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The Impact of Access to Educational Technology and Educator's Attitudes towards Educational Technology on the Use and Integration of Educational Technology in South African schools.

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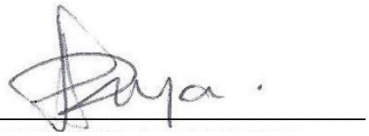
University of the Witwatersrand



A research project submitted in partial fulfilment of the requirements for the degree of BA Masters (Educational Psychology) in the Faculty of Humanities, University of the Witwatersrand, Johannesburg, January 2017

DECLARATION

I declare that this research project is my own, unaided work. It has not been submitted before for any other degree or examination at this or any other university.

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PLAIGIRISM DECLARATION

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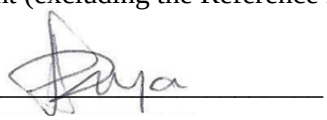
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ABSTRACT

Educational Technology (ET) is fast becoming a part of South African classrooms. Educators play a major role in the effective and successful integration of this technology within the classroom. This study explores the relationship between educators' level of access to ET, their attitudes towards ET and their use of ET for various teaching related purposes. The factors of perceived competence, cultural relevance and perceived usefulness are also explored. Roger's Diffusion of Innovations Theory and Ajzen and Fishbein's Theory of Reasoned Action and Theory of Planned Behaviour were used as the theoretical framework for this study. A convenience sample of 119 educators from various schools in Gauteng (both public and private) completed a questionnaire consisting of a demographics section, the Attitudes towards Computer Scale (ACTS) and the Information and Communication Technology Survey. Results were analyzed using descriptive statistics and multiple regressions. The study found that while educator's attitudes towards ET are positive, levels of use and integration of more complex ET items are still low. Varying levels of access were recorded for different ET items at home and at school. Both, perceived usefulness and levels of access were found to be the most significant predictors of educators ET use and integration. These results are in keepings with both Roger's Diffusion of Innovations Theory and Ajzen and Fishbein's Theory of Reasoned Action and Theory of Planned Behaviour as attitudes were shown to predict use and integration of ET. This research has potential to contribute to teaching policy, practice and research in South African schools.

Keywords: Attitudes; Access; Educational Technology; Educators; Integration

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CHAPTER ONE: INTRODUCTION

1.1 Statement of Problem

One of the recent past and future aims of the Department of Basic Education in South Africa is to have all school going learners capable of using and learning from various educational technologies (DoE, 2004). A number of benefits, for both learners and educators, come from the proper use and integration of technology in classrooms (Faulkner, et al., 2013 & Huseyin, 2014, as cited in Stover, 2015; Mikusa, 2015).

As the world moves towards becoming more environmentally friendly, paperless solutions are fast becoming the preferred option. For technology to be properly integrated into the school system certain attention needs to be paid to key members. These key role players include the Department of Basic Education as well as educators and learners (Eyyam & Yaratan, 2014; Goosen & van de Merwe, 2015; Msila, 2015; Wilson-Strydom, Thompson& Hodgkinson-Williams, 2005). While it is acknowledged that educators play a key role, this role has not been adequately explored, with regards to attitudes and levels of usage and access, in the South African context.

1.2 Objectives

This study focuses solely on the role of educators and factors involving them, namely, their attitudes, their levels of access to Educational Technology (ET) and how frequently they use ET. Some of these factors are molded by personal feelings and attitudes and may be intrinsic, while others, such as access to technology at school, are extrinsic and beyond their control. This study

therefore aims to not only illustrate the current status of technology in classrooms but also attempts to move the conversation forward by asking predictive questions. These questions are concerned with which factors (cultural relevance, perceived competence, perceived usefulness) best predict educators attitudes as well as which factors (cultural relevance, perceived competence, perceived usefulness, educator attitudes, access to ET) best predict an educators level of ET use and integration in a number of contexts.

1.3 Significance of the Study

In 2011, the National Education Infrastructure Management System (NEIMS) report stated that 63% of schools in Gauteng had access to computers for teaching and learning purposes (NEIMS, 2011). This was a close second to the Western Cape with 79% of schools equipped with computers and a long way from both the Eastern Cape and Limpopo's 10%. The 2015 NEIMS reported an increase, with regards to educator's access to computers, to approximately 80% for schools in Gauteng (NEIMS, 2015). As educators in Gauteng reported higher levels of access to technology the logical next step would be to examine the level at which they are integrating it into teaching and learning.

Koc (2005) explains that technology within the classroom is important because it encourages higher order thinking as well as both self-directed and interactive learning. ET allows learners to gain knowledge beyond the textbook, explore relevant real world issues and develop problem solving skills (Moersch, 1995; Mikusa, 2015). ET also prepares learners for entering the world of work (Mikusa, 2015). While the technology may be present in classrooms it is deemed useless if the educator is not willing to make full use of it. According to Cope and Ward (2002)

in order for the integration of ET to be successful, educators need to believe that technology is useful and view it as part of a student centered approach. Similarly, Angadi (2014) explains that more meaningful experiences are created in the classroom when technology is integrated into lessons. Godfrey (2001, as cited in Sang, Valke, van Braak & Tondeur, 2009, p.1) adds that ET creates richer learning environments and experiences and that it allows "learners to adopt multiple perspectives on complex phenomena", and allows for different learning styles to be catered for, thus promoting an inclusive environment. The presence of various ET's as well as the internet allows educators to access more creative and current multimedia examples, thus keeping lessons relevant (Cuhabdar, 2014, as cited in Stover, 2015).

Other advantages include changing the font size for those leaners with visual impairments, and the use of applications which convert text-to-speech for those learners who may struggle with dyslexia (Faulkner, et al., 2013, as cited in Stover, 2015). ET therefore promotes a more inclusive classroom and allows for certain special needs to be accommodated. Advantages for educators include faster communication with learners, while saving printing and paper costs in the long term and neat and legible writing on the screen so that learners are able to see work more easily (Huseyin, 2014, as cited in Stover, 2015). Mikusa (2015) explains that educators who utilized ET as a dynamic and powerful tool found that students were more engaged in lessons, their confidence levels increased due the immediate feedback provided by the program used and thus the process of self-reflection (with regards to their knowledge level) was possible. Students are immediately able to see whether they understand a topic or not and so they can immediately move on or revise that topic (Mikusa, 2015).

A number of studies have found that educator attitudes influence use and integration of ET in classrooms (Mosely & Higgins, 1999; Sang, et al., 2009; Watson, 1998) which in turn influence learner attitudes towards technology and lesson being presented (Eyyam & Yaratan, 2014). These studies explain that educators who possess positive attitudes towards ET are more likely to use forms of ET within the classroom for educational and teaching purposes. Hew and Brush (2007) argue that negative attitudes towards ET can be seen as a barrier to its integration in the classroom.

> *"South Africa's educational needs are unique and have their own set of challenges. It is well understood that Information and Communication Technology can have a profound impact on the growth and development of the country, from both a social and economic point of view" (Telkom, 2015, p7).*

In South Africa, many studies focus on either integration of ET (Msila, 2015; Wilson-Strydom et al., 2005); educator's attitudes towards ET (Maharaj & Govender, 2005) or access to ET (Czerniewic & Brown, 2005).

The current study therefore aims to integrate all three aspects as well as to explore at the relationship between these factors. In doing so, this study uses Roger's Diffusion of Innovations Theory (Rogers, 1995) as well as The Theory of Planned Behaviour (Fishbein & Ajzen, 1975) and The Theory of Reasoned Action (Ajzen, 1991) as a framework to investigate educators access to ET; their attitudes; factors that are thought to influence these attitudes and the effect this may have on ET integration in different contexts. Influential factors include perceived

usefulness, cultural relevance and perceived computer competence. The current study also investigates the use and integration of technology in different contexts in order to better understand the areas in which the ET is being used and the areas that may require further investigation.

1.4 Research Questions

Based on previous literature, the following research questions were devised in order to better understand the relationship between educators attitudes towards ET, their level of access (at home and at school) to different hardware and software items used to enhance teaching and learning and their level of use and integration of these various items in different contexts.

1.4.1 What level of access do educators have to ET?

1.4.2 What are educator's attitudes towards ET?

1.4.2.1 What are educator's perceptions of the cultural relevance of ET?

1.4.2.2 What are educator's perceptions of the usefulness of ET?

1.4.2.3 What are educator's perceptions of their ET competence?

1.4.2.4 To what extent do cultural relevance; perceived usefulness and/ or perceived competence predict educator attitudes?

1.4.3 What is the level of ET use and integration by educators?

1.4.4 To what extent do access, perceived competence (knowledge) and educator attitudes towards ET predict level of use and integration?

