



IMPLEMENTATION AND USE OF ICT IN PUBLIC SECONDARY SCHOOLS, SOUTH AFRICA

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Abstract

Implementation and use of ICT in schools in South Africa face several challenges, embracing teacher's skills. The study examined and described the magnitude of seven pre-determined ICT skills which teachers should have. The study adopted a descriptive survey research design. 40 respondents were sampled through purposive sampling. Questionnaires were appropriately filled and return. Data collected was analyzed by use of descriptive and inferential statistical techniques after which results were presented in tables. Rogers' Diffusion of Innovations Theory was used to characterize educator ICT competencies in terms of technical and pedagogical skills. The study only focussed on one aspect of Roger's theory namely; characteristics of individual adopters, adopters have been determined to have traits that affect their likelihood to adopt an innovation. The study findings established that there was limited competent ICT teachers in Johannesburg district 14. Training should be designed that can enable teachers to acquire ICT skills. Continued professional development of teachers is central to successful implementation of ICT in schools. Generally, teachers had positive attitudes towards adoption and use of ICT in schools.

Keywords: Implementation, Skills, Innovation, ICT, Use.

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Introduction

In South Africa, the integration of ICT in schools has become a major goal for government at national and provincial levels, as well as for all those involved in education. There must therefore be a good reason for this euphoria around the introduction of ICT in schools. Teaching and learning are complex processes requiring multiple tasks, efforts, and flexibility of teachers and learners (Jaarsveldt & Wessels, 2015). According to Stones (1966), teaching refers to knowledge transfer while learning refers to changes that would be taken into

individuals' behavior. The importance of ICT in teaching and learning processes is undoubted because ICT may be looked at as a "mediator ora

bridge" among factors intervening in teaching and learning (Vandeyar, 2015). Teachers play an important role in the teaching and learning process (Alesandrini, 1981). The introduction of ICT in teaching and learning processes has a great impact on teachers as ICT facilitates teachers to share teaching resources (Jaarsveldt & Wessels, 2015), expertise and advice (UNESCO, 2015; Tarus, 2015). ICT tools remove the barrier and allow flexibility in what, how, when and where all teaching and learning activities are conducted (Altınay-Gazi & Altınay-Aksal, 2017). By using ICT, teachers' skills, confidence and enthusiasm are increased. ICT in education serves as a powerful tool for teachers to easily plan and prepare the content to be taught (Burkhardt, et al., 2003). Through ICT applications, teachers

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benefit from full access to current student and school data, anytime, anywhere (Muhametjanova & Cagiltay, 2016; UNESCO, 2015). The role of teachers in implementing the curriculum requires a certain level of knowledge in order to effectively integrate the content to be taught (UNESCO, 2015; Sekoaila & Adebessin, 2016). Similar to other subjects taught by teachers, the integration of ICT in teaching and learning processes requires teachers to have a certain level of different skills to cope with all the challenges associated with the integration of ICT in teaching and learning processes (Igbo & Imo, 2017).

Against this background, this study examined the implementation and use of ICT in public secondary schools, South Africa. Rogers' Diffusion of Innovations Theory was used as a theoretical framework to guide the exploration of competencies and skills in this study. This is outlined in the following literature review, which also provides an exploration of educators' competencies and skills related to the integration of ICT in the classroom.

Problem statement

In general, mainstream teaching methods and curriculum remain largely unchanged in many schools, and technology is generally adopted and underused in the classroom (Dzidonu, 2010). It seems that the focus is on students' ICT abilities, rather than applying ICT knowledge and skills to other subjects throughout the curriculum. Keengwe, & Onchwari (2011) pointed out that despite the rapid growth of access to ICT for teachers in schools, and significant improvements in the ICT infrastructure of schools (Internet connectivity, computer labs, availability of educational software, etc.), Most teachers are not interested in adjusting and using ICT tools in the teaching process. It appears that their skills and attitudes towards ICT remain a challenge for them to adopt and use technology effectively in the classroom.

Purpose of study

This study aims to investigate the implementation and use of ICT by teachers in public secondary schools in Johannesburg, Central district 14 South Africa. Therefore, the major purpose of this study is to examine the implementation and use of ICT by teachers in

public secondary schools in Johannesburg, central district 14 South Africa. In particular, the following research question will be addressed:

- What are the skills educators have to successfully implement ICT in their teaching?

