had no influence on the teaching and learning of the subject(s) they taught their learners. They also indicated that their learners were more interested in using ICT for personal purposes such as social networking, playing games or browsing malicious websites than closely following class proceedings. In this regard it is worth noting that [58] conducted research on how students felt while using ICT devices for educational purposes. As a result of taking increased responsibility for their own learning, students' use of smartphones or other ICT devices did not disrupt their lesson time. Mixed feelings were expressed by 43 % of the teachers and some of the learners about whether they thought ICT lead to improved academic performance, with some advocating for ICT inclusion whilst others were against the idea (Table 7, Fig. 4).

Teachers' responses showed that 43 % of them had a neutral response, 50 % «Agreed» and 7 % «disagreed» that ICT would lead to an improvement in learners' academic performance. This meant that 50 % of the teachers agreed that if

ICT was implemented correctly it would lead to an improvement in learners' academic performance (Table 8, Fig. 5).

Table 7

Teachers' views of ICT use helping to improve academic performance

Question	Teachers responses					Total
	Strongly Disagree	Dis-agree	Neutral	Agree	Strongly Agree	
Is there a marked improvement in the performance of learners as a result of using ICT in teaching/learning?	1	0	6	3	4	14

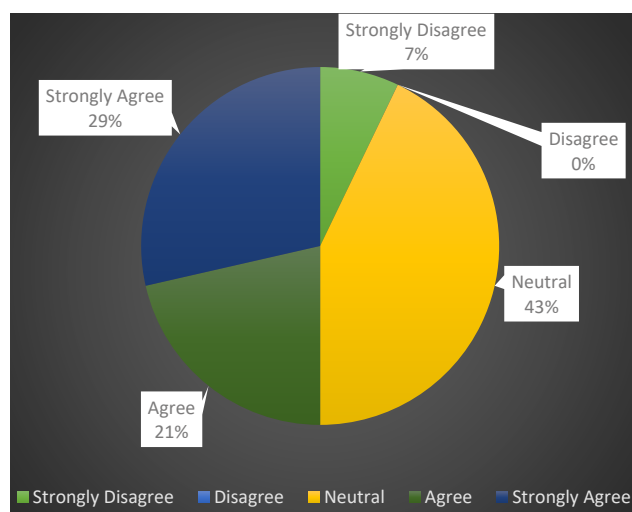


Fig. 4. Noticeable improvement in the performance of learners as a result of using ICT in teaching and learning

Table 8

Learners' views of ICT use helping to improve their academic performance

Question	Learners' responses				Total
	Excel-lent	Good	Fair	Poor	
1. How have your marks been from the selected above since the usage of ICT and internet for learning purposes?	8	16	9	1	34
2. In comparison with the other subjects (not selected), how have your marks been since not using ICT and the internet for studying/learning purposes?	3	14	13	4	34

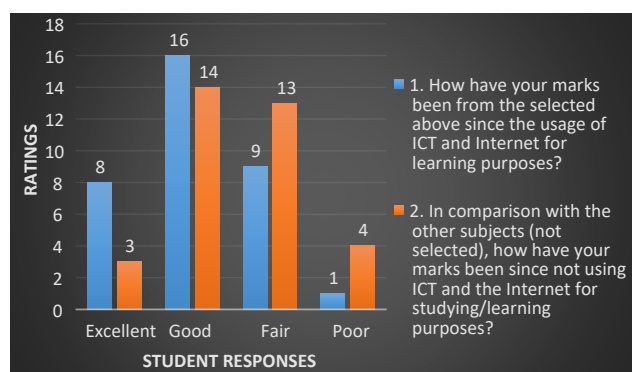


Fig. 5. Graphs illustrating the learners' responses

The findings on ICT use showed that the majority of the 34 students from the three different schools were positive about using ICT at school and during lessons because of how their marks had improved since ICT was implemented. Hence, ICT use for learning and studying purposes was viewed as very positive. When ICT tools are related to pedagogy, they are likely to have a positive effect [3]. When ICTs are used correctly to supplement the teacher's pedagogical philosophies, it results in a beneficial impact on learners' performance. When learners use ICTs, they also tend to take more responsibility for their own learning. However, few respondents had reported indifferently, signifying that in some instances, ICT does not make significant difference.