1.4.5 To what extent do access, perceived competence (knowledge), perceived usefulness and /or cultural relevance predict level of use and integration?

1.5 Outline of chapters

This research report consists of five chapters. Chapter one, on page 12, provides a contextualization for the research report. It outlines the main problem, followed by the objectives of the study. The significance of this study is presented particularly as it pertains to the South African context. This chapter concludes with the proposed research questions for the study.

Chapter two, on page 19, reviews the literature in the area. The chapter commences by first defining the following major concepts: educators, educational technology, accessibility, attitudes and use and integration. The theoretical framework of this study, namely, Roger's Diffusion of Innovations Theory and Ajzen and Fishbein's Theory of Reasoned Action and Theory of Planned Behaviour is then outlined. Finally, an exploration of both international and South African literature on each of the core concepts is explored.

Chapter three, on page 50 describes the specific methods used in order for appropriate and effective data collection. This chapter begins with a description of the sample, instruments and

research design. After which, the specific procedure, ethical considerations and data analytic techniques adopted for this study are discussed.

Chapter four, on page 63, presents the results obtained for this study. This chapter is structured such that the results for each research question are consecutively presented. Descriptive statistics, particularly frequencies, were used to describe all nominal data. Means, standard deviations, minimum and maximum values, skewness and kurtosis coefficients were examined for all ordinal and interval variables. Inferential statistics namely, multiple regressions were used to answer the predictive questions.

Chapter five, beginning on page 92, forms the conclusion of this research report, beginning with a discussion of the results found for each research question. This is followed by some discussion on the limitations encountered through this study. Recommendations are presented together with some commentary on how this study may influence policy as well as future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

South Africa's education system is moving towards becoming more technologically advanced every day. The introduction of computers in South African schools began mainly in private schools in the 1980's and has since increased exponentially (Howie, Muller & Paterson, 2005). This has also expanded to classrooms in public schools and is a priority moving forward. The Minister of Basic Education, in collaboration with other officials, recently launched a pilot project called "the Big Switch On" (Baloyi, 2015). This project is aimed to turn South African classrooms paperless and for students and educators to access all learning material through Information and Communication Technology (ICT). The project began with seven schools in Gauteng and aims to move to other parts of South Africa (Baloyi, 2015). Other projects include the Khanya Project in Cape Town. This project began in 2001 with its main goal being to educate educators about effective ET use and integration. The project trained 16 000 educators and delivered 24 000 computers to schools around the Western Cape (Telkom, 2015).

The South African Department of Basic Education had also previously proposed that all South African learners would be capable of using ICT's by 2013 (DoE, 2004). While not all learners and educators have access to and are ICT capable now, in 2016, projects such as "The Big Switch On", Gauteng Online and the White Paper on E-education are slowly making this a reality. However, the success of programs such as these depends largely on all those involved at a grassroots level in schools. This includes educators, learners, school governing bodies, school management teams and principals. While each of these stakeholders have a part to play,

educators are directly involved in the classroom. Nkula and Krauss (2014) explain that merely having technology present in the classroom is not sufficient enough and that the educator is responsible for the level at which technology is integrated into the lesson. This study therefore chose to place its emphasis on the role of educators.

It is important to note here that one may speak about two different types of ET use. The first type describes learners being educated about computers in computer classrooms whereas the second type talks about using technology, in various subject areas, for educational purposes (Hokanson & Hooper, 2000). This study will focus on the latter.

The literature review to follow commences with defining the following terms: Educator, ET, access to ET, attitudes and use and integration. Thereafter, the major theoretical frameworks used in this study are discussed. These include: Fishbein and Ajzens Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) as well as factors that influence attitudes and usage (based on Rogers Diffusion of Innovations Theory). International literature concerning the above factors will be discussed after which the paper will conclude with a deeper look at research conducted in a South African context.

2.2 Definition of terms:

2.2.1 Educator

The current study uses the term educator to refer to those educators who conduct lessons in classrooms and will not include educators who focus solely on activities outside of the classroom such as sports. These educators are not limited to those teaching computer related subjects but

rather include all subjects. Currently, in South Africa, educators who are responsible for teaching Computer Applications Technology (CAT) and Information Technology (IT) are concerned with educating learners about the use and application various hardware and software (Chiles, 2012). This study includes those educators focusing on various subject matter (such as, but not limited to, accounting, natural sciences, mathematic).

2.2.2 Educational Technology (ET)

Reiser and Ely (1997) explain that defining ET is not a simple task and that its definition may evolve over time as changes in the technology itself occurs. For example, changes with regards to the various functions of technology, the role it is able to play in enhancing teaching and learning and the functions that educators are able to perform while using the technology all have an impact on the definition of ET. The latest definition offered by the Association for Education Communications and Technology (AECT) explains that "educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources" (Januszewski & Molenda, 2013, p.1). More recently, Aziz (2010), offers an alternative definition, explaining that "educational technology is the considered implementation of appropriate tools, techniques, or processes that facilitate the application of senses, memory, and cognition to enhance teaching practices and improve learning outcomes". Aziz (2010) believes that this definition takes future developments into consideration by using "between-the-lines" terms rather than rigid terms (Aziz, 2010).

In South Africa, the Department of Basic Education defines Information and Communication Technology (ICT) as all devices, networks, software and hardware that are used not only for

communication but also allow for the analysing, management and processing of information (DoE, 2004). "Most technologies have two components: (1) hardware, consisting of the tool that embodies the technology as a material or physical object, and (2) software, consisting of the knowledge base for the tool" (Rogers, 2003, as cited in Probst, Hoffmann & Christinck, 2007, p.37). The White Paper on E-education adopts this same definition and further explains that e-learning "is flexible learning using ICT resources, tools and applications, focusing on accessing information, interaction among teachers, learners, and the online environment, collaborative learning, and production of materials, resources and learning experiences" (DoE, 2004, p.15). "E-learning may involve the use of Internet, CD-ROM, software, other media and telecommunications" (DoE, 2004, p.15). The current study adopts the definition offered by Aziz (2010) and will refer to educational technologies such as tablets, smartboards, computers, laptops and any devices available to the educator in order to assist and enhance teaching and learning.

According to the White Paper on E-education (DoE, 2004, p.14):

> *"ICTs, when successfully integrated into teaching and learning, can ensure the meaningful interaction of learners with information. ICTs can advance high order thinking skills such as comprehension, reasoning, problem-solving and creative thinking. Success in the infusion of ICTs into teaching and learning will ensure that all learners will be equipped for full participation in the knowledge society before they leave further education and training (FET) institutions".*

Successful integration is therefore largely in the hands of the educator as they are present in the classroom and control learners level of engagement with ET. The level of integration allowed by the educator is said to be largely influenced by his/her attitude towards the technology (Gulbahar

& Guven, 2008; Hennesy, Harrison & Wamakote, 2010; Rogers, 2003 Teo, 2008; Woodrow, 1990). Before considering attitudes, it is important to understand the concept of accessibility and its definition in terms ET.

2.2.3 Accessibility

In order for use and integration of ET to take place in schools, appropriate hardware and software items need to be available to and accessible by educators (Plomp, Anderson, Law & Quale, 2009 as cited in Buabeng-Andoh, 2012). Studies explain that simply having access to various types of technology is not enough but rather that educators need to have access to appropriate educational technology such as the internet, projectors, smartboards and other technology that may enhance teaching and learning (Tondeur, Valcke & van Braak, 2008; Mikusa, 2015). Low levels of access can therefore be seen as a barrier towards proper integration (Tondeur et al., 2008).

Pelgrum (2001) found that the four biggest obstacles perceived by a sample of educators at schools in 26 different countries include: an insufficient number of computers and technology available at the school, a lack of knowledge and skills, difficulty with regards to integrating the instructions and limited copies of software instructions. These countries include Canada, France, Norway and South Africa (Pelgrum, 2001).

The current study therefore focuses on access to various software and hardware items outlined by Gulbahar and Guven (2008) both at home and at school. Once levels of access are determined levels of use and integration are important to understand.

2.2.4 Use and integration

Rao (2013) argues that it is paramount that one understand the difference between the terms use and integration. Rao (2013) explains that there are specific and different instances in which the terms "use" and "integration" may be appropriately used in terms of educators and ET.

Usage infers random or sporadic use of technology where by "lower-order thinking tasks" may be achieved by educators. The technology may be used to merely deliver information and thus have little impact on the power of the lesson (Rao, 2013).

In contrast, Rao (2013) argues that the integration of ET encompasses the planned and purposeful use of ET in lessons in order for the maximum effect of the lesson to be achieved. Integration therefore focuses on developing higher order thinking in learners and allows the educator to go beyond what was possible without the technology, provided that they do not simply use it to substitute those activities possible without the use of ET (Rao, 2013).

