

Art. #1483, 11 pages, <https://doi.org/10.15700/saje.v38ns2a1483>

## The effectiveness of Information and Communication Technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province

 OA Ojo and  EO Adu

School of General and Continuing Education, Faculty of Education, University of Fort Hare, East London, South Africa  
oojo@ufh.ac.za

The effectiveness of the use of information and communication technologies (ICTs) in teaching and learning is germane to the recent educational innovations in South Africa. The study examined the level of availability and utilisation of ICT facilities by teachers and students in high schools in Eastern Cape Province, South Africa as well as the factors influencing and challenging its effectiveness. A random sampling technique was adopted to select a sample of 600 (450 students and 150 teachers) for the study. Four research questions were answered with the aid of self-developed instruments tagged Teachers' Questionnaire on Effectiveness of ICTs in Teaching and Learning (TQEICTTL) and Students' Questionnaire on Effectiveness of ICTs in Teaching and Learning (SQEICTTL). Frequency and a simple percentage were used to analyse the data obtained. It was revealed that the highest available ICT facilities in all selected schools were mobile phones being used by students to download relevant information on their various courses and exchange ideas and knowledge among other students. It was, therefore, recommended that government play an active role in the effectiveness of the use of ICTs by funding ICTs in schools through training and re-training of teachers and exposure of stakeholders to the relevance of the pedagogy relating to the use of ICTs for teaching and learning.

**Keywords:** effectiveness; high schools; Information Communication Technologies (ICTs); learning; South Africa; students; teachers; teaching and learning; utilisation

### Introduction

Information and Communication Technologies (ICTs) include but are not limited to electronic machine or devices used to help the teacher achieve the set goals and objectives in teaching and learning within the shortest time. Examples are a video camera, projector, photocopy machine, scanners, and others, which appeal to all the senses and feeling of the students. These devices help teachers to communicate effectively to the students in a unique way of understanding that facilitates learning.

The effectiveness of the use of information and communication technologies (ICTs) in teaching and learning in high school is germane to the recent educational development and innovation in Africa. J Anderson (2005), views information communication technology as a tool for changing students' learning behaviour. In a statement by Ali, Haolader and Muhammad (2013), it was described that both the teachers and administrative staff had an imperative passion for the integration of the use of ICTs into teaching and learning during classroom interaction. This idea is promoted where access to information, students' online registration, proper and soft record keeping of documents, and electronic learning opportunities is unhindered.

South African high school starts from Grade 7 to 12 and age ranges from 13 years to 18 years for a few decades in the past have used traditional teaching methods e.g., telling the method to transfer knowledge to learners. Schools in South Africa, most importantly those that are disadvantaged in terms of infrastructure, face numerous constraints ranging from an inability of the parent to pay students' school fees to the negligence of schools on the part of the government. The high schools in South Africa that do not make use of ICTs in teaching and learning have led to South Africa's ineffectiveness in the recent development and advancement in the educational sector.

The development of education in South Africa has undergone various stages of transformation, considering the development in the last two decades (Isaacs, 2007:2). The National Qualification Framework for schools based on Outcomes Based Education (OBE), happens to be central to this transformation (Isaacs, 2007:2). OBE considered the 21st century as a period of dramatic change and development, highlighting the other roles of teachers to be learning mediators, curriculum interpreters, leaders, managers and administrators, masters of his/her subject areas, scholars, facilitators of learning, subject experts, lifelong learners, learning designers, programme innovators, and teaching materials developers, as stated in the National Curriculum Statement (NCS) of 2003 (Department of Education [DoE], 2003). Furthermore, OBE consideration as regards the 21st century was supported by those who designed the NCS. The Curriculum developer considers the process of learning to be as important as the content, hence one of its critical outcomes envisages learners who will be able to use science and technology effectively and critically, showing responsibility towards the environment and the health of others (DoE, 2003).

In recent times, the advancement of ICTs in high schools challenged the advanced ways and processes of teaching and learning and improved the management of education, ensuring flexibility and simplicity (Wikipedia, 2018b). ICTs have changed from being a technology of information and communication alone, to a driver of curriculum innovation and delivery system for both teachers and students. For Schiller and Tillett (2004), ICTs increased the rate of teacher productivity by acting as an entry point into previously inaccessible

content. In addition, they extend students' ability to access available information and in addition, enable teachers towards professional ICTs enhanced opportunities of complicated collaborative activities of teaching and learning visible in space and time division, ensuring seamless interaction between the two parties (Olelewe & Amaka, 2011).

#### The Concept of Information and Communication Technologies (ICTs) in Education

The World Bank (Wikipedia, 2018c) revealed that globally, ICTs have to do with the use of hardware, software, networks, and media for the gathering, storing, processing, transmission, and presentation of information (voice, data, text, images etc.), as well as related services. According to Obanya (2002), ICT is a broad term that is concerned with the harnessing of process, the methods and the product of electronic communication related technologies and other related resources in the new trend of a knowledge-driven society, for improving the productivity, the spread and efficiency of set programme activities geared towards the achievement of clearly defined goals.

According to Mdlongwa (2012), ICT is a global network in which ideas are exchanged, or information and knowledge is shared, through devices such as cell phones or computers, used to connect people. Also, the DoE (2003) stated in the Draft White Paper on E-Education that Information and Communication Technologies could be described as the convergence of information technology and communication technology. They stated further that ICTs are the combination of networks, hardware, and software as well as the means of communication, collaboration, and engagement that enable the processing, management, and exchange of data, information, and knowledge.

One of the main reasons for the introduction of ICTs in the educational curriculum is to enhance the effectiveness of teaching and learning (Bottino, 2003). However, Nwite (2007) has revealed that advanced countries have attested to the fact that ICT is a central focus of educational policies through their implementation for its usage and integration in the curriculum of the school. Moreover, Hennessy, Harrison and Wamakote (2010) observed in their study that the use of ICTs in both primary and high schools is to enhance the quality of teaching and learning interaction in the classroom.

The study of Gulbahar and Guven (2008) also revealed that teachers are thirsty for the desire to improve on their teaching pedagogies through the use of ICT facilities, and are aware of the existing potential in the field of education; hence it requires accessibility and adequate knowledge of its handling before it can be used effectively. According to Yusuf (2005), the national policy for

information technology places little emphasis on the effectiveness of ICTs on educational system at all level, moreover, he suggested that policy implications and suggestions ought to be offered alongside to ensure effectiveness of usage of ICT facilities in the Nigerian school system, which in one way or another affects other African continents.