The study was limited to one selected district in a province in South Africa, hence, the findings may not be generalized to other provinces or countries. Thus, it is suggested that similar study be conducted using two or more districts and provinces in South Africa, as well as countries or continents. During the course of the study, it was discovered that there is a quest for the discouragement of ICT use in some rural secondary schools. Thus, it is suggested that a study be conducted in that regard, possibly using qualitative method in order to gather in depth information on the phenomenon.

4. Conclusions

Whilst ICT use in teaching and learning is strongly celebrated and upheld by many as having positive impacts and should be desirous to be more incorporated in school activities, however, following the submission of some respondents, it is otherwise. In other words, in rural based secondary schools, ICT which should be embraced by all seems not to be by some due to different reasons. Nevertheless, following the analyzed data based on the responses of majority, ICT use in secondary schools remains pivotal. From the findings of the study, the following recommendations are made:

- Adoption of ICT for teaching and learning in rural and other schools which helps to improve learners' academic performances should be promoted.
- The Department of Basic Education should see to it that teachers are trained in how to use ICT in the classroom, as some teachers, especially those who have been in the profession for a long time, are sometimes unable or unwilling to start using ICT. They may also be resistant to these positive developments because they are unaware of the advantages of using ICT.
- The government should also fund education inclined workshops targeted at ICT use in teaching and learning, for record keeping, analysis of learner performance, assessment, among others currently handled manually by teachers.
- School administrators and principals of schools should ensure that their schools have Wi-Fi in order to take advantage of the wealth of resources available for successful teaching and learning. This is especially important nowadays, since learners can easily conduct their own online research. However, it is necessary to technologically ensure that learners do not access inappropriate and malicious websites. Having access to the internet also means that purchasing textbooks and other books, which can be costly and difficult for learners who live in remote areas and who are also financially

disadvantaged, can now be replaced by electronic books available cheaper online, making it possible for more learners to gain access to these resources.

– Government should draw up an annual budget for providing free ICT and ICT devices to each and every rural and urban secondary school learner. This will ensure that all learners have equal opportunities in making use of devices such as computers, laptops and/or smartphones in order to achieve better academic results and gain ICT skills for the future.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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Data availability

