A Study on the Current Status of Information and Communication Technology Use in Selected Schools in South Africa

Siphiwe Radebe

Department of Humanities, Faculty of Science, Tshwane University of Technology, Pretoria, South Africa

s.matips@gmail.com

Sylvia Ramaligela

Department of Humanities, Faculty of Education, University of Limpopo, Polokwane, South Africa

Sylvia.ramaligela@ul.ac.za

Moses Makgato

Department of Humanities, Faculty of Science, Tshwane University of Technology, Pretoria, South Africa

makgatom@tut.ac.za

Abstract

The objective of this study was to examine the current status of Information and Communication Technology (ICT) use in selected schools in South Africa, with the focus on identifying the variables that might significantly influence educators to integrate ICT into their teaching in the classroom. These schools were provided with ICT by the Department on Education in 2008. Additionally, these schools were the first to have been allocated these tools. The sample consisted of 40 educators from secondary schools. Information was gathered through questionnaires. Data gathered were analysed using mean and standard deviation. The study used Rogers' Diffusion of Innovations Theory with three level that were used to characterise educator ICT competencies in terms of technical and pedagogical skills.

Keywords: Educators, ICT, Innovation, Integration, Variables.

DOI Number: 10.14704/nq.2022.20.9.NQ440106 **Neuro Quantology 2022; 20(9):948-956**

Introduction

Schools in South Africa have faced numerous challenges since the introduction of Information and Communication Technology (ICT) by the Department of Education, with the main challenge being the implementation of ICT in teaching and learning. One way in which this challenge could be overcome would be for the South African government to work towards meeting the international standards of education in technology and to produce a workforce that will meet the demands of the 4th industrial revolution. An education initiative to meet these demands was outlined in section 2.23 of the White Paper on e-Education, Education White Paper 7 (Department of Basic Education (DBE), 2004), stipulated as a goal that every educator and learner ought to be ICT capable by 2013. In line with this as an ongoing goal, the Department of Basic Education has advised educators to develop learners with 'relevant modern skills that match the needs of our changing world' (DBE, 2016).

Learners should be able to 'access, analyse, evaluate, integrate, present and communicate information; create knowledge and new information by adapting, applying, designing, inventing and function efficiently in a knowledge society by using appropriate ICT skills' (DBE, 2007). This will allow the country to enter and compete in the globalized information society. Despite efforts by the South African government, such as those outlined above, it is apparent that ICT tools are not being used at all or are not being used optimally in South African schools (Mooketsi & Chigona, 2014; Ndlovu & Lawrence, 2012; Makgato, 2012), with many studies considering educators' attitudes towards ICT use

in teaching and learning to be the driving force behind their ICT-use behavior in the classroom. With this in mind, this study investigated the current status of ICT use in selected schools in South Africa. Rogers' Diffusion of Innovations Theory was used as the theoretical framework to guide the exploration of educator ICT competence and skills in this study. This theory is outlined in the literature review that follows, which also provides an exploration of local research on educators' competence and skills and their effect on the integration of ICT in the classroom.

Problem statement

The lack of skills in the integration of ICT into teaching has been a serious problem facing educators over recent decades in Johannesburg Central, District 14 schools. In this district, the usage of ICT is marginal regardless of the availability of ICT tools such as smartboards from the Gauteng Department of Education. The ideal scenario would be to have educators who have the required skills for accessing ICT tools, along with a high level of the competencies required to use ICT for teaching and learning as educators need to be able to carry out a substantial part of their duties using ICT. The role of educators is to promote the use of ICT in teaching and learning, inside and outside the classroom. If the marginal use of ICT by teachers in these schools is left unattended, educators' lack of ICT competence and skills will produce learners that are unable to navigate a multifaceted digital landscape and therefore not able to take part fully in trade and industry, or the social and cultural life around them. Furthermore, these learners will lack knowledge in various areas that demand intellectual analysis and critical thinking later on in life.