According to Achimugu, Oluwagbemi and Oluwaranti (2010), information communication technology has become a tool of reformation for education as well as an integrative part of national education policies in the Nigerian educational system and Africa as a whole. It is widely accepted that ICTs can be seen as a catalyst in teaching and learning for enhancing the productivity of teachers and the performance of the students. Furthermore, according to Olelewe and Amaka (2011), a teacher that is understood to be skilled uses various teaching and learning technologies (like video camera, fax machine, computer, internet and multimedia equipment) that are now widely being used by teachers to enhance teaching and learning process through presentation of new ideas and innovations that will assist both the teachers and students to interact with adequate knowledge that is required of a student to properly retrieve, retain and analyse for decision making in a conducive school environment.

Edozie, Olibie and Aghu (2010) have confirmed that ICTs are a means of empowering the potential abilities of people through the use of the available ICT facilities to improve their life skills and strengthen their capabilities. With regard to their view, Umunadi (2011) added that the need for ICTs in teaching and learning is rapidly becoming one of the most important issues in the senior high schools' education system in Africa. In another view, Obanya (2009) opined that high schools in Nigeria must strive to meet common 21st-century challenges of providing the student with an education that is viewed by the general society as both relevant and valuable; and that teaching and learning must be driven by ICTs for the purposes of effectiveness. In another recent development, Ogwo (2005) stated that teachers in the high school will become the facilitators of learning, collaborators, coaches, mentors, knowledge navigators and co-learners, and not merely dispense knowledge.

#### The Trend of the Development of ICTs for Teaching and Learning in South Africa

The population of South Africa is currently estimated at 48 million people (2010), where the number of engagement with the internet was already three million. Although 64 percent of South Africans had access to and used the internet, this stands in contrast to the 72 percent of Americans that had access and used the internet. By 2005, 10

out of every 75 South Africans had access to the internet, while 10 out of 100 had access to fixed landlines (Kritzinger & Padayachee 2010).

In a paper entitled *White Paper on e-Education* (2003), the DoE made known that the use of ICT for teaching and learning in Africa increased by 20 percent. Granting that the increase was not evenly distributed because the percentage of usage in the countries with the higher gross domestic product (GDP) per capita was higher than that of other countries. Furthermore, between the 19th and 20th of April 2012, South African government, through the Department of Communication (DoC), organised a colloquium to review all the government policies on ICT that have been in existence since 1994. In June 2012, various stakeholders in business, labour, academia and civil society across Africa and beyond gathered to further the conversation on ICT use.

According to the DoE (2003) on Draft White Paper on e-education, the provinces within South Africa totalling nine have recorded the various degree of progress with regard to ICT implementation. The Western Cape, Northern Cape, and Gauteng had made significant development as at that moment; meanwhile, the remaining provinces are still trying to meet up to the standard. Although the government in their effort to improve on ICTs engaged the services in partnership with some non-governmental organisations (NGOs), this has responded to bridging the digital divide by initiating various projects:

- a. INTEL 'Teach to the Future' teacher development programme, which provides insights for teachers on ICT integration into teaching and learning;
- b. SCOPE, which is a Finnish development support programme, has, in collaboration with SchoolNet SA and the South African Institute for Distance Education (SAIDE), developed 11 teacher development modules for introduction into schools; and
- c. SchoolNet SA, which provides online, mentor-based programmes that provide in-service training to teachers on how to integrate ICT into the curriculum and its management.

Moreover, the DoE, through its Education Management Information System and information received from provinces presents the reflection of ICT profile of South African high schools.

In 2013 the DoE took the following steps:

- a. The establishment of the Presidential National Commission on Information Society and Development (PNC on ISAD) in 2001:
  1. The aim was to advise the government appropriately on the development of ICT in South Africa; and
  2. to ascertain that the ICT level is the same or higher than other developed countries. The commission comprises of members from both the public and the private sector.
- b. The establishment of the Electronic and Communications Transaction Act, No. 25 of 2002 by the Department of Communication (DoC):

1. The aim was to lead and direct all ICT initiatives in South Africa; and
  2. to ensure the development of a five-year national e-strategy for citizenship empowerment plan especially in the education sector.
- c. The support of ICT in teaching and learning through the integration of various initiatives led to the formulation of policy for the effectiveness of ICT.

#### Statement of the Problem

The need for the provision and utilisation of ICTs in teaching and learning in school was faced with many noticeable challenges of the policy at school and classroom levels despite the accompanying gains (Nwite, 2007). According to the findings of Ajisafe (2014) and Jegede and Owolabi (2008), it is affirmed that the effective utilisation of ICTs in teaching and learning enhances the effectiveness of the high schools' subject curriculum. In the attempt to revolutionise the South African educational sector by introducing ICT into the school curriculum, the government has introduced various measures of improvement in teaching and learning. Therefore, this study investigated the effectiveness of Information Communication Technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province, South Africa.

#### Purpose of the Study

The purpose of this study is to investigate the effectiveness of ICTs in teaching and learning in high schools in Eastern Cape Province, South Africa. Specifically, the study intends to:

- a. examine the level of availability and utilisation of ICT facilities by teachers and students in high schools in Eastern Cape Province, South Africa;
- b. examine the extent of utilisation of the use of ICT facilities in an evaluation of teaching and learning process in high schools in Eastern Cape Province, South Africa; and
- c. highlight the factors influencing and challenges facing the effectiveness of the utilisation of ICTs by teachers and students in high schools in Eastern Cape Province, South Africa.

#### Research Questions

1. What is the extent of availability of ICT facilities by teachers and students in public high schools in Eastern Cape Province, South Africa?
2. What is the extent of utilisation of ICT facilities by teachers and students in high schools in Eastern Cape Province, South Africa?
3. What are the factors influencing the effectiveness of the use of ICTs for teaching and learning in high school in Eastern Cape Province, South Africa?
4. What are the challenges facing the effectiveness of utilisation of ICTs by high school teachers in Eastern Cape Province, South Africa?

#### Methodology

##### Research Design

Cohen, Manion and Morrison (2007) described research design as the procedure used by the researcher to conduct any study with the intention

of finding suitable answers to research questions. McMillan and Schumacher (2001:30) also defined research design as a mode of inquiry as a collection of research practices. Thus, the mode of inquiry dictates the research design, e.g. the setting up of the research, the events of happenings of the subjects, and the methods of collecting the data being used (Maree, 2007:33). Therefore, a descriptive survey design was used to carry out this study. The reason for choosing this research design results from its advantage in allowing the description of conditions as they occur in their natural setting. A survey of research involves the assessment of public opinion through the use of a questionnaire. It is appropriate for this study, with its intention to gather information from teachers and students on the effectiveness of ICTs in teaching and learning.