Cohen (2003) outlines that ET may be used in a number of different school contexts including administration, communication with the extended school community, in the enhancement of teaching and learning and to aid the preparation of printed materials.

In the current study, the terms use and integration are combined in order to encompass all the above described aspects. The term use and integration therefore refers to how frequently an educator makes use of various ET's (hardware and software items) in a number of different contexts related to teaching and learning. This will be determined through a self-report scale and

thus illustrates an educator's level of perceived, rather than actual, ET use and integration. These five contexts include: use for educational and teaching purposes, lesson planning purposes, communication with parents and learners, communication with the principal and colleagues and all personal and social communication.

According to Rogers (2003), the use and integration of an innovation is influenced by one's attitude.

2.2.5 Attitudes

A number of definitions have been used over time to describe the term "attitudes". Some of these definitions are presented here in order for a more holistic understanding. An early definition, offered by Baldwin (1901, as cited in Allport, 1935, p. 804) proposes that attitudes can be described as "readiness for attention or action". Chave (1928, as cited in Allport, 1935) later added that attitudes are complex but still believed that they largely influence ones readiness to act. By explaining attitudes as "a mental disposition of a human individual to act for or against a definite object", Droba (1933 as cited in Allport, 1935, p. 804) acknowledges the polarity that exists. This polarity continues to appear in later definitions. Allport (1935, p.6) explains in more detail that an attitude is "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related". "A psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly & Chaiken, 1993, p. 15). More recently, Petty, Wheeler and Tormala (2003) explain that an attitude can be defined as a person's evaluation of a task or object. Hogg and Vaughan (2005, p.150) add that

an attitude is "a relatively enduring organization of beliefs, feelings, and behavioral tendencies towards socially significant objects, groups, events or symbols"

Two important points emerge from the above definitions. Firstly, that attitudes can be seen as having direction. For example, one is either for or against something; views it as favourable or unfavourable; or has a positive or negative view about it. Secondly, one must acknowledge the strong attitude-behaviour inference that was present from earlier definitions and continues in more current definitions (Allport, 1935; Ajzen & Fishbein, 1980; Azjen, 2001; Kinzie & Delcourt, 1991).

The current study therefore views educator's attitudes on a spectrum from positive to negative. Rogers (1995) explains that if an educator has a positive attitude towards ET, he or she will engage with the technology more frequently. The current study also hypothesises the predictive value of attitudes with regards to educators use and integration of ET.

2.3 Access to ET and its effects on use and integration

Dwyer (1995) highlights the importance of having access to and using ET through educator's responses. Educators reported that:

> *"they interacted differently with their students—more as guides or mentors and less like lecturers. In fact, their personal efforts to make technology an integral part of their classrooms caused them to rethink their most basic beliefs about education and opened them to the possibilities of redefining how they went about providing opportunities for students to learn". (Dwyer, 1995, p.11)*

In a Syrian study conducted on 314 high school English as a Foreign Language educators it was reported that only 5.1% of these educators had access to computers on a daily basis at school while 66.6% have never had access to ET at school (Albirini, 2006). Higher levels of access were reported at home with 30.6% of educators having access to computers on a daily basis. Similar results were found by Usluel, Askar and Bas (2008) who found that in a Turkish study of 814 educators, 38.7% reported having access to computers while only 28.2% reported having access to the internet in their classrooms. Educators reported the highest levels of access to projector systems in their classrooms (55.8%), however these levels of access produce low levels of ET use and integration. Educators in this study reported using ET's most commonly as a means of communication, searching for information and preparing for courses (Usluel, et al., 2008).

Buabeng-Andoh (2012, p.143) explains that the "effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware and software". If educators do not have access to useful ET's, they are unable to use them. Thus, limited levels of access at school may immediately inhibit proper integration (Albirini, 2006).

Similarly Butler and Selbom (2002) identified access as a barrier to effective integration of ET in conjunction with the reliability of the technology, poor support services and software incompatibilities with regards to school and home software, making sufficient lesson planning

difficult. A number of studies have identified poor access to the correct types of ET as a major barrier towards proper use and integration (Ertmer, 2005; Hew & Brush, 2007).

In South Africa, Wilson-Strydom, Thomson and Hodgkinson-Williams (2005) found that 93% of a sample of 231 educators reported having access to various ET's for educational and teaching purposes with 63% reporting access to the internet. More specifically, the majority of these educators had reported no access to computers in their classrooms while, in some cases, one computer was available per classroom. With regards to usage, they report that 13.5% of this sample used ICTs for teaching and learning approximately only once per month and 9.2% used technology less than once per month. 28.8% of this sample had not yet integrated technology into their lessons. Similarly, Hart and Laher (2015) found that 21.4% and 18.8% of educators had access to computers and laptops in their classrooms, respectively. 29.9% of educators had access to tablets while 9.4% of them had access to smartphones. Wilson-Strydom and colleagues (2005) further hypothesize that true integration may not be the next step, but rather providing constant access to ET's in order for educators to be able to truly rely on the technology.

Wilson-Strydom and colleagues (200-5) also investigated the effects that levels of access have on use and integration of ET's. This study found that increased levels of access to ET does not always result in higher levels of use and integration. The highest levels of use and integration were reported for administrative rather than teaching. Some educators who reported no direct access to ET still made use of ET by frequenting public computer centers (Wilson-Strydom, et al., 2005). Thus indicating the importance of investigation personal characteristics, such as attitudes.

A report compiled by Telkom in 2015 explains that increased educator access to ET means more efficient record keeping, quicker communication between colleagues and little wastage of paper (Telkom, 2015).

The White Paper on e-education (DoE, 2004) stresses the importance of integrating ET into South African classrooms. Hennessy and colleagues (2010) analysed a number of studies which investigate factors that influence ICT use within classrooms in Sub Saharan Africa. They conclude that integration largely depends on educators' attitudes and knowledge, amongst other factors. Attitudes are important to measure as they often assist in predicting a person's future behaviour with regards to decision-making (Ajzen & Fishbein, 1980 as cited in Maharaj & Govender, 2005). Similar results were found by Goosen and van de Merwe (2015) where educators explained that there was not only a lack of adequate training provided but that they also had an inadequate amount of access to relevant ET's. Without proper training many educators were unable to use the technology provided thus resulting in low levels of use and integration.

2.4 Educator attitudes towards ET and its effects on use and integration

Contrary to the low levels of access reported, many studies have found that educators' attitudes towards ET are largely positive (Cavas, Cavas, Karaoglan & Kisla 2009; Mosely & Higgins, 1999; Teo, 2008). A Malaysian study describes that in a sample of 200 secondary school educators, the majority have positive attitudes towards ET and that educators who owned computers exhibited more positive attitudes than those who did not own computers (Hong &

Koh, 2002). It can therefore be hypothesized that access to ET may result in more positive attitudes. Some studies explain that educator's negative attitudes towards ET can be largely attributed to the difficulty found when using it (Stover, 2015). Inadequate training and technical support may therefore result in problems of dependability (Stover, 2015). Stover (2015) found that, in a sample of 10 educators, only 4% felt that they were adequately trained to use technology such as tablets, smartphones and apple TV's , which were all available to them.

Samak (2006) further explains that perceived usefulness, cultural relevance, perceived competence, and access explained 64% of the variance found in educator's attitudes towards ET in a Jordanian sample of English educators. According to Rogers Diffusion of Innovations Theory, Knowledge (competence), perceived usefulness, cultural relevance and access all affect ones attitude (Rogers, 2003).

Some studies have identified competence as an essential factor when investigating ET use in schools (Berner, 2003 & Na, 1993 as cited in Bordbar, 2010). In a Syrian sample of English educators, the majority reported little or no competence while only 0.6% perceived themselves as having "much competence" (Albirini, 2006). Albirini (2006) also found that the majority of the sample felt positively towards technology being culturally and socially relevant in Syrian schools. Perceived usefulness was found to be strong predictor of educator's attitudes towards ET (Albirini, 2006; Hart & Laher, 2015).

Pamuk, Cakır, Ergun, Yılmaz and Ayas (2013) explain that the majority of educators, in a sample of 181 educators from 11 schools in Turkey, agreed that some of the technology in the

classroom allowed learners to become more distracted at times and thus do not always want to make use of it. They explain that learners are often preoccupied with features of the tablet or technology which are not relevant or related to the lesson when they are supposed to be focusing on (Pamuk, et al., 2013).