Purpose of the study

The success of learners that learn with ICT depends largely on the educators' skills., Educators' skills in the use of ICT are a very important factor in the integration of ICT into learning in the classroom and are a major predictor for future ICT use in the classroom. With this in mind, the major purpose of this study was to examine the current status of ICT use in selected schools in South Africa. In particular, the following research question was addressed:

- What are the skills that educators have to successfully integrate ICT into their teaching?

Rogers' Diffusion of Innovation Theory

In an attempt to understand how educators, adapt their skills to technological innovation, the Diffusion of Innovations Theory put forward by Rogers (2003) guided the study. The diffusion of innovations, according to Rogers (2003), occurs through a five-step process. The stages through which a technological innovation passes in the process of adoption are: Knowledge, Persuasion, Decision, and Implementation. In this study we focused particularly on the implementation stage because this stage concerns how educators' competence influences the integration of ICT into their teaching and learning. This meant that for this study, the implementation stage concerned whether or not teachers' competence influenced the integration or use of ICT in schools well enough to contribute to learners' learning.

In order to understand the levels of influence, the study embraced three levels of adoption as put forward by Rogers. Although Rogers used four levels of adoption, this study found only three levels to be relevant: laggards, majority and venturesome. In this study these levels are explained as set out in Table 1.

Table 1: Three levels of adoption in the implementation stage

Implementation stage	Laggards	These are educators who are not interested in using or implementing ICT tools in teaching and learning
	Late adopters	These are educators who take time to implement or integrate ICT tools into their teaching
	Venturesome	These are educators who in a way

		implement or integrate ICT continuously in their teaching, keeping records, tracking their learners' progress etc.

Teachers as facilitators of change in the use of ICT

Teachers are the facilitators of change in education through the operational and efficient implementation of ICTs in the learning situation (Ndlovu & Lawrence, 2012; Doyle & Reading, 2012; Mwalongo, 2011; Cavas, Cavas, Karaoglan & Kisla, 2009). As they are academically qualified, teachers are expected to consider ICT practice to be an integral part of teaching and to devote particular effort to developing competencies in their learners, such as creativity, decision-making, problem-solving, collaboration and life-long learning, attributes that are consistent with the practices of the knowledge society (Levinsen, 2011. The same sentiment is expressed by Gulbahar and Guven (2008) when recommending that teachers embed ICT in significant learning in order to prepare learners for real life in a world determined by technology and characterised by diversity.

The lack of adequate training and experience is one of the main reasons why teachers do not use technology in their teaching. This also results in teachers' negative attitudes towards computers and technology. In addition, lack of confidence leads to a reluctance to use computers by teachers (Kumar & Kumar, 2003). According to Nash (2009), the most important ICT training should include skills development to assist ICT teaching and learning approaches for subject-specific areas of specialization; maintenance training; and research-oriented training on ICT use for data analysis – numerical data; spread sheets; and programs. The use and implementation of ICT in schools have previously been investigated, but few investigations have focused on the current status of ICT use in selected schools in South Africa since its introduction. This is one of the main contributions that the study makes to the scientific field. Instead, previous studies focus on the lack of teacher confidence and resistance to change (Chigona, Chigona, & Davids, 2014; Mdlongwa, 2012) and not, for example, on the number of innovations and research projects in which they collaborate, type of education that they employ, and type of school (whether public or private) in which they work, among other things. The field of study was broadened in this study to include factors such as expertise and aptitude, since including these factors gave the present study a more solid base, with the study aiming to predict factors that might significantly influence the use of ICT.

Methodology

The study employed a quantitative research methodology. Quantitative research is the systematic empirical investigation of observable phenomena via statistical, mathematical, or computational techniques (Lisa, 2008). Polit and Hungler (1999) refer to a population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. The population of this study comprised educators in secondary schools in Johannesburg Central, District 14. The records of the District Office (D14) (2018) show the total number of secondary schools to be 11, with 401 educators, where 173 (33% are male educators and 228 67% are female educators. The study used purposive sampling in selecting the schools and the participants for inclusion in this study. Babbie (2010) defines purposive sampling as a form of nonprobability sampling in which units to be observed are selected on the basis of the researcher's judgment about which ones are the most useful or representative. Sampling is a technique used in eliciting data from the representative group from a larger population. The main reason for sampling is to collect specific data that will explore depth and understanding of the study (Neuman 2011). The study took the form of a case study. For this reason, the sample in this study consisted of 40 educators as this would allow the researchers to gain an in-depth understanding of the topic.