#### Population and Sampling

The term population is defined by the dictionary as people living in a particular area, place or country. The population of the study consisted of all high school students and teachers in Eastern Cape whereas the sample was drawn from the 10 randomly selected public high schools in Eastern Cape Provinces, South Africa. Simple random sampling was used to select 600 respondents comprising of 150 teachers and 450 students from 10 secondary selected schools.

#### Data Collection Instruments

A survey (which is this research preferred design) is defined as a scientific way of gathering relevant information on an individual or group of people through questioning and inquiring about something important in relation to their values, attitudes, behaviour, belief, perception, and knowledge. Leedy and Ormrod (2014:195) and Wrench, Thomas-Maddox, Richmond and McCroskey (2013) see survey as a form of research, which involves the acquisition of information in respect to one or more groups of people's ideas, perceptions and their characteristics, opinion, attitude or previous experience by requiring tabulated answers for the generated questions given to them.

The two instruments used were "Teachers' Questionnaires on Effectiveness of Information and Communication Technologies on Teaching and Learning" (TQEICTTL), which has five sections, and "Students' Questionnaires on Effectiveness of Information and Communication Technologies on Teaching and Learning" (SQEICTTL), which has only three sections. Section 1 was on background information, Section 2 was on availability, which contains 13 ICT facilities to be ticked appropriately by the respondents, and Section 3 was on utilisation of the same items raised in Section 2. Section 4 and 5 comprises of 15 items each generated to answer the research questions of the study.

A four-point Likert-type rating scale was adopted ranging from Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) interpreted numerically as 4, 3, 2 and 1, respectively.

#### Validity and Reliability of the Instruments

The content validity of the instrument was done by two experts chosen in the field of educational research. Consideration was given to the variables in the study in order to ensure equal representation. Face validity was checked in terms of the typesetting of the instruments and the researcher ensured that the appearance of the instrument is good and attractive to the respondents. The questionnaires' observations and corrections were made before it was administered. The reliability of the two instruments was established by a test-retest method. The same instruments were administered to 20 students and 10 teachers from another province. After two weeks, the same instruments was re-administered to the same respondents and the two scores were generated accordingly. The Cronbach's alpha coefficients ( $r$ ) were used and a reliability coefficient of 0.78 was obtained.

#### Data Analysis

The analysis of data for this study was based on the type of data gathered by the researcher. The descriptive statistics of percentages were used as the main descriptor of the results.

### Results

#### Research Question 1

What is the extent of availability of ICT facilities by teachers and students in public high schools in Eastern Cape Province, South Africa?

Table 1 below indicated that the highest available ICT facilities in school as observed by both the teachers and the students were mobile phones, 136 out of 150 teachers (90.67 percent) and 387 out of 450 students (86 percent) indicated its availability at their schools (see Figure 1). Another very important facility that has a close range of percentage among both teachers and students revealed scanner with 80.67 percent and 64 percent respectively (see Figure 1), followed by a computer that revealed 68 percent and 58.44 percent, respectively. Moreover, the case of the availability of the laptop was different; the result shows that 74 percent of the teachers have access to a laptop in one way or another, whereas this was only available to 23.78 percent of students (see Figure 1). In the case of the radio player, students claimed to have the upper hand in the availability of the facilities, with 65.11 percent, while teachers' accessibility was at 18.67 percent. Furthermore, the result also indicated that facilities like the Television set, projector, interactive whiteboard and video recording machine were also available,

but varied accordingly, as shown in the table. Finally, the availability of the mobile phones by both the teachers and the students revealed 58.67 percent and 46.45 percent, respectively, as shown in Figure 1.

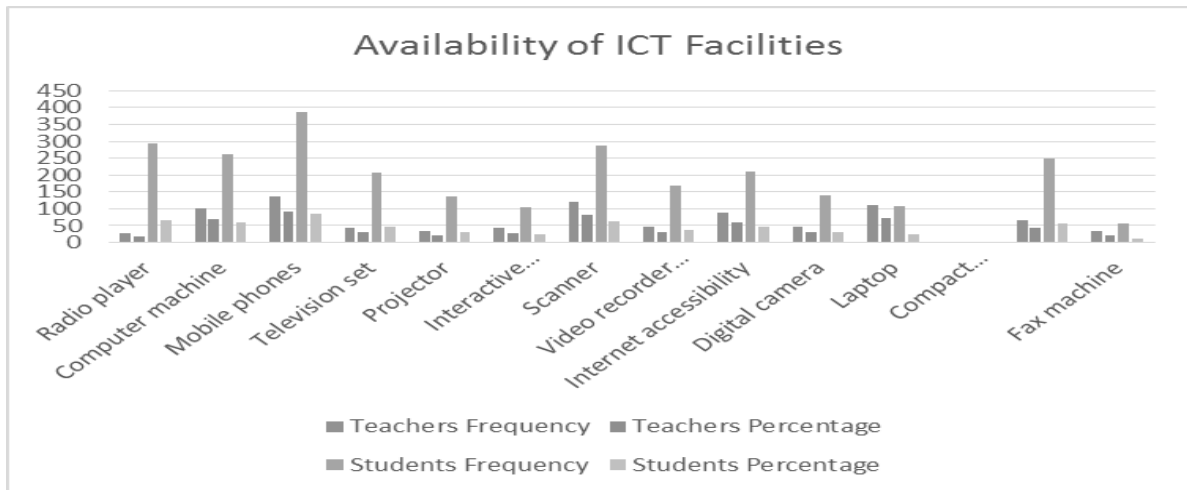
**Research Question 2**

What is the extent of utilisation of ICT facilities by teachers and students in public high schools in the Eastern Cape Province, South Africa?