Research also shows that educators who have more positive attitudes towards ET feel more comfortable with using the technology. Watson (1998) explains that positive attitudes not only reduce educators' resistance with regards to using computers and other technology but also plays a vital role in the extent to which the educator allows for ET integration to occur. A significant correlation was found between positive attitudes towards ET and ET integration in a sample of 727 Chinese student educators (Sang, et al., 2009). Studies have found that educator's beliefs and attitudes towards technology largely influences integration of ICT within the classroom (Chen, 2008; Ertmer, 2005; Hermans, et al., 2008; Hew & Brush, 2007; Lui, 2011; Msila, 2015). Vannatta and Banister (2009) conducted a study on a sample of 279 educators in Ohio. Their scale measured ET integration, amongst other factors. Results indicated that educators used technology predominantly for administrative purposes and not to enhance teaching and learning. Also in Ohio, Isleem (2003) conducted a study on 774 public school educators on their level of ET use with regards to instructional purposes as well as the relationship between level of use, access, attitudes, expertise, support and educator characteristics. The study found that high levels of use with regards to "mainstream applications" such as word processing, use of the internet, email and so on (Isleem, 2003, p.64). He also found a strong positive correlation between use of ET, educator's attitudes and level of expertise thus illustrating the importance of ET competence (Isleem, 2003).

As ET is becoming more common in South African schools, a number of studies of a similar nature have been conducted. In South Africa, Maharaj and Govender (2005) used Roger's Diffusion of Innovations Theory to investigate 1222 secondary school educators' attitudes towards the integration of ICT in Kwa-Zulu Natal. Their findings concluded that educators exhibit largely positive attitudes and 90% of participants "consider computers a viable tool that has the potential to bring about different improvements to their schools and classrooms" (Maharaj & Govender, 2005, p.88). The study reported that 93% of participants intended using computers in the future.

Msila (2015) conducted a quantitative study on 25 educators in five schools in Gauteng about ET integration within their classrooms. Statements from educators concluded that ICT integration in schools is largely dependent on educator's attitudes and competence levels. "When educators do not feel confident and have negative attitudes towards computers, digital classrooms will hardly work" (Msila, 2015, p.1797). Educators, in a sample of 108 educators from four Pretoria secondary school, displayed mainly positive attitudes towards ET's and through regression analysis found that positive attitudes predicted a greater intention to make use of ET's (Du Rand, 2015).

Some studies have found that educators' attitudes towards ET were largely positive and that perceived usefulness was the strongest predictor of these attitudes (Hart & Laher, 2015; Du Rand, 2015). A study conducted on 117 educators in Gauteng made use of the Attitudes towards Computers Scale and found that the majority of educators exhibited positive attitudes (Hart &

Laher, 2015). Hart and Laher (2015) then hypothesized that these positive attitudes would lead to high levels of use and integration. Du Rand (2015) adds that, along with perceived usefulness significantly predicting educators attitudes, the amount of technical support services educators receive and the ease of use of the technology also contribute to their positive attitudes. They explain that the two most commonly used applications were Facebook and WhatsApp. However, this study does not specify what the technology is being used for and in what context.

After reviewing some of the literature that exists in the field, it is important to understand the theoretical framework that the current study adopts. The complex interplay that exists between one's attitude and behaviour is therefore described in more detail using the following theories: the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and Planned Behaviour (Ajzen, 1991) as well as Rogers Diffusion of Innovations Theory (2003).

2.5 Theoretical Framework:

2.5.1 The Theory of Reasoned Action

Fishbein and Ajzen (1975) first describe the relationship between attitudes and behaviour in terms of the Theory of Reasoned Action (TRA). This theory, as illustrated in Figure 2.1, states that attitudes and subjective norms first influence a person's intention which finally influences their actual behaviour (Fishbein & Ajzen, 1975).

Subjective norms can be defined as a "socially accepted mode of conduct" (Ajzen, 1991, p.199). These refer to the beliefs a person holds with regards to how others may perceive them for

engaging or not engaging in a particular behaviour. These norms may be influenced by ones friends, educators, parents and other significant others (Ajzen 1991).

Figure 2.1 also illustrates that in addition to subjective norms a person's personal views and attitudes play a role in influencing their intention to either carry out a behaviour or not (Hale, Householder & Greene, 2002). Thus, forming a link between ones attitude and behaviour. In terms of the TRA an attitude is defined as "an affective response toward performing some behaviour and not toward some generalized attitude object" (Hale, et al., 2002, p.206). The theory therefore aims to describe whether or not one will engage in a type of behaviour rather than their attitude towards an object. This behaviour may however involve that object.

Ajzen (1991) then describes "intention" as how ready a person is to carry out the behaviour. "Intentions are assumed to capture the motivational factors that influence a behaviour; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour" (Ajzen, 1991, p.181). Ajzen and Fishbein (1980) further explain that between the time an intention is formed and the time person carries out the behaviour, the intention may change. Therefore, in order for one's true intention to be accurately measured, it needs to be measured as close to "performing the behaviour" as possible. The TRA views intention as the largest predictor of behaviour (Ajzen, 1991; Hale, et al., 2002). Hale and colleagues (2002) believe that in order to inflict true change, ones attitudes and subjective norms need to be guided from adolescence.

Hale and colleagues (2002) critically explain that the TRA only takes into account voluntary actions or behaviours which are performed after some thought and thus fails to acknowledge those behaviours that may be spontaneous or impulsive.

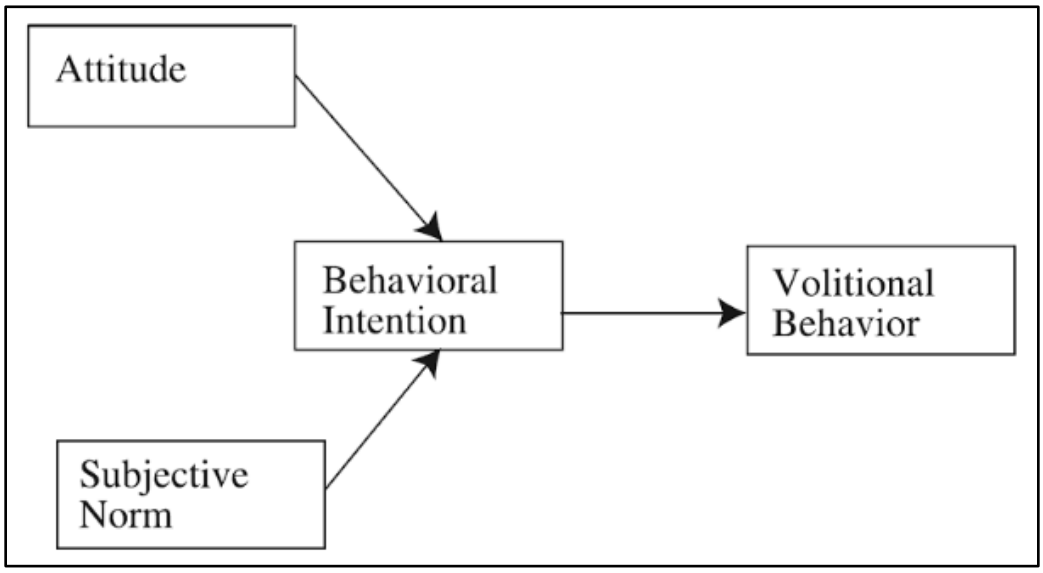


Figure 2.1: The Theory of Reasoned Action (Hale, et al., 2002, p. 261)

The TRA further breaks down attitudes and subjective norms and describes them as forming from beliefs. Figure 2.2 illustrates that attitudes are influenced by both, belief strength and belief evaluation (Ajzen, 1980). Belief strength refers to ones ideas or beliefs about the change their behaviour may bring about while belief evaluation refers to a person's ideas about the positive and negative aspects of the change brought about by their behaviour (Ajzen, 1980).

Similarly, subjective norms are influenced by both normative beliefs and ones motivation to comply (Ajzen, 1980). Normative beliefs refer to the opinions of those in society while motivation to comply illustrates ones need to comply with those societal opinions (Ajzen, 1980). This is illustrated in instances where individuals require the opinions of others before making decisions and when their original decisions and ideas are altered upon consultation with others.

In summary, the TRA proposes a strong link between ones attitudes and behaviours while acknowledging the influence social norms may have on ones willingness to perform certain behaviour. Ideas and beliefs about the changes behaviours may bring about and the ways in which others may respond to this come into play before any intention is formed (Ajzen, 1980). The TRA was expanded upon to form the Theory of Planned Behaviour, discussed in more detail below.