'Data' is defined as information obtained in the course of a study (Polit & Hungler, 1999). The study collected data in Johannesburg Central, District 14, in the city of Johannesburg in South Africa. Data was collected via a structured questionnaire. The questionnaire was distributed to the respondents, with the criterion that they

had a teaching background. The completed questionnaires were gathered and collected for further data analysis to arrive at the output and findings of the study.

Data analysis is described as an activity that involves the synthesis of data in order to come up with conclusions on a research problem (Walliman, 2005). This analysis was also used to determine the mean, standard deviation, frequency and percentage to identify the factors associated with ICT competencies the integration of ICT in their classrooms.

Findings and discussion

In order to examine whether educator skills influence the effective integration of ICT in teaching, this study focused on one particular research question (RQ2) of a larger study. RQ2 investigated whether educators' skills have any significance in successfully integrating ICT into their teaching. The findings of the study are presented according to the questions associated with this research question. In order to understand the educators' skills in the integration of ICT in teaching and learning, the study adopted Rogers' Diffusion of Innovation Theory and the study used the implementation stage as a measuring mode. In order to answer the research question, the respondents were required to answer seven questions in the questionnaire that were grouped according to RQ2. The questionnaire was based on a Likert scale that showed 1 'Strongly Disagree', 2 'Disagree', 3 'Neutral', 4 'Agree' and 5 'Strongly Agree'.

RQ2 What are the skills that educators have to successfully integrate ICT into their teaching?

RQ2 sought to examine whether educators' skills play a role in the integration of ICT into their teaching. This RQ used seven questions: thus, Q1–Q7.

(Q1) Use the World Wide Web to assess different types of information

This question investigated whether the educators could use a search engine to obtain information. Figure 1 below shows their responses.

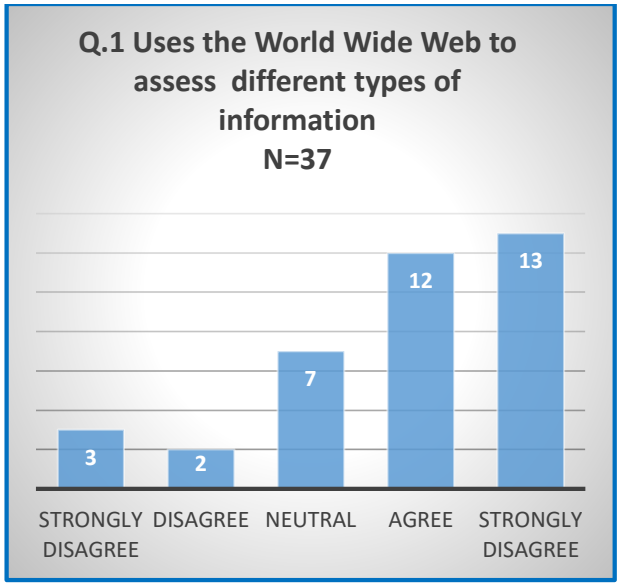

Figure 1: Use of the World Wide Web to assess different types of information

The sample size for this result was n=37 because n=2 of the n=39 participants did not respond to the question. Of the 39 participants, n=3 (7.69%) strongly disagreed that they could use the World Wide Web to assess different types of information, n=2 (5.12%) disagreed, n=7 (17.94%) were neutral, n=12 (30.76%) agreed and n=13 (33.33%) strongly agreed, while n=2 (5.12%) did not respond to the question The findings showed a standard deviation (SD) of 5 (12.10) and a mean (M) of 6.5 (13.84). This suggests that the majority of educators were positive that they could use the World Wide Web to assess different types of information, with 64.09% in total agreeing that they could use the World Wide Web to assess different types of information. Therefore, most of the educators could be considered venturesome, since their responses indicated that they were confident that they can use the World Wide Web competently and with ease as a tool to assist them in their teaching to acquire more information. This finding was in line with Reed's (1996) finding that, as ICT skills improve, there is a commensurate improvement in managing ICT applications and in performance.