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References

- Balanskat, A., Blamire, R., Kefala, S. (2006). The ICT impact report. *European Schoolnet*, 1, 1–71.
- Nketiah-Amponsah, E., Asamoah, M. K., Allassani, W., Aziale, L. K. (2017). Examining students' experience with the use of some selected ICT devices and applications for learning and their effect on academic performance. *Journal of Computers in Education*, 4 (4), 441–460. doi: <https://doi.org/10.1007/s40692-017-0089-2>
- Trucano, M. (2005). *Knowledge maps: ICT in education*. Washington: World Bank, 77.
- Namome, C., Moodley, M. (2021). ICT in mathematics education: an HLM analysis of achievement, access to and use of ICT by African Middle School Students. *SN Social Sciences*, 1 (9). doi: <https://doi.org/10.1007/s43545-021-00230-6>
- Christopoulos, A., Sprangers, P. (2021). Integration of educational technology during the Covid-19 pandemic: An analysis of teacher and student receptions. *Cogent Education*, 8 (1). doi: <https://doi.org/10.1080/2331186x.2021.1964690>
- Kozma, R. B. (2004). *Monitoring and evaluation of ICT for education impact: A review*. Available at: https://www.academia.edu/42103264/Monitoring_and_evaluation_of_ICT_for_education_impact_a_review
- Imamun, S. O. (2021). *Availability, Use and Teachers' Competence in Information and Communication Technology in Classroom Teaching in Senior Secondary Schools in FCT, Abuja*. University of Abuja, 126.
- Teachers' ICT skills and knowledge needs* (2008). Swedish National Agency for School Improvement.
- Pison, A., Levi, B. (2017). *Examining The Influence of Information and Communication Technology (ICT) on Learning Among Secondary Schools in Developing Countries in Africa: Case Study Uganda-Mitooma: Secondary Schools in Kashenshero Sub County*. Available at: https://www.researchgate.net/publication/318851582_the_influence_of_information_and_communication_technology_ict_on_learning_among_secondary_schools_in_developing_countries_in_africa_case_study_uganda-mitooma_secondary_schools_in_kashenshero_sub_count
- ICTs in Education for People with Disabilities: Review of innovative practice* (2011). Moscow: UNESCO.
- Carlson, C., Philip, A., Mcneill, S., Powell, T., Witt, L. (2012). «Which Technology Should I Use to Teach Online?»: Online Technology and Communication Course Instruction. *Journal of Online Learning and Teaching*, 8, 334–347.
- Johnson, T. (2014). *The Effects of Information and Communication Technology on Student Achievement*. Sophia, the St. Catherine University. Available at: <https://sophia.stkate.edu/maed/75>
- Chisalita, O. (2013). *New Educational Literacies. Changes Brought by the Information and Communication Technologies (ICT's) in Education. Paper presented at the International Scientific Conference eLearning and Software for Education*. doi: <https://doi.org/10.12753/2066-026X-13-010>
- Khan, M. S., Khan, I., Siraj-U-Din, Ismail, H. M., Khattak, R., Jan, R. (2015). The impacts of ICT on the students' performance: A review of access to information. *Research on Humanities and Social Sciences*, 5 (1).
- Kent, N., Facer, K. (2004). Different worlds? A comparison of young people's home and school ICT use. *Journal of Computer Assisted Learning*, 20, 440–455. doi: <https://doi.org/10.1111/j.1365-2729.2004.00102.x>
- Sahu, T. K., Pradhan, S. R. (2016). *A study of the use of ICT in the teaching-learning process in secondary and senior secondary schools of Sangrur District (Pb)*. Available at: https://www.academia.edu/4123172/A_Study_of_the_Use_of_ICT_in_the_Teaching-Learning_Process_in_Secondary_and_Senior_Secondary_Schools_of_Sangrur_District_Pb
- Keiling, H. (2019). *4 Types of Communication and How to Improve Them*. indeed. Available at: <https://www.indeed.com/career-advice/career-development/types-of-communication>
- Wozney, L., Venkatesh, V., Abrami, P. C. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and Teacher Education*, 14 (1), 173–207.
- Cuban, L., Kirkpatrick, H., Peck, C. (2001). High Access and Low Use of Technologies in High School Classrooms: Explaining an Apparent Paradox. *American Educational Research Journal*, 38 (4), 813–834. doi: <https://doi.org/10.3102/00028312038004813>
- Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: the case of Syrian EFL teachers. *Computers & Education*, 47 (4), 373–398. doi: <https://doi.org/10.1016/j.compedu.2004.10.013>
- Howei, S., Muller, A., Paterson, A. (2005). *Information and communication technologies in South African secondary schools*. Cape Town: HSRC. Available at: <https://repository.hsra.ac.za/handle/20.500.11910/8062>
- Mdlongwa, T. (2012). *Information and Communication Technology (ICT) as a Means of Enhancing Education in Schools in South Africa: Challenges, Benefits, and Recommendations*. Africa Institute of Institute of South Africa. Policy Briefing No. 80. Available at: [https://www.semanticscholar.org/paper/Information-and-Communication-Technology-\(ICT\)-as-a-Mdlongwa/af9113636bd6f57b9a69953fe3c3dd87c7cc07e2](https://www.semanticscholar.org/paper/Information-and-Communication-Technology-(ICT)-as-a-Mdlongwa/af9113636bd6f57b9a69953fe3c3dd87c7cc07e2) Last accessed: 15.08.2020
- Draft White Paper on e-education: Transforming learning and teaching through ICT* (2003). Pretoria: Government Printers.
- Dwolatzky, B., Harris, M. (2020). *SA Education: A national reset is needed and mass internet access is the only way forward*. Daily Maverick. Available at: <https://www.dailymaverick.co.za/article/2020-07-02-sa-education-a-national-reset-is-needed-and-mass-internet-access-is-the-only-way-forward/>
- Provision of ICT in schools: Department of Basic Education & Department of Telecommunications and Postal Services briefing*. Telecommunications and Postal Services (2016). Parliamentary Monitoring Group. Available at: <https://pmg.org.za/committee-meeting/22096/>
- Goktas, Y., Gedik, N., Baydas, O. (2013). Enablers and barriers to the use of ICT in primary schools in Turkey: A comparative study of 2005–2011. *Computers & Education*, 68, 211–222. doi: <https://doi.org/10.1016/j.compedu.2013.05.002>
- Fu, J. S. (2013). ICT in Education: A Critical Literature Review and Its Implications. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 9 (1), 112–125.
- Maslowski, R. (2001). *School Culture and School Performance: An Explorative Study into the Organisational Culture of Secondary Schools and their effects*. Twente: Twente University Press.
- Ottestad, G. (2013). School Leadership for ICT and Teachers' Use of Digital Tools. *Nordic Journal of Digital Literacy*, 8 (1-2), 107–125. doi: <https://doi.org/10.18261/issn1891-943x-2013-01-02-07>