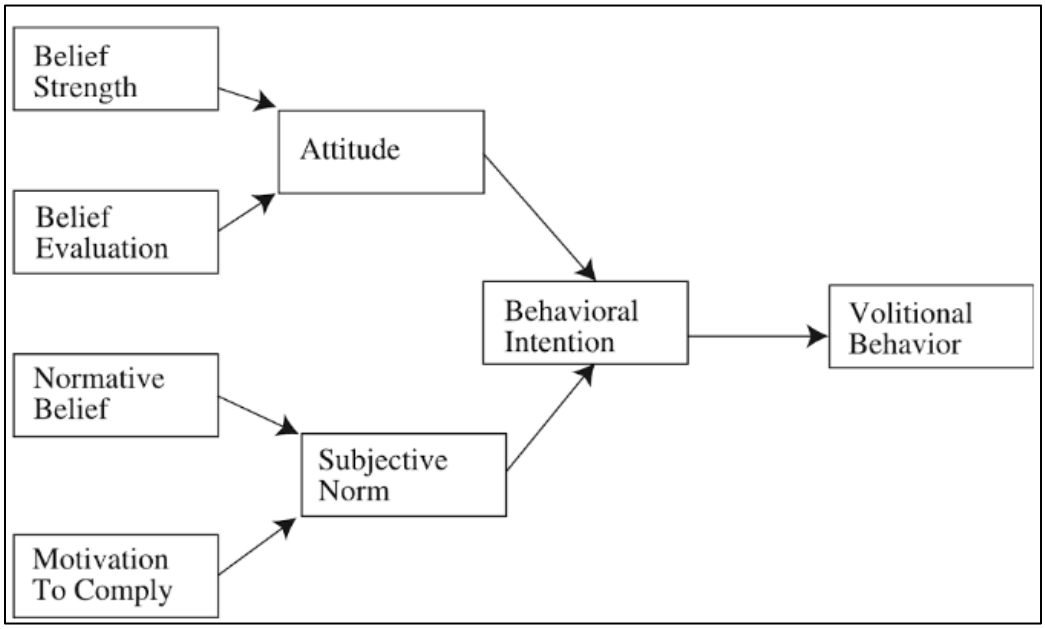


Figure 2.2: The expanded Theory of Reasoned Action (Hale, et al., 2002, p. 263)

2.5.2 The Theory of planned behaviour

The Theory of Planned Behaviour (TPB) was developed as an extension of TRA (Ajzen, 1991). This theory was developed in an attempt to account for one of the major drawbacks of the TRA: its inability to account for spontaneous and uncontrolled behaviours (Ajzen, 1991). As illustrated in Figure 2.3, the TPB expanded on TRA by looking at perceived behavioural control in addition to attitudes and subjective norms. Ajzen (1991) believed that looking at perceived behavioural control rather than actual control would lend more to the theory.

Perceived behavioural control describes a person's beliefs about whether or not they can perform a specific task or behaviour and how easy or difficult they believe that behaviour is (Ajzen, 1991; Knabe, 2012). Ajzen (1991) explains that "perceived behavioral control is most compatible with Bandura's (1977, 1982) concept of perceived self-efficacy which "is concerned with judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1982, p. 122, as cited in Ajzen, 1991, p.184).

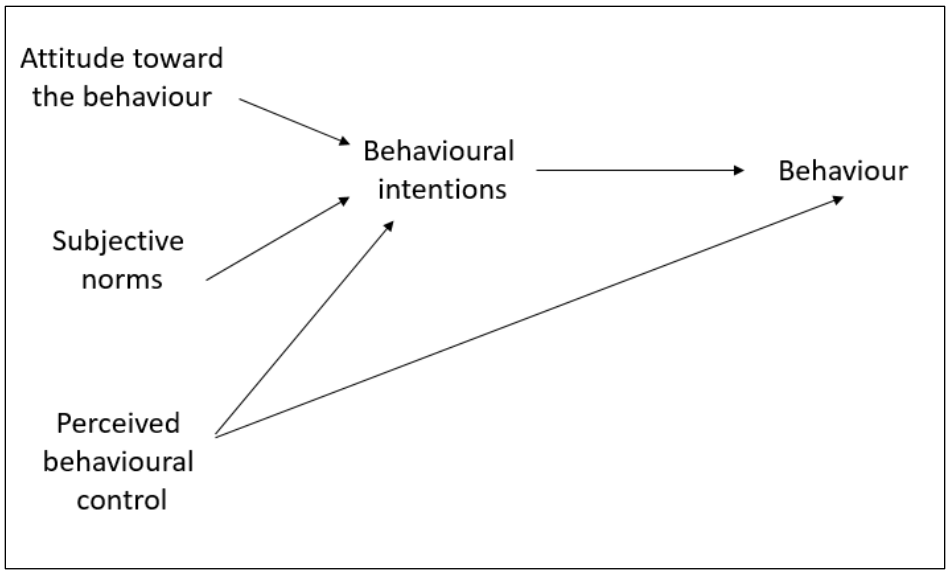


Figure 2.3: The Theory of Planned Behaviour (Ajzen, 1991)

Similarly, Rogers (1995) explains that while attitudes may predict the use of an innovation, a number of factors are first responsible for that attitude. Drawing on some of these same ideas, Roger's (1995) Diffusion of Innovations Theory is discussed in more detail below.

2.5.3 Roger's Diffusion of Innovations Theory

The current study primarily makes use of Roger's Diffusion of Innovations Theory as a basis for designing appropriate research questions. This theory describes the way in which objects, ideas

or technology, which are perceived as new by a group of people, spread within that population (Rogers, 1995). As illustrated in Figure 2.4, Rogers describes a five step process leading from the time a person is exposed to a new innovation to the point of evaluating the innovation after usage.

Firstly, the Knowledge stage describes the point at which a person is exposed to an innovation, therefore they must have access to it and a perceived sense of competence towards that innovation (Rogers, 1995). Computer competence can be defined as a person's ability to use a range of technologies for a variety of purposes (van Braak et al., 2004). Perceived competence therefore refers to a person's own understanding of their ability to use the technology. In addition to this, the wider social system is also said to play an influential role in the formation of attitudes (Rogers, 1995). The idea of the social system that Rogers (2003) describes refers to whether or not the innovation or technology fits into ones social and cultural norms and that this has an effect on the attitudes a person holds.

Also seen in Figure 2.4, knowledge, the social system and access along with usefulness all influence the Persuasion stage. Persuasion describes the formation of positive or negative attitudes.

Perceived usefulness can be explained in terms of five factors: (1) Relative advantage: a person must perceive the new innovation as having a relative advantage over previous innovation; (2) Compatibility: the innovation must be consistent with the individuals existing values; (3) Complexity: ideas that are easier for to understand are adopted faster; (4) Trialability: the extent

to which the person has explored or experimented with the innovation; and (5) Observability: whether or not observable results can be seen (Rogers, 1995). For the purposes of this study, the factors Relative advantage, Compatibility, Complexity and Observability will be grouped together and referred to as perceived usefulness. Trialability could not be investigated through a self-report scale. Rogers (2003) further explains that one's level of perceived usefulness may be influential in predicting the rate at which that technology or innovation is used and integrated and thus paramount to decision making.

Figure 2.4 illustrates that once the Knowledge and Persuasion stages are passed, a person moves on to the Implementation stage. This is where a decision about the innovation is made. Rogers (2003) first clarifies that an invention refers to when an idea is discovered whereas an innovation describes the process towards the use of an idea. The decision can either be to reject or to adopt the innovation. Adoption refers to when a person makes use of the innovation after deciding that it is the best way forward while rejection refers to the opposite (Rogers, 2003). Adoption of an

innovation can either lead to continued use or discontinuous use and rejection of an innovation can similarly, either leads to continued rejection or adoption at a later stage (Rogers, 1995).