**Table 1** Availability of ICTs in schools

S/N	Available ICT facilities	Teachers		Students	
		Frequency	Percentage	Frequency	Percentage
1.	Radio player	028	18.67	293	65.11
2.	Computer machine	102	68.00	263	58.44
3.	Mobile phones	136	90.67	387	86.00
4.	Television set	045	30.00	206	45.78
5.	Projector	033	22.00	135	30.00
6.	Interactive whiteboard	043	28.67	106	23.56
7.	Scanner	121	80.67	288	64.00
8.	Video recorder machine	048	32.00	170	37.78
9.	Internet accessibility	088	58.67	209	46.45
10.	Digital camera	046	30.67	140	31.11
11.	Laptop	111	74.00	107	23.78
12.	Compact Disc (CD)/Digital Versatile Disc (DVD) player	067	44.67	248	55.11
13.	Fax machine	034	22.67	056	12.44

Note. Source: Fieldwork February 2017.

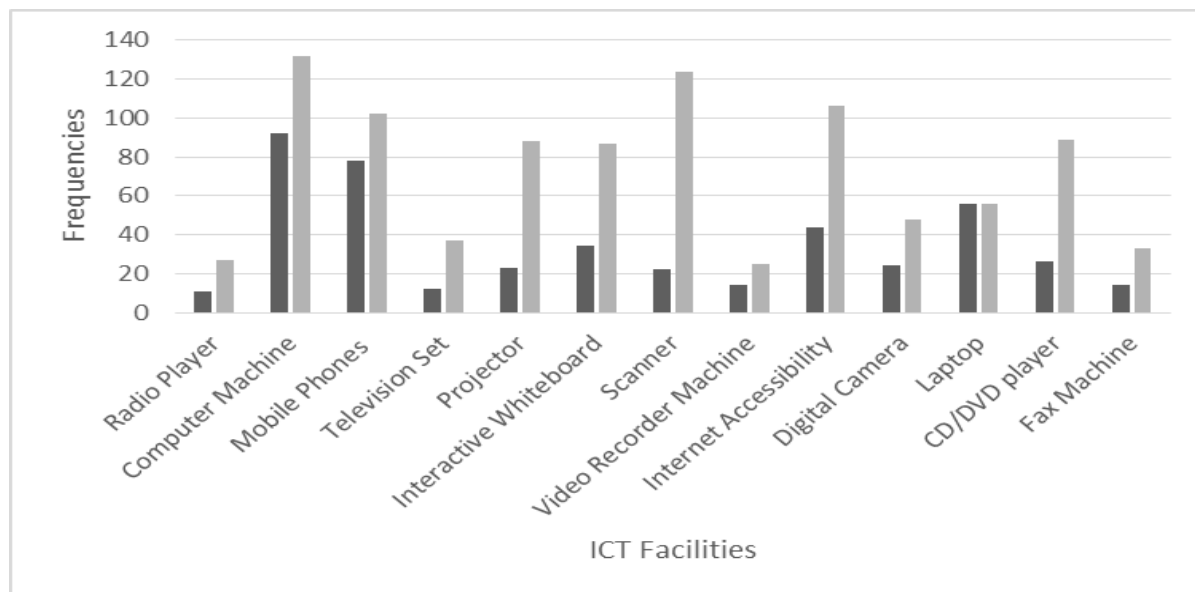


**Figure 1** Bar chart showing the availability of ICTs in schools for teaching and learning. Source: Fieldwork 2017.

**Table 2** Utilisation of ICTs in schools for teaching and learning

S/N	Available ICT facilities	Teachers		Students	
		Frequency	Percentage	Frequency	Percentage
1.	Radio player	011	7.33	027	6.00
2.	Computer machine	092	61.33	132	29.33
3.	Mobile phones	078	52.00	102	22.67
4.	Television set	012	8.00	037	8.22
5.	Projector	023	15.33	088	19.56
6.	Interactive whiteboard	034	22.67	087	19.33
7.	Scanner	022	14.67	124	27.56
8.	Video recorder machine	014	9.33	025	5.56
9.	Internet accessibility	044	29.33	106	23.56
10.	Digital camera	024	16.00	048	10.67
11.	Laptop	056	37.33	056	12.44
12.	CD/DVD player	026	17.33	089	19.78
13.	Fax machine	014	9.33	033	7.33

Note. Source: Fieldwork February 2017.



**Figure 2** Bar chart showing the utilisation of ICTs in schools for teaching and learning. Source: Fieldwork February 2017.

Table 2 above shows the utilisation of ICTs by teachers and students in schools since the availability is not the same as the utilisation. The results revealed that the teachers utilised only computer and mobile phones higher than other ICT facilities in school for teaching and learning with 61.33 percent and 52 percent, respectively, whereas students in their own submission gave 29.33 percent and 22.67 percent, respectively, for the same facilities (see Figure 2). The computer was the facility with the highest percentage of 29.33, as recorded by the students, followed by internet facility with 23.56 percent. The result also revealed that laptop, internet accessibility, and interactive whiteboard recorded a closer percentage of utilisation by the teachers with 37.33 percent, 29.33 percent, and 22.67 percent, respectively; whereas the results given by the students on the same facilities varies accordingly with 12.44 percent, 23.56 percent, and 19.33 percent, respectively (see Figure 2). It was also observed from the results that four ICT facilities, namely radio player, television set, video recorder and fax machine recorded below 10 percent utilisation by both the teachers and students for teaching and learning in schools.

### Research Question 3

What are the factors influencing the effectiveness of the use of ICTs for Teaching and Learning in High schools in Eastern Cape, South Africa?

Table 3 shows that teachers' opinion on the factors are influencing the effectiveness of ICTs' usage for teaching and learning. Two out of the fifteen items indicated that more than half of the teachers strongly agreed with the item raised by the researcher. That is, 58.67 percent strongly agreed

that ICTs enhance teachers' administration and management skills, while 50.67 percent also strongly agreed that ICTs will help teachers to acquire suitable knowledge. One of the items, which stated that ICTs help teachers to gather additional support for content, has a very close range between the numbers of respondents that strongly agreed and agreed with 37.33 percent and 31.33 percent, respectively. Moreover, the respondents revealed the highest percentage in 10 out of the 15 items raised by the researchers as follows: ICTs promote quality teaching (54 percent); ICTs enable teachers to prepare systematic lesson plan (38.67 percent); ICTs' usage aids teachers' assessment and evaluation (43.33 percent); ICTs enhance effective change and development (52 percent); ICTs increase the rate at which teachers gain idea and knowledge (44.67 percent); ICTs promote opportunity for group teaching (38 percent); ICTs' usage reducing menace of examination malpractices (56.67 percent); ICTs help teacher to provide quality teaching materials (46 percent); ICTs' usage broadens the knowledge of the teacher (59.33 percent); and ICTs enable the teacher to focus on mastery of subject matter (67.33 percent).