Objectives of the study

To Get information about the ICT competence level of teachers and their views on the adoption and use of ICT in their respective schools.

Significance of the study

The findings and recommendations of this study are expected to provide a process or framework to help school administrators make decisions on how to adopt and use ICT in schools. It is expected that planners and policy makers will use the results of this research as a basis for reviewing current ICT policies to overcome challenges that hinder the adoption

and smooth use of ICT in schools. South Africa. Teachers are expected to find the results of this study useful because it highlights the challenges they face in the adoption and use of ICT in schools. In addition, the research results are expected to open up areas for further research by other researchers and scholars, thereby benefiting the entire community.

Theoretical Framework

The current study is conceptually grounded in Rogers's model of the diffusion of innovations theory. Rogers defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (2003, 12). Rogers defined adoption as "a decision to make full use of an innovation as the best course of action available" (2003, 473). Rogers's model seeks to explain the processes by which innovations are adopted by members of a society. As shown in table 1, Rogers's model describes five characteristics that impact a person's choice to adopt an innovation. Rogers (2003) claimed that if an innovation is

perceived to be advantageous; is compatible with existing norms, beliefs, and past experiences; has a relatively low level of complexity; can be experimented with; and use of the innovation has observable results, including being able to see

others using the innovation, then there will be an increased likelihood of adoption. In the present study, the successes and barriers experienced by teacher trainers while trying to adopt use of the ICT skills were analysed through Rogers's five innovation characteristics. Along with innovation characteristics, Rogers (2003) describes five types of adopters. The categories are determined by the degree to which a person adopted an innovation. Through the decision process, potential adopters may choose to

- Adopt the innovation early: Early adopters:
- Adopt the innovation later: Late majority:
- Adopt the innovation last: Laggards:

Skills and competencies in the implementation and use of ICT.

Andoh (2012) believes that the goal of training should be "use ICT for teaching", not "learn to use ICT". Prestridge (2012) describes some ICT software packages required by high school

According to Higgins, & Moseley, (2011) teachers cannot understand why they should use ICT and how they should use it is an obstacle for the implementation of ICT in schools. Andoh, (2012) After analysing and organizing the different methods of use of ICT by teacher training institutions, the conclusion is that these institutions are not sufficiently prepared for their student teachers to use technology effectively in teaching and learning. Ananiadou & Rizza (2010) conducted a study of normal universities in OECD countries that use ICT and found that ICT is considered a horizontal discipline that encompasses all other disciplines, so no one feels responsible for it. The authors concluded that this had a negative impact on the use of ICT by student teachers when they were sent to schools. They suggest that continuous and continuous training is important to allow students to adopt and use the technique effectively and comfortably after starting practice.

Methodology

According to Mugenda, (2003) the research methodology is a plan of action, design, strategy or processes that the researcher chooses to teachers, such as data processing, word

induce the requested results. This study adopts

processing, Internet usage, spreadsheet usage, presentation software usage, such as PowerPoint and email. These ICT software packages are important to teachers because they help develop lesson plans, analyse and configure student tests, acquire new knowledge, and present courses in a clear manner. In order to acquire these skills, teacher educators must fully prepare teachers. As Higgins and Moseley (2011) pointed out, teachers who use ICT tools in the classroom may have experienced or observed their own teachers using ICT tools during the initial teacher training. Therefore, the lack of preparation of student teachers on how to use ICT in the classroom can be considered as the reason why teachers cannot adopt and use ICT effectively after practice. Teacher training colleges need to change their teacher training strategies to allow them to use technology to practice before being sent to school. If professional development provides teachers with enough time to learn, share, practice, and collaborate with colleagues in technology, they are likely to adopt and use ICT in the classroom.

a descriptive survey research design. Sekran (2007) observes that descriptive survey research aims to provide statistical information on education that is of interest to policy makers and educators. It is a method of collecting information by conducting a questionnaire survey on a population sample. Descriptive investigations are designed to obtain information about the state of the phenomenon or answer questions such as where, what, how, why, when, and who. According to Orodho (2008), specifying the target population of the study is important because it can help researchers to make decisions about sampling and the use of resources. The subjects of this study were 401 public high school educators in Johannesburg District 14, who were classified as public schools. Kombo, (2006) believes that researchers choose samples because several factors make it difficult to study the entire population, while Sekran, (2007) observes that sampling procedures are strategies or procedures used to select samples from the target population. According to Gay (2002), sample size and sampling procedures are