(Q2) Solve simple problems in operating computers

This question investigated whether the educators could solve simple problems using ICT tools. Figure 2 below shows their responses.

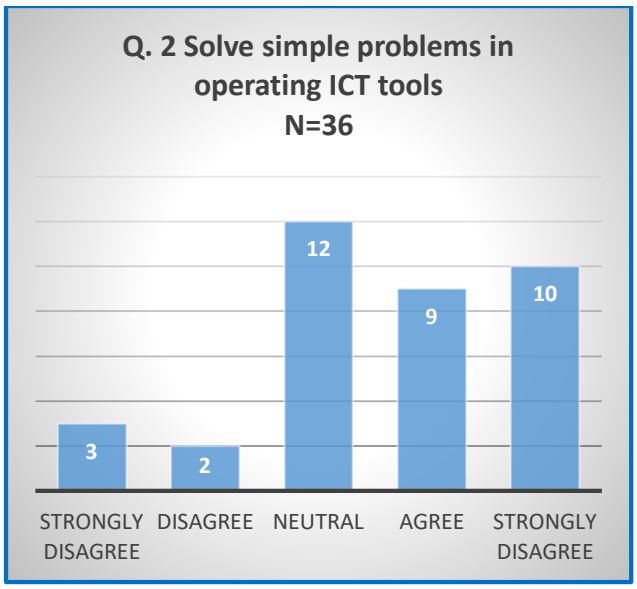

Figure 2: Solving of simple problems in operating ICT tools

The sample size for this result was n=36 because n=3 of the n=39 participants did not respond to the question. Of the 39 participants, n=3 (7.69%) strongly disagreed that they could solve simple problems in operating computers, n=2 (5.12%) disagreed, n=12 (30.76%) were neutral, n=9 (23.07%) agreed and n=10 (25.64%) strongly agreed, while n=3 (7.69%) did not respond to the question. The SD was 4.23 (11.08) and M 6.5 (16.66). This indicates that the majority of educators were positive that they could solve simple problems in operating ICT tools. In total 48.71% agreed that they could solve simple problems in operating these tools. These percentages are positive indicators that the educators had a positive attitude and were willing to implement ICT in their teaching. This makes most of the educators venturesome, since these educators' responses indicated that most were confident that they could solve simple problems in operating computers proficiently and with ease as a tool to assist them in their teaching. This finding was in line with Son et al.'s (2012) finding that positive attitudes toward ICT tools could be important factors in helping educators learn ICT skills and use the tools; with ICT attitudes influenced by ICT knowledge and skills.

(Q3) Use the internet for communication

This question investigated whether the educators could use the internet to communicate, for example by email. Figure 3 below shows their responses.