Another notable fact revealed by this result was that only two items show the highest percentage of disagreement by the respondents. Fifty-six percent of the respondents either disagreed or strongly disagreed that ICTs provide adequate opportunity for the teacher to retrieve information on students' records, also 54.66 percent objected that ICTs promote the honour and dignity of the teaching profession.

#### Research Question 4

What are the challenges facing the effectiveness of utilisation of ICTs by high schools' teachers in the Eastern Cape Province, South Africa?

The results indicated in Table 4 show the challenges facing the effectiveness of teaching and learning in high schools as observed by the teachers. It was revealed that the respondents totally agreed with 13 out of 15 items raised. This is a clear indication that the effectiveness of utilisation of ICTs by the high schools' teachers in South Africa faces numerous problems. Most of this response in terms of agreements of the respondents combining the percentage of strongly agreed (SA) and agreed (A) indicated more than 70 percent ranging from lack of enough teachers with adequate knowledge of ICTs (30.67 and 50.67 percent); inappropriate management support (12.67

and 68 percent); inadequate network connectivity (22.67 and 58 percent); high cost of acquiring ICT facilities (25.33 and 52.67 percent); large class or overpopulation (32.67 and 45.33 percent); lack of adequate policy by the government (34.67 and 42 percent); lack of funding of ICT programmes (18 and 59.33 percent); failure of the government to provide incentives (24 and 51.33 percent); lack of proper training (17.33 and 54 percent); lack of reinforcement (22.67 and 48 percent) and inadequate knowledge of skills (15.33 and 52 percent). Only two of the items recorded the highest percentage in form of strongly disagreed (SD) and disagreed (D), namely insufficient availability of software (45.33 and 32 percent) and inappropriate course content for the use of ICTs (45.33 and 22 percent), respectively.

**Table 3** Response of teachers regarding the factors influencing the effectiveness of the use of ICTs for teaching and learning in high schools

SN	Factors	SA	A	D	SD
1.	ICTs enhance teachers' administration and management skills.	88 (58.67%)	43 (28.67%)	14 (9.33%)	05 (3.33%)
2.	ICTs help teachers to acquire suitable knowledge and innovation for teaching.	76 (50.67%)	39 (26.00%)	28 (18.67%)	07 (4.67%)
3.	ICTs promote quality teaching.	46 (30.67%)	81 (54.00%)	13 (8.67%)	10 (6.67%)
4.	ICTs provide adequate opportunity for the teacher to retrieve information on students' records as at when due.	33 (22.00%)	48 (32.00%)	53 (35.33%)	16 (10.67%)
5.	ICTs help the teacher to gather relevant information as additional support for the content of their teaching at one time or the other.	56 (37.33%)	47 (31.33%)	29 (19.33%)	18 (12.00%)
6.	ICTs enable the teacher to prepare systematic and structural lesson plans that aids teaching.	26 (17.33%)	58 (38.67%)	39 (26.00%)	27 (18.00%)
7.	ICTs promote honour and dignity in the teaching profession.	19 (12.67%)	34 (22.67%)	56 (37.33%)	41 (27.33%)
8.	ICTs' usage aids teachers' assessment and evaluation of students' achievement.	46 (30.67%)	65 (43.33%)	23 (15.33%)	16 (10.67%)
9.	ICTs enhance effective changes and development in teaching and learning.	22 (14.67%)	78 (52.00%)	34 (22.67%)	16 (10.67%)
10.	ICTs increase the rate at which teachers gain ideas and knowledge from other colleagues.	19 (12.67%)	67 (44.67%)	43 (28.67%)	21 (14.00%)
11.	ICTs promote opportunity for group teaching and learning and give a teacher the opportunity to perform a supervisory role.	43 (28.67%)	57 (38.00%)	36 (24.00%)	14 (9.33%)
12.	ICTs' usage by the teachers reduces drastically the menace of examination malpractice.	32 (21.33%)	85 (56.67%)	24 (16.00%)	09 (06.00%)
13.	ICTs help the teacher to provide quality teaching material.	48 (32.00%)	69 (46.00%)	18 (12.00%)	15 (1.00%)
14.	ICTs' usage broadens the knowledge of the teacher and gives the students the opportunity to improve on their study habit.	34 (22.67%)	89 (59.33%)	16 (10.67%)	11 (7.33%)
15.	ICTs enable the teachers to focus on the mastery of subject matter.	23 (15.33%)	101 (67.33%)	14 (9.33%)	12 (8.00%)

Note. Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree. Source: Fieldwork February 2017.

**Table 4** Challenges facing the effectiveness of utilisation of ICTs by teachers in high schools in Eastern Cape Province, South Africa

S/N	Items	SA	A	SD	D
1.	The government does not have an adequate policy for the use of ICTs for teaching and learning in high schools.	52 (34.67%)	63 (42.00%)	21 (14.00%)	14 (9.33%)
2.	Inadequate network connectivity.	34 (22.67%)	87 (58.00%)	13 (8.67%)	16 (10.67%)
3.	Inadequate knowledge and skill required for the usage of ICTs in schools.	23 (15.33%)	78 (52.00%)	34 (22.67%)	15 (1.00%)
4.	Inappropriate management support for the teachers' usage of ICTs in teaching.	19 (12.67%)	102 (68.00%)	18 (12.00%)	11 (7.33%)
5.	Insufficient availability of software and materials for ICTs.	11 (7.33%)	23 (15.33%)	68 (45.33%)	48 (32.00%)
6.	Inappropriate course content and instructional programmes for the use of ICTs.	14 (9.33%)	35 (23.33%)	68 (45.33%)	33 (22.00%)
7.	Lack of funding for programmes and ICT related activities.	27 (18.00%)	89 (59.33%)	16 (10.67%)	18 (12.00%)
8.	Lack of enough teachers with adequate knowledge of ICT application.	46 (30.67%)	76 (50.67%)	13 (8.67%)	15 (1.00%)
9.	Lack of proper training for the teachers on the knowledge and usage of ICTs.	26 (17.33%)	81 (54.00%)	29 (19.33%)	14 (9.33%)
10.	The government failed to provide incentives for the teachers on ICTs.	36 (24.00%)	77 (51.33%)	24 (16.00%)	13 (8.67%)
11.	The cost of acquiring the ICT facilities is very high.	38 (25.33%)	79 (52.67%)	22 (14.67%)	11 (7.33%)
12.	The size of the classroom and the ability of the teacher to manage a larger population.	49 (32.67%)	68 (45.33%)	19 (12.67%)	14 (9.33%)
13.	Lack of reinforcement for the prospective teachers as regards the use of ICTs in their teaching process.	34 (22.67%)	72 (48.00%)	28 (18.67%)	16 (10.67%)
14.	Inappropriate maintenance affects the lifespan of ICT facilities.	21 (14.00%)	92 (61.33%)	21 (14.00%)	16 (10.67%)

Note. Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree. Source: Fieldwork February 2017.