essential to determine the representativeness of the sample for generalization. The study used



purposive sampling to select schools and participants for inclusion in this study. Babbie (2010) defines purpose sampling as a form of non-probability sampling, in which the units to be observed are selected based on the researchers' judgment of which units are most useful or representative. The sample size for this case study consisted of 40 educators. The questionnaire was used as the main tool for data collection. According to Kombo (2006), questionnaires are widely used to obtain information on current conditions and practices, and to make inquiries on attitudes and opinions quickly and accurately. Orodho, (2008) noted that questionnaires provide an inexpensive way to collecting data from a large population. In line with Gay, (2002) validity is the degree to which a test measures what's purported to measure. Mugenda, (2003) observes that reliability is the degree to which a test consistently measures what it measures. In this study, the validity of the questionnaire was ensured through the judgment of experts in teaching, learning, information and communication technology, research techniques, and the reliability was established by testing and reassessment methods in the study. Orodho (2008) observed that data analysis involves performing some procedures on information collected through the use of statistical tools to calculate statistics or percentages. In this study, qualitative and quantitative analysis of data was performed using descriptive and inferential statistics.

Findings and discussion

Rogers' (2003) model of diffusion of innovations postulates that different types of adopters may be involved in the adoption of innovations. As described above, the decision categories for the current study were the following: early adopters, late adopters, teachers who experienced dropout, and teachers who rejected the innovation. The determination of the decision category was based on a set of seven competencies sub-questions.

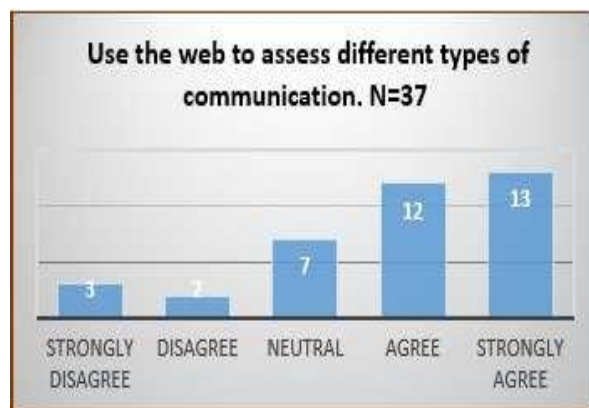
RQ1 What are the skills do educators have to successfully integrate ICT in their teaching?

Respondents were asked to describe their experiences in using ICT capabilities. These data were analysed by adoption category using

Rogers' (2003) five innovation characteristics. The following questions ask end-users about successes experienced in using ICT capabilities. Only 7 sub-questions were used, i.e. SRQ1- SRQ7.

(SRQ1) Use the World Wide Web to assess different types of information

This question investigates whether educators can use the search engine to get information. Figure 8 below shows their responses.



The data shows that the sample size for this outcome is n=37 as n=2 of the n=39 participants did not answer the question. Out of the 39

4 participants, n=3 (7.69%) strongly disagreed that they can use the World Wide Web to evaluate different types of information, n=2 (5.12%) disagreed, n=7 (17.94%) were neutral,

n=13 (33.33%) strongly agreed, n=12 (30.76%) agreed, while n=2 (5.12%) did not answer the question with (SD) 5 (12.10) and (M) 6.5 (13.84). This implies that most educators (64.9%) were early adopters because they can competently and with ease use the World Wide Web as a tool in their teaching to obtain more information. This result is in line with Reed (1990) who stated that as ICT skills improve, there is a corresponding improvement in the use of ICT applications and performance.

(SRQ2) Solve simple problems in operating computers.

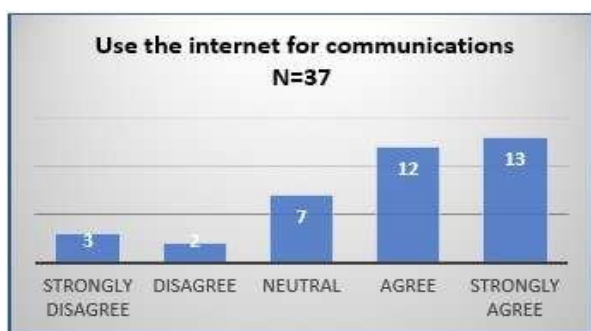
This question investigates whether educators can solve problems using ICT tools. Figure 9 below shows their responses.