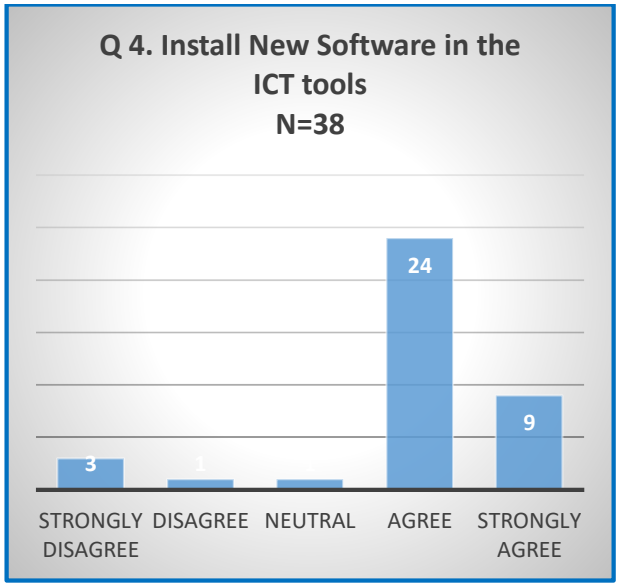

Figure 3: Use of the internet for communication

The sample size for this result was n=39. Of the 39 participants, n=1 (2.56%) strongly disagreed that they could use the internet for communications (e.g., email and chat rooms), n=5 (12.82%) were neutral, n=19 (54.71%) agreed and n=14 (35.89%) strongly agreed. The SD was 8 (21.07) and M 9.75 (24.99). This suggests that the majority of educators were positive that they could use the internet for communications such as email and chat rooms. A total of 90.6% agreed that they used the internet for communications (e.g., email and chat rooms). These percentages are positive indicators that the educators had a positive attitude and were willing to implement ICT in their teaching. This means that most of the educators could be considered venturesome, since these educators could use the internet to communicate with. Their responses also indicated that they were confident that they could use the internet for communications to assist them in their teaching. This finding was in line with Pelgrum's (2001) finding that the success of educational innovations depends largely on the skills and knowledge of educators.

(Q4) Install new software in the computer

This question investigated whether educators could install new software on a computer. Figure 4 below shows their responses.