30. Ward, L., Parr, J. M. (2010). Revisiting and reframing use: Implications for the integration of ICT. *Computers & Education*, 54 (1), 113–122. doi: <https://doi.org/10.1016/j.compedu.2009.07.011>
31. Ertmer, P. A., Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42 (3), 255–284. doi: <https://doi.org/10.1080/15391523.2010.10782551>
32. Mokgadi, G. T. (2015). *The Implementation of Information and Communication Technology (ICT) In Teaching and Learning in Rekopantswe Area Office Schools*. Mafikeng Campus.
33. Jansen, J. D. (2002). Political symbolism as policy craft: explaining non-reform in South African education after apartheid. *Journal of Education Policy*, 17 (2), 199–215. doi: <https://doi.org/10.1080/02680930110116534>
34. Kozma, R. B. (2003). Technology and Classroom Practices. *Journal of Research on Technology in Education*, 36 (1), 1–14. doi: <https://doi.org/10.1080/15391523.2003.10782399>
35. Buda, A. (2020). Stumbling Blocks and Barriers to the Use of ICT in Schools: A Case Study of a Hungarian Town. *Informatics in Education*, 19 (2), 159–179. doi: <https://doi.org/10.15388/infedu.2020.08>
36. Tondeur, J., van Keer, H., van Braak, J., Valcke, M. (2008). ICT integration in the classroom: Challenging the potential of a school policy. *Computers & Education*, 51 (1), 212–223. doi: <https://doi.org/10.1016/j.compedu.2007.05.003>
37. Gratton, E. (2021). *English Language Statistics: How Many People Speak English Worldwide?* Preply. Available at: <https://preply.com/en/blog/english-language-statistics/>
38. Dzansi, D. Y., Amedzo, K. (2014). Integrating ICT into Rural South African Schools: Possible Solutions for Challenges. *International Journal of Educational Sciences*, 6 (2), 341–348. doi: <https://doi.org/10.1080/09751122.2014.11890145>
39. Andiema, N. V. (2015). Challenges of Adoption of Information Communication Technology On Teaching and Learning in Public Pre-Schools in North Rift Region, Kenya. *International Journal of Economics, Commerce and Management United Kingdom*, 3 (12), 515–528.
40. Chisango, G., Lesame, C. (2017). Challenges of Information and Communication Technology Policy Implementation in Rural South Africa. *Communitas*, 22, 48–61. doi: <https://doi.org/10.18820/24150525/comm.v22.4>
41. Matlala, M., Kheswa, S. (2021). Internet Usage by Selected High School Learners in Limpopo Province. *Mousaion: South African Journal of Information Studies*, 38 (4), 1–18. doi: <https://doi.org/10.25159/2663-659x/8033>
42. Mafang'ha, M. (2016). *Teachers' Experience on the Use of ICT to Facilitate Teaching: A Case of Ilala District Secondary Schools*. University of Tanzania, 120.
43. Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 8 (1), 136–155.
44. Ghavifekr, S., Kunjappan, T., Ramasamy, L., Anthony, A. (2016). Teaching and Learning with ICT Tools: Issues and Challenges from Teachers' Perceptions. *Malaysian Online Journal of Educational Technology (MOJET)*, 4 (2), 38–57.
45. Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development*, 68 (5), 2449–2472. doi: <https://doi.org/10.1007/s11423-020-09767-4>
46. Habibu, T., Abdullah-Al-Mamun, M., Clement, C. (2012). Difficulties Faced by Teachers in Using ICT in Teaching-Learning at Technical and Higher Educational Institutions of Uganda. *International Journal of Engineering Research & Technology (IJERT)*, 1 (7), 1–9.