Because n=3 of the n=39 participants did not respond to the question, the data suggests that the sample size for this outcome was n=36. N=3 (7.69%) strongly disagreed, n=2 (5.12%) disagreed, n=12 (30.76%) were indifferent, n=10 (25.64%) strongly agreed, n=9 (23.07%) agreed, and n=3 (7.69%) did not react to the question. This indicates that the majority of educators (48.71 percent) were early adopters, as these educators were able to overcome simple challenges in using ICTs proficiently and easily as a tool to support them in their teaching. This finding was consistent with Son et al. (2012) findings that good attitudes toward ICTs may be crucial elements in assisting educators in learning and using ICTs.

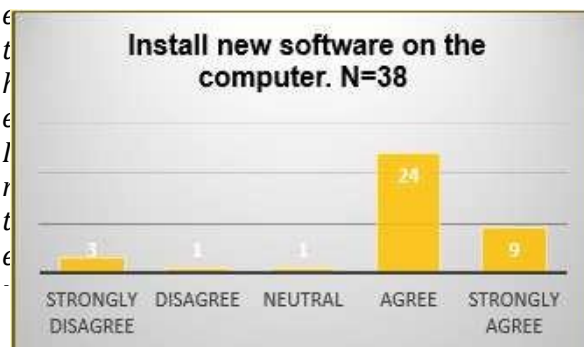
(SRQ3) Use the internet for communication

This question investigates whether educators can use internet for example to email. Figure 10 below shows their responses.



The data indicates that the sample size for this result was n=39. Of the 39 participants n=1 (2.56%) strongly disagreed that they can use the Internet for communications (e.g., email & chat rooms), n=5 (12.82%) were neutral, n=14 (35.89%) strongly agreed, n=19 (54.71%) agreed with (SD) 8. (21.07) and (M) 9.75 (24.99). This

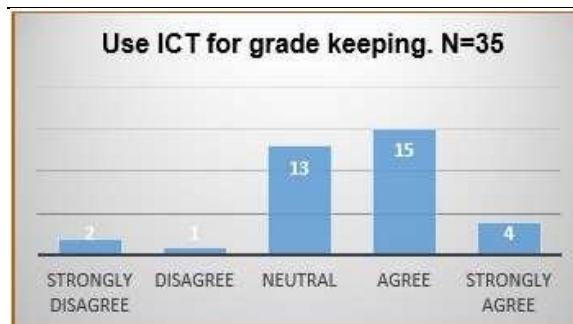
indicates that (90.06 percent) of educators are early adopters, as they can effectively and easily



Because n=1 of the n=39 participants did not respond to the question, the sample size for this outcome was n=38, according to the data. Of the 39 participants, n=3 (7.69%) strongly disagreed that they can install new software in ICT, n=1 (2.56%) disagreed, n=1

(2.56%) neutral, n=9 (23.07%) strongly agreed, n=24 (61.53%) agreed, and n=1 (2.56%) did not react to the question with (SD) 9.11 (23.37) and (M) 6.5 (16.66). This indicates that (84.04 percent) were early adopters, as these educators can competently and easily install new software in the ICT as a tool to aid them in their teaching. This finding was consistent with Gaible, Bloome, Schwartz, Hoppes, and Vota's (2011) findings that ICT integration training helps to educate educators with competences and skills in how to incorporate ICT tools in their respective subjects in the classroom environment.

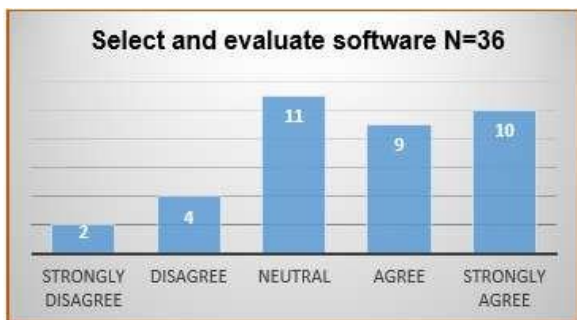
(SRQ5) Use computers for grade keeping. This question investigates whether educators can use ICT tools like excel for grade keeping. Figure 12 below shows their responses.