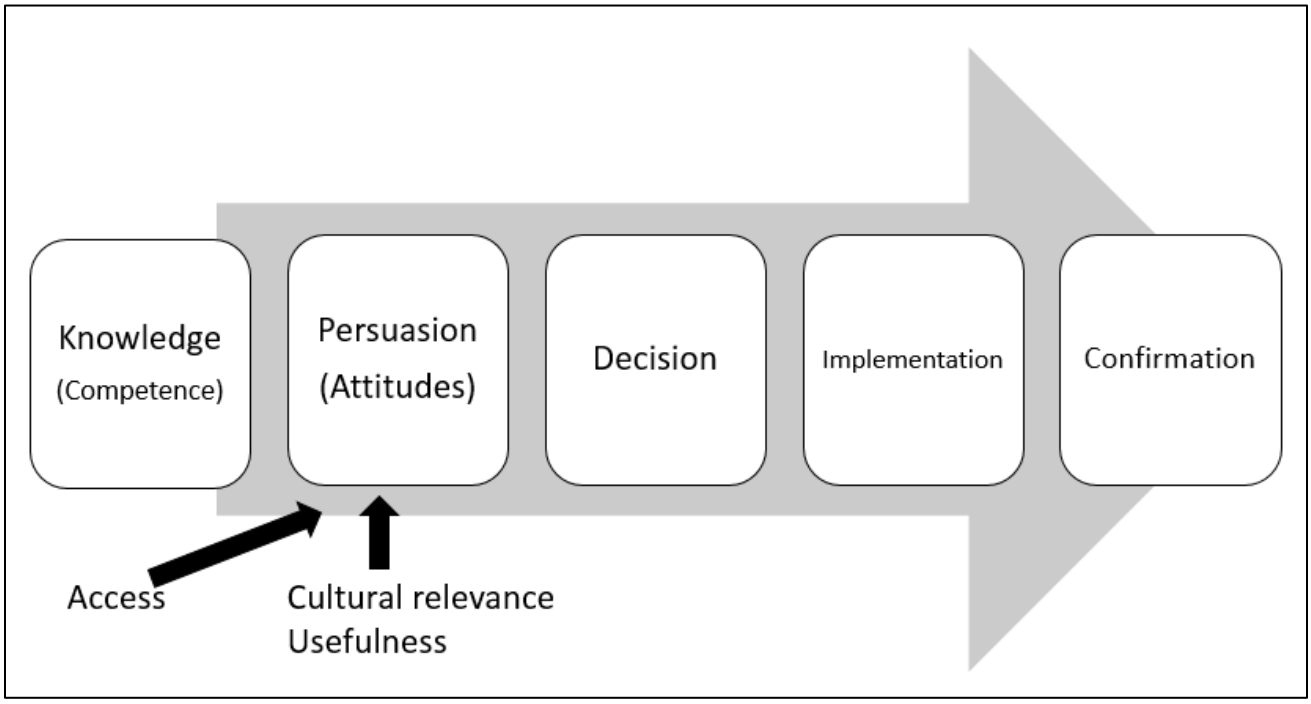


Figure 2.4: Roger's Diffusion of Innovations Theory. (Rogers, 2003)

Using Roger's Diffusions of Innovation Theory, Albirini (2006) developed a scale called the Attitudes towards Computer Scale (ATCS). The ATCS makes use of both the Knowledge and Persuasion stages and investigates perceived usefulness, access to computers, educator competence, cultural relevance and educator's attitudes towards computers (Albirni, 2006). This theory has been used as a basis for a number of other studies summarized by Sahin (2006), relating to technology and education.

Both Ajzen's and Rogers's models, highlight the importance of social factors, ease of use and the effect of ones attitudes on behaviour. Not only do both models place emphasis on the relationship between attitudes and behaviour but also agree on the direction of this relationship.

They explain that the behaviour comes after attitude formation. These ideas are pertinent to the understanding of why educators may or may not use technology and is thus used as the major theoretical framework of the current study. A review of international and South African literature explaining these factors in terms of educators and ET is presented below.

2.6 Conclusion

It is clear that while a large amount of information exists regarding an educator's level of access and attitudes to ET in terms of international literature, there is still room for investigation within the South African context. While many studies focus on either access, attitudes or integration, the current study not only investigate all three factors and looks at the relationship between these factors but it also further breaks down access into home access and school access and use and integration into five different contexts in an attempt to further understand these factors. Further dividing these variables will more accurate conclusions to be drawn.

The current study also looks at which of the following factors best predicts educators' attitudes: perceived competence; perceived usefulness and cultural relevance. This will aid a more in depth understanding of an educator's adoption or rejection of ET and the factors that may influence this decision. The study therefore aims to further investigate the effects that both educator attitudes and level of access have on the use and integration of ET's. With the hope that this can assist in informing teaching policy, practice and research in South African schools.

Chapter three provides a deeper look at the specific methodology applied to the current study.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

After having discussed the various literature available on the topic of educational technology, the current chapter begins with an outline of the research design and sampling methods used in order for the relevant quantitative data to have been collected in the appropriate time frame. The current sample will be described using the following descriptive factors: gender, type of school, grades currently taught, years of teaching experience and educator's preferred methods of teaching. The current study used a combination of two instruments, namely the Attitudes towards Computer Scale and the Information and Communication Technology Survey. These instruments will be described in terms of their scales, number of items and response format. Reliability coefficients of the original scales will then be quoted and compared to the current study. Minor changes made as a result of piloting the complete combined questionnaire will be outlined. The chapter will move on to a thorough explanation of the procedure followed to applying for ethical approval at the University of the Witwatersrand and the Gauteng Department of Education. Lastly, the data analysis techniques carried out using SPSS, version 23 (IBM, Corporation, 2016), are described in terms of both descriptive and inferential statistics, before moving on to the results chapter.

3.2 Sample

Non-probability convenience sampling was used as educators completed the questionnaires on a voluntary basis. A total of 240 questionnaires were sent out to eight schools and 119 were completed and returned. Thus a 49.6% response rate was achieved. Like any study, the current

study aimed for the highest response rate possible. According to Burton (2000) face to face communication yield a higher response rate than email or telephonic communication. The current study used a combination of the two where principals were contacted via email and assisted with a face to face explanation of the research. Educators then volunteered to complete the paper questionnaire and return it to the principal within a two-week period. Babbie and Rubin (2011, p. 388) explain that "a response rate of at least 50% is usually considered adequate for analysis and reporting". A response rate of 49.6%, as obtained in the current study, falls just under this cut off but can be considered adequate. Thus, the final sample consists of 119 educators from eight primary and high schools in the Ekurhuleni region and greater Johannesburg area. These areas were primarily chosen on a convenience basis but also according to the schools that were willing to participate as participation was dependent on the principal. Due to the limited number of schools willing to participate, educators from both, private and public schools were included in the sample. The final sample thus consisted of three private schools and five public schools which ensured a larger sample size. Table 3.1 summarizes all descriptive data collected for this particular sample of educators. Descriptive categories included gender, teaching experience, type of school and highest level of qualification. Educators preferred methods of teaching also appears in this table.

As reported in Table 3.1, the final sample consisted of 119 educators. These educators had a mean age of 40 years and consisted of 14 male educators (12%) and 105 female educators (88%). A considerable number of these educators have been teaching for more than 20 years (33%) while 24% of the sample are still in their first 5 years of teaching. A large majority of the sample (82%) currently teach in public schools with 79% of the entire sample stating that ET is

currently being used at their school. The majority of these educators reported using active discussion (75%) as one of their preferred methods of teaching while 41% reported using computer assisted instruction, which was the second most popular method.

Table 3.1

Descriptive data for sample

Variable	Frequency	Percentage
Gender		
Male	14	12
Female	105	88
Teaching experience		
1-5	29	24
6-10	21	18
11-15	23	19
16-20	7	6
20+	39	33
School		
Public	98	82
Private	21	18
Highest qualification*		
Higher Diploma in Education	24	20
BA	11	9
M. Ed	7	6
PCGE	10	8
B. Ed	25	21
B. Ed Hons	14	12
Matric	3	3
BSc	5	4
B. Comm	6	5
Preferred method of teaching		
Active discussion	75	89
Collaborative activities	37	31
Demonstration	52	44
Hands-on learning	39	33
Lecturing	33	28
Role playing	20	17
Computer assisted instruction	49	41

*Note: *14 participants chose not to answer this item*

3.3 Research design

The current study used questionnaires as its only method of data collection and thereafter employed statistical and mathematical techniques to analyze the data. This study is therefore quantitative in nature (Babbie, 2010). Babbie (2010) further explains that quantitative may employ the use of polls, surveys and/ or questionnaires as a means of data collection.
Olsen and George (2004, p.7) explain that the information collected in cross sectional studies "represents what is going on at only one point in time". The current study is therefore cross sectional in nature and non-experimental as questionnaires were handed out to educators at one point in time with no manipulation of the IV (Huck, 2012).

Stangor (2011, p.180) explains that "correlational research is designed to test research hypotheses in cases where it is not possible or desirable to experimentally manipulate the independent variable of interest". The current study employed no manipulation. Stangor (2011, p. 180) then goes on to mention that "correlational methods range from analysis of correlations between a predictor and an outcome variable to multiple regression analysis assessing the patterns of relationships among many measured variables". The current study makes use of multiple regression analyses along with descriptive statistics to investigate the relationships between educator's attitudes towards ET; access to different types of ET; levels of ET usage; ET integration; perceived competence; cultural relevance and perceived usefulness, and is therefore said to be correlational in nature.