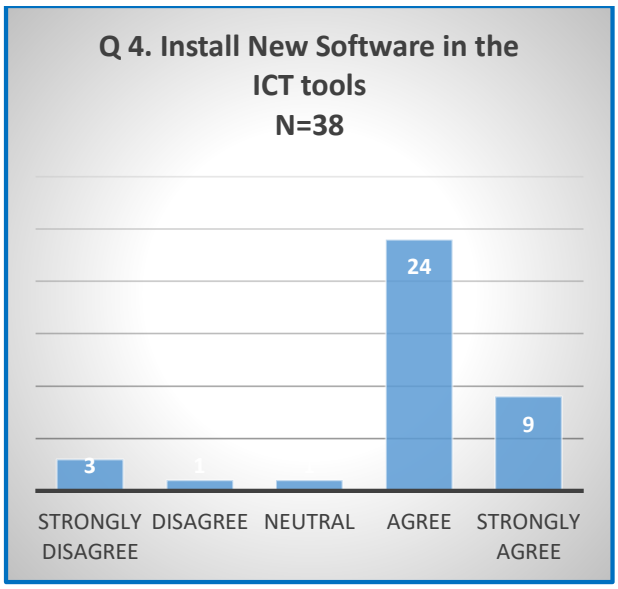

Figure 4: Install new software in the ICT tools

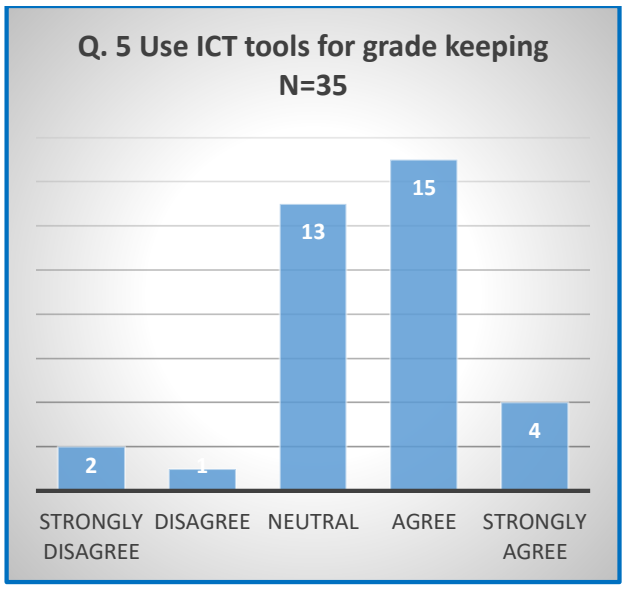

Figure 5: Use of ICT tools for grade keeping

The sample size for this result was n=38 because n=1 of the n=39 participants did not respond to the question. Of the 39 participants, n=3 (7.69%) strongly disagreed that they could install new software in an ICT tool, n=1 (2.56%) disagreed, n=1 (2.56%) were neutral, n=24 (61.53%) agreed and n=9 (23.7%) strongly agreed, while n=1 (2.56%) did not respond to the question. The SD for this result was 9.11 (23.37) and the M 6.5 (16.66). As 84.6% agreed that they could install new software in an ICT tool, this suggests that a large majority of educators were positive that they had this skill. These percentages are positive indicators that the educators had a positive attitude and were willing to implement ICT in their teaching. Therefore, most of the educators could be defined as being at the venturesome level of adoption, since these educators were confident that they could install new software in the ICT competently and with ease as a tool to assist them in their teaching. This finding was in line with the finding of Gaible, Bloome, Schwartz, Hoppes Poché and Vota (2011) that training educators on ICT integration helps to provide them with the competencies and skills necessary to incorporate ICT tools in their respective subjects in the classroom environment.

(Q5) Use computers for grade keeping

This question investigated whether the educators could use ICT tools such as Microsoft Excel for grade keeping. Figure 5 below shows their responses.

The sample size for this result was n=35 because n=4 of the n=39 participants did not respond to the question. Of the 39 participants, n=2 (5.12%) strongly disagreed that they could use ICTs for grade keeping, n=1 (2.56%) disagreed, n=13 (33.33%) were neutral, n=15 (38.46%) agreed and n=4 (10.25%) strongly agreed, while n=4 (10.25%) did not respond to the question. The result showed an SD of 5.95 (15.27) and M of 6.5 (16.66). This implies that the majority of educators were positive that they could use ICT tools for grade keeping, with 71.46% agreeing that they had this skill. These percentages are positive indicators showing that the educators had a positive attitude and were willing to implement ICT in their teaching. Thus, most of the educators could be considered venturesome, since these educators' responses indicated that they were confident that they could use ICTs for grade keeping proficiently and with ease as a tool to assist them in their teaching. This finding was in line with the finding of Becker and Riel (1999) that educators who regularly participate in professional interactions and activities beyond their classroom teach in different ways than educators who have minimal contact with their peers or profession.

(Q6) Select and evaluate educational software

This question investigated whether the educators were competent in evaluating and selecting relevant educational software. Figure 6 below shows their responses.

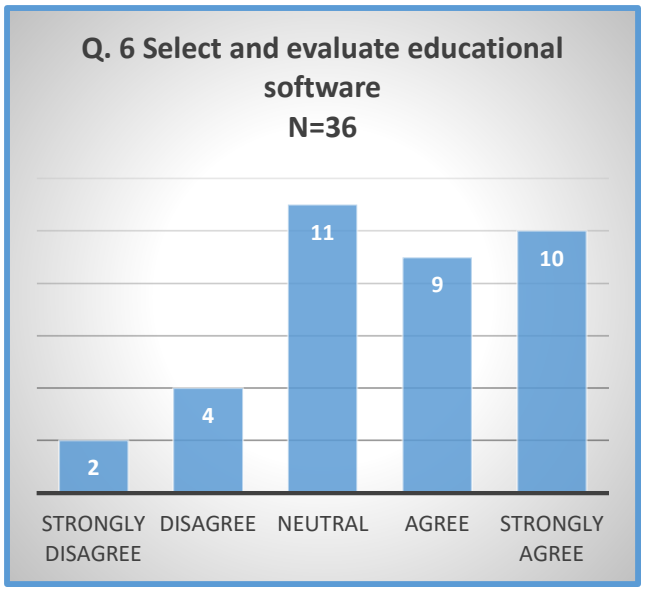

Figure 6: Selecting and evaluating educational software

The sample size for this result was n=36 because n=3 of the n=39 participants did not respond to the question. Of the 39 participants, n=2 (5.12%) strongly disagreed that they were able to select and evaluate educational software, n=4 (10.25%) disagreed, n=11 (28.20%) were neutral, n=9 (23.07%) agreed and n=10 (25.64%) strongly agreed, while n=3 (7.69%) did not respond to the question. The SD for the question was 3.93 (10.09) and the M 6.5 (16.66). This implies that the majority of educators were positive that they could select and evaluate educational software. These percentages are positive indicators showing that educators had a positive attitude and were willing to implement ICT in their teaching. Therefore, most of the educators could be classified as venturesome, since these educators were confident that they could select and evaluate educational software proficiently and with ease as a tool to assist them in their teaching. This finding was in line with Becker and Riel's (1999) finding that those educators extensively involved in professional activities are in a position, with sufficient authority and time, to help other educators move towards being more accomplished users of ICT technology.