The data indicates that 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 can use ICTs for grade keeping, $n=1$ (2.56%) disagreed, $n=13$ (33.33%) where neutral, $n=4$ (10.25%) strongly agreed, $n=15$ (38.46%) agreed while $n=4$ (10.25%) did not respond to the question with (SD) 5.95 (15.27) and (M) 6.5 (16.66). This means that (71.46 percent) of educators were early adopters, since they were able to use ICTs for grade keeping proficiently and easily as a tool to aid them in their teaching. This conclusion corroborated Becker and Riel's (2000) findings that educators who engage in professional relationships and activities outside of the classroom teach differently than those who have little contact with their peers or profession.

(SRQ6) Select and evaluate educational software.

This question investigates whether educators are competent in evaluating and selecting relevant educational software. Figure 13 below shows their responses.

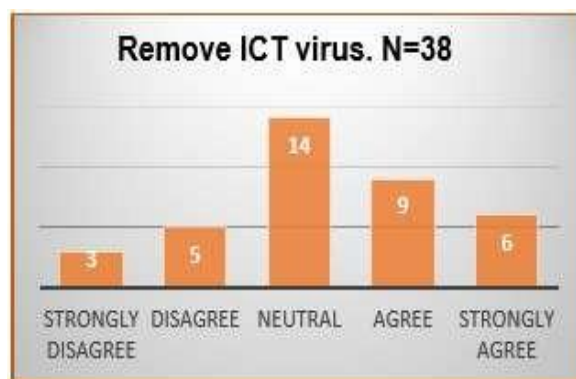


Because $n=3$ of the $n=39$ participants did not respond to the question, the sample size for this outcome was $n=36$, according to the data. Of the 39 participants, $n=2$ (5.12%) strongly disputed that they can pick and evaluate educational software, $n=4$ (10.25%) disagreed, $n=11$ (28.20%) were indifferent, $n=10$ (25.64%) highly agreed, $n=9$ (23.07%) agreed, and $n=3$ (7.69%) did not react to the question with (SD) 3.93 (10.09) and (M) 6.5 (16.66). This means that (74.35%) of the teachers were early adopters. This finding was consistent with Becker and Riel's (2000) findings that those educators who are heavily involved in professional activities are in a

position to assist other educators in becoming more successful users of ICT technology if they have sufficient authority and time.

(SRQ7) Remove computer virus.

This question investigates whether educators can use an ant-virus in a computer. Figure 14 below shows their responses.



The data indicates that the sample size for this ⁶ 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 can remove an ICT virus, $n=5$ (12.82%) disagreed, $n=14$ (35.89%) where neutral, $n=6$ (15.38%) strongly agreed, $n=9$ (23.07%) agreed while $n=2$ (5.12%) did not respond to the question with (SD) 4.41 (11/32) and (M) 6.5 (16.66). This suggests that (61.55%)

of the teachers were more of late adopters since they cannot evacuate an ICT virus. This finding was in line with Gaible, Bloome, Schwartz, Hoppes, and Vota, (2011) discoveries that

Preparing teachers on ICT integration offer assistance to supply them with competencies and abilities of how

to consolidate ICT apparatuses in their particular subjects within the classroom environment.

Conclusion

The focus of this study was on the implementation and use of ICT in public schools, South Africa. The following were the conclusions of the study. There is a scarcity of skilled ICT educators. The majority of secondary



school teachers lacked the necessary competences to expedite the use of ICT in the classroom. A key impediment to effective ICT implementation in schools is the lack of teachers who are competent in ICT and can thus provide support and model standards of good practice to those who are still inexperienced with the technology. Because of a lack of sufficient training in initial teacher training institutions, the majority of teachers' ICT training is far from satisfactory. Word processing (e.g., Microsoft Word), data processing (e.g., Microsoft Access), presentation (PowerPoint), spreadsheet (e.g., Microsoft Excel), internet, and e-mail are the relevant ICT packages that secondary school teachers should be competent and skilled with. However, the majority of teachers stated that they are not knowledgeable about them.

Recommendations

The following recommendations were grounded on the study's findings:

Teachers should receive adequate training on how to incorporate ICT into teaching and learning. Teacher education institutions should coordinate their curricula to provide student teachers with the skills and competencies needed for classroom instruction through the use of ICT. Rather than receiving general computer training, teachers should receive comprehensive training on how to use ICT. All teachers be trained in ICT skills to make them effectively deliver ICT based curriculum. It is crucial that South Africa has well-trained teachers, able to implement ICT in schools in a mode that brings change from old to new pattern of learning which are much more learner-centered than before.

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