47. Mamun, A., Tapan, S. M. (2009). Using ICT in Teaching-Learning at the Polytechnic Institutes of Bangladesh: Constraints and Limitations. *Teacher's World-Journal of Education and Research*, 33-34, 207–217.
48. *The Impact of COVID-19 on Secondary Education in Africa: Amplifying Challenges and Opening New Opportunities* (2020). Mastercard Foundation. Available at: <https://mastercardfdn.org/the-impact-of-covid-19-on-secondary-education-in-africa/> Last accessed: 12.04.2021
49. Aristovnik, A., Keržič, D., Ravšelj, D., Tomažević, N., Umek, L. (2020). Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective. *Sustainability*, 12 (20), 8438–8472. doi: <https://doi.org/10.3390/su12208438>
50. Uleanya, C., Alex, J. K. (2021). The Constraints of Learning from Home During the Pandemic: Experiences of Rural Higher Education Institution (HEI) Students. *International Online Journal of Education and Teaching (IOJET)*, 8 (4), 2176–2188.
51. Harrison, H., Birks, M., Franklin, R., Mills, J. (2017). Case Study Research: Foundations and Methodological Orientations. *Forum: Qualitative Social Research*, 18 (1). doi: <https://doi.org/10.17169/fqs-18.1.2655>
52. Bratcher, Z. (2020). *Implementing Alternative Modes of Data Collection to Overcome Covid-19 Challenges*. U.S. Bureau of Labor Statistics, UNECE Virtual Data Collection Workshop. Available at: https://unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.58/2020/mtg4/DC2020_D1-6_USBLS_-_Bratcher_P.pdf
53. Uleanya, C., Gamede, B. (2019). Technology Solution to Quality Rural University Education. *The International Journal of Interdisciplinary Educational Studies*, 14 (2), 59–74. doi: <https://doi.org/10.18848/2327-011x/cgp/v14i02/59-74>
54. Uleanya, C., Gamede, B. T., Kutame, A. P. (2020). Rural and irrelevant: exploration of learning challenges among undergraduates' rural universities. *African Identities*, 18 (4), 377–391. doi: <https://doi.org/10.1080/14725843.2020.1767037>
55. Munje, P. N., Jita, T. (2020). The Impact of the Lack of ICT Resources on Teaching and Learning in Selected South African Primary Schools. *International Journal of Learning, Teaching and Educational Research*, 19 (7), 263–279. doi: <https://doi.org/10.26803/ijlter.19.7.15>
56. Johnston, J., Barker, L. T. (2002). *Assessing the Impact in Teaching and Learning*. Institute for Social Research. Michigan: University of Michigan.
57. Haralambos, M., Holborn, M. (2008). *Sociology: Themes and Perspectives*. London: Unwin and Hyman, 16.
58. Pachler, N., Redondo, A. (2014). *A critical exploration of the impact of technology on learning, pedagogy and teacher effectiveness*. Singapore Cengage Learning.
59. Musheer, Z. (2018). ICT as a catalyst for teaching-learning process: A meta-analysis study. *International Journal of Advanced Education and Research*, 3 (2), 61–64.

Olukayode Ayodele Oki, Lecturer, Department of Information Technology, Walter Sisulu University, Mthatha, South Africa, ORCID: <https://orcid.org/0000-0002-6887-9782>

✉ **Chinaza Uleanya**, Associate Professor, Department of Educational Leadership and Management, University of Johannesburg, Johannesburg, South Africa, e-mail: chinazau@uj.ac.za, ORCID: <https://orcid.org/0000-0002-7732-0905>

Sanelisiwe Mbanga, Postgraduate Student, Department of Information Technology, Walter Sisulu University, Mthatha, South Africa, ORCID: <https://orcid.org/0000-0002-0850-8920>

✉ Corresponding author