(Q7) Remove computer virus

This question investigated whether the educators could use anti-virus software to remove a virus from a computer. Figure 7 below shows their responses.

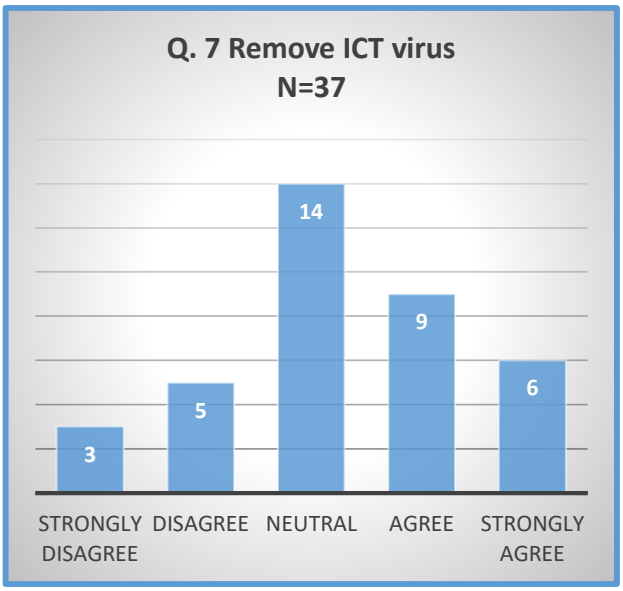

Figure 7: Removing of ICT virus

The sample size for this result was n=38 because n=2 of the n=39 participants did not respond to the question. Of the 39 participants, n=3 (7.69%) strongly disagreed that they could remove an ICT virus, n=5 (12.82%) disagreed, n=14 (35.89%) were neutral, n=9 (23.07%) agreed and n=6 (15.38%) strongly agreed, while n=2 (5.12%) did not respond to the question. The question had an SD of 4.41 (11/32) and M of 6.5 (16.66). This implies that the majority of educators were positive that they could remove an ICT virus, with 38.45% agreeing that they could remove such a virus. These percentages are positive indicators that the educators had a positive attitude and were willing to implement ICT in their teaching. With this in mind, most of the educators could be classified as venturesome, since these educators' responses showed their confidence that they could remove an ICT virus knowledgeably and easily as a tool to assist them in their teaching. This finding was in line with Gaible et al.'s (2011) finding that training educators on ICT integration helps to provide them with the competencies and skills that will enable them to incorporate ICT tools in their respective subjects in the classroom environment.

Conclusion and Recommendations

The study investigated the state of ICT use in selected schools in South Africa. Findings indicated that educators were not using ICT in the classroom this is due to lack of skills and competence.

This study recommends that vigorous training be held for school principals in regard to strategic

planning within the school so as to empower Principals with skills and competence to be able to assist and guide both the School management teams and educators in the implementation of ICT in the classroom. Secondly, there is an urgent need for the Department of Education to revisit its policies and come up with strategies that will be relevant for the 4th industrial revolution and that will encourage educators and principals to use ICT effectively in their teaching and administration respectively.

Technology-based tools are electronic devices that have restructured the world in all aspects of human undertaking and developed a stronghold in the establishment of education for all. Traditional means of transferring knowledge can no longer meet learners' needs in the era of the 4th industrial revolution. As a result, it is crucial that the main element of an education system, its educators, be exposed to educational developments and changes and that they become familiar with the progress made in the 4th industrial revolution.

References

Babbie, E. 2010. *The practice of social research*. London: Wadsworth Cengage Learning.