3.4 Instruments

The current study made use of a combination of two scales. This included a demographics section and a combination of the Attitudes towards Computer Scale as well as the Information and Communication Survey. These scales were adapted and piloted in order to suit the South African context. The demographics section requested the educator's gender, type of school they currently teach at, the grades they currently teach, the years of teaching experience they have and their preferred methods of teaching.

The Attitudes towards Computer Scale (ATCS) developed by Albirini (2006) was used to measure educator's attitudes towards ET, perceived usefulness, cultural relevance and perceived competence. An adapted version of the Information and Communication Technology Survey used by Gulbahar and Guven (2008) on a Turkish population was used to measure both, ET access as well as integration.

A pilot study was conducted as a number of items were added and re-organized in the access and use and integration section of the questionnaire. Three experts in the area and five volunteers who could potentially have been participants in the study were asked to complete the questionnaire and report areas of concern with regards to content of the questionnaire, understanding of items and response format, sentence structure and ease of completion. Upon feedback, two questions were reworded while the rest of the questionnaire was reportedly completed with ease. Minor changes were therefore made for the final questionnaire. These changes are explained below.

3.4.1 The Attitudes towards Computers Scale (ATCS)

The ACTS was developed in 2006 by Albirini. The scale is based on Rogers Diffusions of Innovations Theory and was used on a sample of Syrian educators (Albirini, 2006). Adapted versions of this scale have been used in a number of international and South African studies (Al-Zaidiyeen, Mei & Fook, 2010; Hart & Laher, 2015; Samak, 2006). Albirini (2006) used this scale to determine educator's attitudes, their perceived competence, ideas on cultural relevance, access to computers and computer attributes. The term "attributes" consisted of a number of questions, based on Rogers Diffusion of Innovations Theory and asked about relative advantage, compatibility, complexity and observability (Albirini, 2006). Hart and Laher (2015) used an adapted version of this scale to better suite a South African population. The current study also made use of these adaptations.

The ATCS consists of six sections and can be completed in less than 20 minutes. Sections 1-3 are answered on a five point Likert type scale from Strongly Disagree (1) to Strongly Agree (5). Section one measures educators attitudes towards ET (20 items); section two measures computer attributes (perceived usefulness in this study) (18 items) and section three measures perceived cultural relevance (16 items). Section four measures perceived competence (15 items) and makes use of a four point Likert type scale from No competence (1) to Much competence (4). Section five, which measures access to ET was removed from the questionnaire. Rather, access questions were included in the usage scale to determine a more thorough level of access at home and school. Section six consists of 8 demographic questions requesting age, experience, gender, preferred method of teaching, number of years teaching. Also, a question about household

income has been removed as this is not relevant to this particular study and may be uncomfortable for participants to answer. After piloting the questionnaire, the word proliferation in two questions was changed to "increasing" for easier understanding. Also, a question as to whether or not a school uses ET was added in the demographic section to accommodate schools where ET may not be used currently.

3.4.1.1 Reliability

Albirini (2006) reported the following Cronbach alpha reliability coefficients: computer attitudes (0.9); computer attributes or usefulness (0.86); perceived cultural relevance (0.76) and computer competence (0.94). The scale was also used on a South African sample of 117 educators where the following Cronbach alpha coefficients were reported: computer attitudes (0.85); perceived usefulness (0.82); cultural relevance (0.73) and competence (0.92) (Hart & Laher, 2015). Other international studies found similar results ranging from .94 for perceived competence to .81 for cultural relevance (Samak, 2006).

The following Cronbach alpha reliability coefficients were obtained in this study: Attitudes: .893; Perceived usefulness .883; Cultural relevance: .549; Perceived competence: .911. Items 14 and 15 in the cultural relevance subscale were removed in order to increase the reliability of this scale to .717.

3.4.2 The Information and Communication Technology Survey

The original Information and Communication Technology Survey consists of six sections (Gulbahar & Guven, 2008). Section one measures educators' level of perceived competence

with regards to software usage (13 items); section two measures educators level of perceived competence with regards to the usage of instructional tools and materials (11 items); section three measures educators preferred methods of professional development with regards to information and support resources (9 items); section four measures educators perceptions of factors that encourage technology usage and lastly (8 items); section five measures educators perceptions about ET use (18 items); and lastly sections six measures educators perception about the barriers to that exist with regards to technology usage (19 items) (Gulbahar & Guven, 2008). This scale was originally used on a sample of 326 Turkish educators (Gulbahar & Guven, 2008).

For the current study, sections three to six were removed as these questions are not directly related to ET integration and similar questions are asked in the ATCS. Section one measured software usage such as word processors and search engines. This section consists of 13 questions with response options of "good"; "average" and "none". The response choices for this section were changed to "frequently"; "sometimes" or "never" in order to measure level of integration and not perceived competence. Section two consists of 12 questions about usage of instructional tools and materials where respondents can choose from "frequently"; "sometimes" or "never" and a (Gulbahar & Guven, 2008). Two additional items were included, namely smartphones and tablets while one item was removed from the original questionnaire. This items asked about and "opaque projector and/or document camera" which appeared unfamiliar to educators as during the pilot study.

Two additional columns were added to each item in order to measure level of access at home and at school in order to answer the questions proposed in the current study. In order to better

understand the reason for usage of technology, appropriate and relevant items in the scales have also been replicated to form separate sections regarding use for teaching purposes, research purposes; communication with the principal and colleagues; communication with parents and for personal social communication purposes.

3.4.2.1 Reliability

Gulbahar and Guven (2008) reported a Cronbach alpha reliability coefficient of .93 for software usage and a Cronbach alpha reliability coefficient of .81 for usage of Instructional Tools and Materials. The current study reported Cronbach alpha coefficients of .805 and .736 for the respective scales.

The current study also reported an acceptable Cronbach alpha coefficients for the additional access (.920) scale. This scale was divided into two sections: access at home (.852) and access at school (.883).

3.5 Procedure

In order to gain access to educators, principals of the various schools were approached via email using the principals approach letter (See appendix A). In the case of public schools, permission to conduct the research was first received from the Gauteng Department of Education (GDE) (See appendix F). Once permission was received from the GDE and the principal (in the form of a signed consent form), questionnaires were distributed to the various schools and collected two weeks later. Principals assisted with the handing out, explanation and collection of questionnaires. Each questionnaire was handed out with an envelope attached to a participant

information sheet (See appendix B and C). On completion, educators placed the questionnaire in the envelope and sealed it, thus preserving anonymity and confidentiality. Data from the questionnaires was entered into MS excel and then analyzed using SPSS version 23 (IBM, Corporation, 2016).

3.7 Ethical considerations

Ethical clearance was obtained from the Human Research Ethics Committee (HREC Non-Medical) of the University of the Witwatersrand (Protocol number: MEDP/16/005 IH) and permission from the Gauteng Department of Education was obtained for all government schools that participated in this study. Consent from the principals of each of the schools was obtained with regards to investigating educators' attitudes towards ET and their level of ET usage. In order for the details of the participating schools to remain truly confidential, these signed forms have not been included as part of the appendices. Principals assisted with the handing out and collection of questionnaires. Educators who participated in the study did so on a voluntary basis and their completion of the questionnaire was seen as consent. Participants were informed, using the participant information sheet, that the questionnaire would take approximately 25 minutes to complete and that no risks or benefits are involved in participating.

All information obtained remained confidential and only the supervisor and researcher had access to raw data. Anonymity was guaranteed as no names appeared on the questionnaire and completed questionnaires were placed in an envelope (sealed by the educator) and collected at a point in time by the researcher. All data was stored on a password-protected computer to which only the researcher and her supervisor had access. Participants were informed that the

information obtained may be presented at conferences and/or published in journal articles or books but that the anonymity of the participants and the schools will be preserved. All participating schools will receive feedback in the form of a summary, upon submission.

3.8 Data analysis

All data was analysed using SPSS (Version 23, IBM, 2016). Internal consistency reliability of all scales were determined by Cronbach alpha reliability coefficients. Thereafter, frequencies were used to explain all nominal data such as age; gender; type of school; grades taught and years of teaching. For the two scales used in the study, the reversed scored items were reversed and scales were totalled. The mean, standard deviation, minimum and maximum values and skewness coefficients were determined for educators' attitudes towards ET, perceived cultural relevance, perceived usefulness, perceived competence; software usage; usage of instructional tools and access to various ET's. The above descriptive statistics were used to answer research questions one, two (2.1, 2.2, 2.3) and three.