### Conclusion and Discussion

ICTs promote teaching and learning and most of the facilities available in Eastern Cape high schools are not really being utilised by the teachers and the students for the purpose expected. Previous research by McClelland (2001) revealed that when e-learning infrastructure is used for teaching and learning, lecturers will be able to provide constant educational support in the classroom. Also, students will communicate effectively with other classmates and lecturers, in addition, surf through the websites and view course material at their convenient time and location. Therefore, it was observed in this study that the majority of these ICTs are in one way or the other available although according to Pelgrum (2001); Williams (2005); Wilson, Notar and Yunker (2003), they identified some factors like infrastructure, school culture and staff support as a boost to effectiveness of the use of ICTs, where this study established that the provision of those infrastructures was available in most South African high schools.

The finding of this study also supports the statement of Roberts (2000) who viewed that the use of ICTs gives enhancement to teaching and learning. It is also in agreement with Haddad and Draxler (2002), who revealed that the use of ICTs makes teaching more effective and also contributes to the development of the educational process through learning expansion. This finding also

agrees with Maclakemenjima (2005), who noted that in a complex society like Nigeria or any other country on the Africa continent, many factors affect the use and integration of ICTs. Moreover, Darling (2002) advocated that e-learning could be considered as a valuable strategic educational and business tool, that when utilised in a proper way will improve the modernisation of education. Internationally, submissions have been made on some significant studies relating to the effectiveness of ICTs in different form and degree of integration by various associations and organisations. RE Anderson (2002) and Tondeur, Valcke and Van Braak (2008) observed that the level of teachers' use of ICTs is relatively very low across the Africa nation compared to other developed nations (Law, Pelgrum & Plomp, 2008; Pelgrum, 2001). This revealed the need to identify those variables related to ICT integration in schools (Ringstaff & Kelley, 2002; Tearle, 2003; Wikipedia, 2018a). The contributions of some of these studies give rise to the integration processes of ICTs internally and externally (Davis, Preston & Sahin, 2009; Ertmer, 2005; Law, Chow & Yuen, 2005; Nachmias, Mioduser, Cohen, Tubin & Forkosh-Baruch, 2004; Tearle, 2003). The discoveries of ICTs and its relationship to teaching and learning is still very new to some teachers, where they are trying to understand properly the possibilities that ICT offers to students as a means



of complementing their traditional receiver role with that of a message producer-transmitter for effectiveness in teaching and learning with the use of ICT (Cuban, Kirkpatrick & Peck, 2001; Drent & Meelissen, 2008).

#### Recommendations

It is strongly recommended that the government of South Africa plays an active role in raising the effectiveness of the use of ICTs in high schools by both the teachers and students. Therefore, the following recommendations are germane. They are as follows: the Government of South Africa should increase the fund being budgeted for the implementation of ICT in high school. Also, necessary action should be taken for effective monitoring and evaluation in all the provinces through the Directorate of Education to ensure adequate and effective usage of ICTs in high schools. Moreover, there is a need for regular seminars and conferences on ICT for both teachers and students, which will expose them to the relevance of the pedagogy relating to the use of ICTs for teaching and learning. The government of South Africa should ensure uninterrupted internet connectivity in all the high schools across the nation. The management of the school should be monitored to give their support and encourage the effectiveness of the use of ICTs in their domain. There should be the provision of all necessary ICT facilities in schools, and teachers ought to be encouraged accordingly, for proper use of the ICTs to make their teaching effective. Finally, the proper maintenance of all the infrastructures relating to the usage of ICT ought to be provided so as to prevent any hindrance to the effectiveness of teaching and learning in schools.

#### Ethical Considerations

Welman, Kruger, Mitchell and Huysamen (2005:182) explain that ethical considerations and ethical behaviour are as important in research as they are in any other field of human activity. As such, ethical considerations were included in the cover letter to inform the participants that participation was voluntary, and that they had the right to withdraw at any time. They were also informed that there was no harm or risk in participating in the study as it would not result in physical or mental discomfort or any form of injury. They were also informed that their anonymity would be guaranteed, as the names would not be revealed in the coding of the questionnaire.

#### Acknowledgement

We wish to sincerely appreciate the support and cooperation of the Directorate of Education in Eastern Cape for their supply of all the necessary information that helps us in the carrying out of this study. Also, our thanks go to the experts in the

faculty of Education, University of Fort Hare that helped us to critically examine the instrument, and makes it a better one. Furthermore, we also acknowledge the patience and time of the respondents in filling out the questionnaire appropriately.

Similarly, we acknowledge the language editor and the statistical consultant for a job well done. Above all, we thank God Almighty for the completion of this study.

#### Note

i. Published under a Creative Commons Attribution Licence.