Becker, H. J. and Riel, M. M. 1999. Teacher professionalism and the emergence of constructivist-compatible pedagogies. University of California, Irvine. *Revised version of a paper presented at the 1999 meetings of the American Educational Research Association* (September 2019). http://www.crito.uci.edu/TLC/findings/special_report2/index.htm.

Cavas, B., Cavas, P, Karaoglan, B. and Kisla, T. 2009. A study on science teachers' attitude towards information and communication technologies in education. *Turkish Online Journal of Educational Technology,* 8(2): 20-32.

Chigona, A., Chigona, W. and Davids, Z. 2014. Educators' motivation on integration of ICTs into pedagogy: case of disadvantaged areas. *South African Journal of Education*, 34(3): 1. (September 2019).

Department of Basic Education, 2016. *Professional Development Framework for Digital learning.* Pretoria: Government Gazette.

Department of Basic Education (DBE). 2004. *White paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies*. Pretoria: Government Printers.

Department of Basic Education (DBE). 2007. *Guidelines for Educator Training and Professional Development in ICT*. Pretoria: Government Printers.

Doyle, H. and Reading, C. 2012. Building teacher educator TRACK *Developing leaders as a catalyst for change in ICT Education.* (September 2019).

Gaible, E., Bloome, T., Schwartz, A., Hoppes Poché, J. and Vota, W. (2011). *First principles: Designing effective education programs using Information and Communication Technology (ICT)* – A compendium. Washington, DC: USAID.

Gulbahar, Y. and Guven, I. 2008. A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Educational Technology and Society*, 11(3): 37-51.

Kumar, P. and Kumar, A. 2003 Effect of a web-based project on preservice and inservice teachers' attitude toward computers and their technology skills, *Journal of Computing in Teacher Education*, 19(3): 87-92.

Levinsen, K. T. 2011. Fluidity in the networked society – self-initiated learning as a digital literacy competence. *The Electronic Journal of e-Learning*, 9(1): 52-62.

Lisa, G. M. 2008. "Qualitative research methods." In: *The Encyclopedia of Educational Psychology*, edited by Neil J. Salkind. Thousand Oaks, CA: Sage Publications, pp. 827-831.

Makgato, M. 2012. Status of educators' use of educational technology: a case of some schools in South African semi-urban locations. *International Proceedings of Economics Development and Research* (IPEDR), 47(23).

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*

South Africa. Policy Brief 80. (September 2019).

Mooketsi, B. E. and Chigona, W. 2014. Different shades of success: Educator perceptions of government strategy on e-education in South Africa. *The Electronic Journal of Information Systems in Developing Countries (EJISDC)*, 64(8).

Mwalongo, A. 2011. Teachers' perceptions about ICT for teaching, professional development, administration and personal use. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 7(3): 36-49.

Ndlovu NS & Lawrence D 2012. The quality of ICT use in South African classroom. Available at http://carnagie3.org.za. Accessed 24 November 2019.

Pelgrum, W. J. 2001. Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education*, 37: 163-178.

Polit, D. and Hungler, B. 1999. *Nursing research: Principle and method* (6th ed.). Philadelphia, PA: Lippincott Company, pp. 416-417.

Reed, W. M. 1996. Accessing the importance of computer-based writing instruction. *Journal of Research on Computing in Education*, 28(4): 418-437.

Rogers, E. M. 2003. *Diffusion of innovations* (5th ed.). New York, NY: The Free Press.

Walliman, N. 2005. *Your research project: A step-by-step guide for the first-time researcher* (2nd ed.). London: Sage Publications.

Nash, J. (2009). Computer skills of first-year students at a South African university. Proceedings of the 2009 Annual Conference of the Southern African Computer Lecturers' Association, Eastern Cape, South Africa (SACLA '09), Mpekweni Beach Resort, South Africa, June 29-July 01, 2009.

Neuman, W. L. (2011). Social research methods: Qualitative and quantitative approaches (7th ed.). Boston: Pearson Education Inc.

Son, J.-B., & Robb, T., & Charismiadji, I. (2011). Computer literacy and competency: a survey of Indonesian teachers of English as a foreign language. CALL-EJ, 12(1), 26–42.