#### References

- Achimugu P, Oluwagbemi O & Oluwaranti A 2010. An evaluation of the impact of ICT diffusion in Nigeria's higher educational institutions. *Journal of Information Technology Impact*, 10(1):25–34. Available at [https://www.researchgate.net/profile/Philip\\_Achimugu/publication/267250476\\_An\\_Evaluation\\_of\\_the\\_Impact\\_of\\_ICT\\_Diffusion\\_in\\_Nigeria's\\_Higher\\_Educational\\_Institutions/links/5465695d0cf2f5eb17ff3a89/An-Evaluation-of-the-Impact-of-ICT-Diffusion-in-Nigerias-Higher-Educational-Institutions.pdf](https://www.researchgate.net/profile/Philip_Achimugu/publication/267250476_An_Evaluation_of_the_Impact_of_ICT_Diffusion_in_Nigeria's_Higher_Educational_Institutions/links/5465695d0cf2f5eb17ff3a89/An-Evaluation-of-the-Impact-of-ICT-Diffusion-in-Nigerias-Higher-Educational-Institutions.pdf). Accessed 22 September 2018.
- Ajisafe OE 2014. Fostering utilization of information and communication technology (ICT) skills among students of business education. *Journal of Association of Business Educators of Nigeria*, 1:171–174.
- Ali G, Haolader FA & Muhammad K 2013. The role of ICT to make teaching-learning effective in higher institutions of learning in Uganda. *International Journal of Innovative Research in Science, Engineering and Technology*, 2(8):4061–4073. Available at [https://s3.amazonaws.com/academia.edu/document/s/32051793/The\\_Role\\_of\\_ICT\\_to\\_Make\\_Teaching\\_Learning\\_Effective\\_in\\_Higher\\_Institutions\\_of\\_Learning\\_in\\_Ugand.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1537613850&Signature=WtAzmkMxdxoGEKOEUFirJsADv%2FE%3D&response-content-disposition=inline%3B%20filename%3DThe\\_Role\\_of\\_ICT\\_to\\_Make\\_Teaching-Learnin.pdf](https://s3.amazonaws.com/academia.edu/document/s/32051793/The_Role_of_ICT_to_Make_Teaching_Learning_Effective_in_Higher_Institutions_of_Learning_in_Ugand.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1537613850&Signature=WtAzmkMxdxoGEKOEUFirJsADv%2FE%3D&response-content-disposition=inline%3B%20filename%3DThe_Role_of_ICT_to_Make_Teaching-Learnin.pdf). Accessed 22 September 2018.
- Anderson J 2005. IT, e-learning and teacher development. *International Education Journal*, 5(5):1–14. Available at <https://files.eric.ed.gov/fulltext/EJ903883.pdf>. Accessed 22 September 2018.
- Anderson RE 2002. Guest editorial: International studies on innovative uses of ICT in schools. *Journal of Computer Assisted Learning*, 18(4):381–386. <https://doi.org/10.1046/j.0266-4909.2001.00175.x> -il
- Bottino RM 2003. ICT, national policies, and impact on schools and teachers' development. In A McDougall, JS Murnane, C Stacey & C Dowling (eds). *Proceedings of the 3.1 and 3.3 working groups conference on International federation for information processing: ICT and the teacher of the*

- future* (Vol. 23). Melbourne, Australia: Australian Computer Society.
- Cohen L, Manion L & Morrison K 2007. *Research methods in education*. Oxon, England: Routledge.
- 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. <https://doi.org/10.3102/2F00028312038004813>
- Darling L 2002. Your e-learning strategy: Make sure it's learning for results. *Training*, 39(3):2–3.
- Davis N, Preston C & Sahin I 2009. ICT teacher training: Evidence for multilevel evaluation from a national initiative. *British Journal of Educational Technology*, 40(1):135–148. <https://doi.org/10.1111/j.1467-8535.2007.00808.x>
- Department of Education (DoE) 2003. *Draft white paper on e-Education: Transforming learning and teaching through ICT*. Pretoria, South Africa: Government Printer. Available at <https://www.westerncape.gov.za/text/2004/11/e-education.pdf>. Accessed 2 October 2018.
- Drent M & Meelissen M 2008. Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education*, 51(1):187–199. <https://doi.org/10.1016/j.compedu.2007.05.001>
- Edozie CG, Olibie EI & Aghu NN 2010. Evaluating university student's awareness of information and communication technology. Empowerment in South-East zone of Nigeria for entrepreneurship development. *Unizik Orient Journal of Education*, 5(2):31–40.
- Ertmer PA 2005. Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4):25–39. <https://doi.org/10.1007/BF02504683>
- Gulbahar Y & Guven I 2008. A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Educational Technology & Society*, 11(3):37–51. Available at [https://www.jstor.org/stable/pdf/jeductechsoci.11.3.37.pdf?casa\\_token=odpiFV4ZpQcAAAAA:3YEFdxu35M3DGN1ocb7Dw70GC8ex7iRDWarEe\\_Ptm1VpC2UqDUtjF1zDfERc64XQclSkJMiOduLckI-dUpN1eOfO8gbKz6KSKxdnqMpBSnO8LZW4iA](https://www.jstor.org/stable/pdf/jeductechsoci.11.3.37.pdf?casa_token=odpiFV4ZpQcAAAAA:3YEFdxu35M3DGN1ocb7Dw70GC8ex7iRDWarEe_Ptm1VpC2UqDUtjF1zDfERc64XQclSkJMiOduLckI-dUpN1eOfO8gbKz6KSKxdnqMpBSnO8LZW4iA). Accessed 18 September 2018.
- Haddad WD & Draxler A 2002. The dynamics of technologies for education. In WD Haddad & A Draxler (eds). *Technologies for education: Potentials, parameters, and prospects*. Washington, DC: Academy for Educational Development (AED). Available at [https://www.researchgate.net/profile/Gudmund\\_Hernes/publication/44828882\\_Emerging\\_trends\\_in ICT\\_and\\_challenges\\_to\\_educational\\_planning/links/54415fee0cf2a76a3cc7e389.pdf#page=12](https://www.researchgate.net/profile/Gudmund_Hernes/publication/44828882_Emerging_trends_in ICT_and_challenges_to_educational_planning/links/54415fee0cf2a76a3cc7e389.pdf#page=12). Accessed 5 January 2017.
- Hennessy S, Harrison D & Wamakote L 2010. Teacher factors influencing classroom use of ICT in sub-Saharan Africa. *Itupale Online Journal of African Studies*, 2:39–54. Available at [https://s3.amazonaws.com/academia.edu.document/s/40256907/Teacher\\_factors\\_influencing\\_classroom\\_us20151122-25582-1gvusha.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1537267174&Signature=xQb%2FT7KSTv%2FYE6RhOvBkV0h%2FleQ%3D&response-content-disposition=inline%3B%20filename%3DTeacher\\_Factors\\_Influencing\\_Classroom\\_Us.pdf](https://s3.amazonaws.com/academia.edu.document/s/40256907/Teacher_factors_influencing_classroom_us20151122-25582-1gvusha.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1537267174&Signature=xQb%2FT7KSTv%2FYE6RhOvBkV0h%2FleQ%3D&response-content-disposition=inline%3B%20filename%3DTeacher_Factors_Influencing_Classroom_Us.pdf). Accessed 18 September 2018.
- Isaacs S 2007. *Survey of ICT and education in Africa: South Africa country report*. Washington, DC: World Bank. Available at <https://openknowledge.worldbank.org/bitstream/handle/10986/10659/463640BRI0Box31ca010ICTed0Survey111.pdf?sequence=1&isAllowed=y>. Accessed 17 March 2014.
- Jegade PO & Owolabi AJ 2008. Computer education in Nigerian high schools: Gaps between policy and practice. *Meridian: A Middle School Computer Technologies Journal*, 6(2):1–11. Available at <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.488.645&rep=rep1&type=pdf>. Accessed 16 September 2018.
- Kritzinger E & Padayachee K 2010. *Teaching safe and secure usage of ICTs in South African schools*. Available at <http://osprey.unisa.ac.za/TechnicalReports/TR-UNISA-2010-01.pdf>. Accessed 3 May 2011.
- Law N, Chow A & Yuen AHK 2005. Methodological approaches to comparing pedagogical innovations using technology. *Education and Information Technologies*, 10(1–2):7–20. <https://doi.org/10.1007/s10639-005-6744-7>
- Law N, Pelgrum WJ & Plomp T 2008. *Pedagogy and ICT use in schools around the world: Findings from the IEA sites 2006 study*. Hong Kong, China: Comparative Education Research Centre.
- Leedy PD & Ormrod JE 2014. *Practical research: Planning and design* (10th ed). Upper Saddle River, NJ: Pearson Education Limited.
- MacIkemenjima D 2005. *e-Education in Nigeria: Challenges and prospects*. Paper presented at the 8th UN ICT Task Force Meeting, Dublin, 13–15 April.
- Maree K (ed.) 2007. *First steps in research*. Pretoria, South Africa: Van Schaik.
- McClelland RJ 2001. Web-based administrative supports for university students. *International Journal of Educational Management*, 15(6):292–303. <https://doi.org/10.1108/EUM000000005911>
- McMillan JH & Schumacher S 2001. *Research in education: A conceptual introduction* (5th ed). New York, NY: Longman.
- Mdlongwa T 2012. Information and Communication Technology (ICT) as a means of enhancing education in schools in South Africa: Challenges, benefits and recommendations. *POLICYBrief*, 80:1–7. Available at <http://www.ai.org.za/wp-content/uploads/downloads/2012/10/No.-80.-ICTas-a-means-of-enhancing-Education-in-Schools-in-South-Africa.pdf>. Accessed 5 October 2018.
- Nachmias R, Mioduser D, Cohen A, Tubin D & Forkosh-Baruch A 2004. Factors involved in the implementation of pedagogical innovations using technology. *Education and Information Technologies*, 9(3):291–308. <https://doi.org/10.1023/B:EAIT.0000042045.12692.49>

- Nwite O 2007. *Utilization of Information and Communication Technology in schools: Problems and suggestions*. Lagos, Nigeria: NAEAP Publication.
- Obanya P 2002. *Revitalizing education in Africa*. Ibadan, Nigeria: Stirling-Horden.
- Obanya PA 2009. *Dreaming, living and doing education*. Ibadan, Nigeria: Educational Research and Study Group.
- Ogwo BA 2005. *Modern instructional techniques and their applications in Technical Vocation Education (TVE) programmes of polytechnics and monotchnics*. Paper presented at the Capacity Building Workshop for Lecturers of Polytechnics and Monotechnics in Nigeria, Unwana, 3–7 October.
- Olewele CJ & Amaka EU 2011. *Effective utilization of Information and Communication Technology (ICT) for sustainable manpower development among computer educators in colleges of education in the South-East geo-political zone of Nigeria*. Paper presented at the 24th National Association of Technology Teachers (NATT) on Technical Vocational Education and Training (TVET) for Sustainable Industrial Development in Nigeria, Nigeria, 17–21 October. Available at <https://files.eric.ed.gov/fulltext/ED529103.pdf>. Accessed 18 October 2018.
- Pelgrum WJ 2001. Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education*, 37(2):163–178. [https://doi.org/10.1016/S0360-1315\(01\)00045-8](https://doi.org/10.1016/S0360-1315(01)00045-8)
- Ringstaff C & Kelley L 2002. *The learning return on our educational technology investment: A review of findings from research*. San Francisco, CA: WestEd RTEC. Available at [https://www.wested.org/online\\_pubs/learning\\_return.pdf](https://www.wested.org/online_pubs/learning_return.pdf). Accessed 18 October 2018.
- Roberts L 2000. *The role of technology in the classroom*.
- Schiller J & Tillett B 2004. Using digital images with young children: Challenges of integration. *Early Child Development and Care*, 174(4):401–414. <https://doi.org/10.1080/030044303200015344>
- Tearle P 2003. ICT implementation: What makes the difference? *British Journal of Educational Technology*, 34(5):567–583. <https://doi.org/10.1046/j.0007-1013.2003.00351.x>
- Tondeur J, Valcke M & Van Braak J 2008. A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *Journal of Computer Assisted Learning*, 24(6):494–506. <https://doi.org/10.1111/j.1365-2729.2008.00285.x>
- Umunadi EK 2011. Perception of technical education students on the role of ICT in general studies programme (GSP) in university education. *International Journal of Academic Research in Business and Social Sciences*, 1(3):190–206. Available at <http://www.hrmars.com/admin/pics/378.pdf>. Accessed 12 September 2018.
- Welman JC, Kruger F, Mitchell B & Huysamen GK 2005. *Research methodology* (3rd ed). Cape Town, South Africa: Oxford University Press.
- Wikipedia 2018a. *Becta*. Available at <https://en.wikipedia.org/wiki/BECTA>. Accessed 1 November 2018.
- Wikipedia 2018b. *UNESCO*. Available at <https://en.wikipedia.org/wiki/UNESCO>. Accessed 2 November 2018.
- Wikipedia 2018c. *World Bank*. Available at [https://en.wikipedia.org/wiki/World\\_Bank](https://en.wikipedia.org/wiki/World_Bank). Accessed 2 November 2018.
- Williams P 2005. Lessons from the future: ICT scenarios and the education of teachers. *Journal of Education for Teaching*, 31(4):319–339. <https://doi.org/10.1080/02607470500280209>
- Wilson JD, Notar CC & Yunker B 2003. Elementary in-service teacher's use of computers in the elementary classroom. *Journal of Instructional Psychology*, 30(4):256–264.
- Wrench JS, Thomas-Maddox C, Richmond VP & McCroskey JC 2013. *Quantitative research methods for communication: A hands-on approach*. New York, NY: Oxford University Press.
- Yusuf MO 2005. Information and communication technology and education: Analyzing the Nigerian national policy for information technology. *International Education Journal*, 6(3):316–321. Available at <https://files.eric.ed.gov/fulltext/EJ854985.pdf>. Accessed 10 September 2018.