Research questions 2.4, four and five required the use of inferential statistics as these included more than one variable and were predictive in nature (Huck, 2012). Research question 2.4 asks which of the three independent variables (cultural relevance; perceived competence and perceived usefulness) best predicts educator attitudes. This question was analysed using multiple regression analysis. The assumptions of normality, multicollinearity and homoscedasticity were tested before conducting multiple regressions. The data was also examined for outliers and influential points. The hypothesis used for question 2.4 was as follows:

$H_{\circ}$: β_1 Cultural relevance = β_2 Perceived competence = β_3 Perceived usefulness

H_1: At least one $\beta_i \neq 0$ for some i = 1, 2, 3

Similarly, question four asks which variable (level of access; educator attitudes and/or perceived competence) best predicts use and integration of ET. This question was analysed using multiple regression analysis. The assumptions of normality, multicollinearity and homoscedasticity were tested before conducting multiple regressions. The data was also examined for outliers and influential points. The hypothesis used for question four was as follows:

H_o: β_1 Access to ET = β_2 Educator attitudes = β_3 Perceived competence

H_1: At least one $\beta_i \neq 0$ for some i = 1, 2, 3

Question five then proceeds to further separate attitudes into its predictive factors, as outlined by Rogers (2003) and again asks which variable (level of access, perceived competence (knowledge), perceived usefulness and /or cultural relevance) best predicts use and integration of ET. The assumptions of normality, multicollinearity and homoscedasticity were tested before conducting multiple regressions. The data was also be examined for outliers and influential points. The hypothesis used for question five was as follows:

H_o: β_1 Access to ET = β_2 perceived usefulness = β_3 Perceived competence = β_4 Cultural relevance

H_1: At least one $\beta_i \neq 0$ for some i = 1, 2, 3, 4

3.9 Conclusion

This study is quantitative in nature and makes use of a non-experimental cross sectional design. A non-probability convenience approach resulted in a sample size of 119 educators from eight different primary and high schools in Gauteng. Educators from both public and private schools

were included in the sample due to the limited number of schools willing to participate. The Attitudes Towards Computer Scale (ATCS) developed by Albirini (2006) and the Information and Communication Technology Survey used by Gulbahar and Guven (2008) were combined and edited in order to form a complete questionnaire measuring educators levels of access to ET at home and at school; their attitudes; levels of perceived competence; perceived usefulness of ET; their opinions about the cultural relevance of ET as well as their levels of ET use and integration in five different contexts. This questionnaire was piloted on five educators after which minor changes were made. Ethical permission was received from the various institutions before data collection began. All the data was collected at one point in time with the assistance of school principals. This was then entered into MS Excel and analyzed using SPSS version 23 (IBM, Corporation, 2016). All descriptive statistics were conducted for nominal data and inferential statistics included multiple linear regression analysis. A presentation of the results obtained will follow in the next chapter.

CHAPTER FOUR: RESULTS

4.1 Introduction

As outlined in chapter three this study was quantitative in nature and required the use of self-report questionnaires. All the data was collected at one point in time as questionnaires were dropped off at all eight schools on a particular day and collected two weeks after. Educators placed their completed questionnaires into individual envelopes after which it was sealed and returned to the principal. No names appeared on envelopes or question papers and so anonymity was guaranteed. A total of 240 questionnaires were distributed amongst the eight schools and 119 were completed and returned on a voluntary basis by educators.

Scores for all items were recorded on Microsoft Excel, on a password protected computer, after which sections were totaled. All the data was cleaned and rechecked before analysis began using SPSS version 23 (IBM, Corporation, 2016).

4.2 Access to ET

The first research question explored educators levels of access to various hardware and software items. Educators levels of access to ET was assessed using a self-report scale with the option of "yes" or "no' for access at home and the same option of "yes" or "no" indicating access at school. Table 4.1 shows the percentage of educators who reported having access to the various hardware and software items listed in the questionnaire, both at home and at school.

Table 4.1

Educators who reported having access to various educational technologies (hardware and software items) at home and school.

Educational Technology	Access at home		Access at school	
	Frequency	Percentage	Frequency	Percentage
Software Item				
Word Processors	111	93	100	84
Spreadsheets	98	82	92	77
Presentation software	84	71	88	74
Databases	54	45	57	48
Computer aided instruction software	49	41	62	52
Search engines	105	88	95	80
Electronic mail	108	91	90	76
Discussion lists and newsgroups	56	47	50	42
Chat forum- WhatsApp	112	94	76	64
Chat forum- Facebook	96	81	48	40
School communicator	-	-	79	66
Electronic encyclopedia	71	61	66	56
Instructional Films	88	74	82	69
Hardware Item				
Smartboard	-	-	49	41
Overhead projector	-	-	62	52
Multimedia computer/ laptop	44	37	74	62
Projector system	-	-	76	64
Internet/Web environment	72	61	86	72
Television/ Video	76	64	63	53
Radio cassette recorder	31	26	37	31
Video camera	42	35	19	16
Slide projector	11	9	18	15
Tablets	63	53	37	31
Smartphones	77	64	68	57
Printed materials	72	61	97	82
Mean		60.86		56.16

79% of educators reported that ET is currently being used at their school while 7% chose to leave this item blank. Only 0.8% of educators reported having access to all 21 listed ET items at home while a larger 5.9% of these educators reported having access to all listed items at school.

As illustrated in Table 4.1 high levels of access were reported for the following hardware and software items at home: Word (93%), WhatsApp (94%), television/ video (64%), smartphones (56%), email (91%), spreadsheets (82%). High levels of access were reported for MSWord (84%) and popular Search engines (80%) at school. Educators reported moderate levels of access to items such as smartboards (41%) and tablets (31%) at school.

Overall, higher access to ET items was reported for access to ET at home ($\bar{x}$ =13.44, *SD* = 4.977) compared to at school ($\bar{x}$ = 11.81, *SD* = 5.605). The mean represents the average number of items to which participants had access to out of a total of 21 items at home and 25 items at school. In order to statistically investigate whether a significant difference occurred between ET access at home and ET access at school, a matched pair's t-test was conducted. A matched pair's t-test is used to investigate significant differences in instances where two different measurements are taken for each participant (Huck, 2012). The total possible value for ET access at school (25 items), as opposed to the total possible value ET access at home (21 items), for each participant comprised of four more options that access at home. These four items were therefore removed in order to conduct a true matched pair's t-test. The four items removed were: the school communicator, smart board, overhead projector and projector system. The following hypothesis was therefore tested:

H_o: $\bar{x}$ ET access at home = $\bar{x}$ ET access at school

H_1: $\bar{x}$ ET access at home $\neq$ $\bar{x}$ ET access at school

Table 4.2 shows that there is a significant difference between the mean value for access at home and access at school. Educators reported higher levels of access at home ($p < 0.01$) with a mean difference of 1.630 and a small Cohen's *d* effect size of 0.27.

Table 4.2

Paired t-test comparison of ET access at home and ET access at school

	Mean	Std. Deviation	SEM	95% confidence interval of the difference Lower	Upper	t	df	Sig (2 tailed)
Home access - School access	1.630	6.117	.561	.520	2.741	2.907	118	.004**

** $p < 0.01$; *$p<0.05$

4.3 Attitudes and ET

The second research question was divided into five parts. The first four parts were concerned with educator's attitudes, perceived usefulness, cultural relevance and perceived competence, respectively. Section five was predictive in nature and asked about which factor (perceived usefulness, cultural relevance and perceived competence) best predicted educator attitudes.

4.3.1 Educator attitudes

Educator's attitudes towards ET were measured using the ET attitudes scale developed by Albirini (2006). This scale is made up of 20 items, 10 of which had to be reverse scored before analysis could begin. Participants had five choices, ranging from Strongly Disagree (1) to Strongly Agree (5), therefore making the lowest possible score 20 and the highest possible score

100 for each educator. Higher scores thus indicated more positive attitudes and lower scores indicated more negative attitudes.

As illustrated in Table 4.3, educators displayed positive attitudes towards ET with a mean score of 82.

Table 4.3

Descriptive statistics for educator's attitudes towards ET scale.

Item number	Mean	Standard deviation
1	4.04	.960
2*	4.14	.968
3	4.33	.793
4*	4.17	.968
5	4.19	.840
6*	4.37	.882
7	3.97	.999
8*	4.34	.932
9	3.37	1.065
10*	4.57	.787
11	3.46	.972
12	4.50	.609
13*	4.69	.533
14	4.24	.710
15*	4.05	.919
16*	3.83	1.122
17	4.18	.799
18*	4.55	.593
19	4.34	.694
20*	4.69	.548
Total	**81.69 (4.08)**	**8.812 (0.4406)**

* Reverse scored

Educators agreed most strongly with items 13 ($\bar{x}$ *= 4.69, SD = .533*) and 20 ($\bar{x}$*= 4.69, SD = .548*), where educators agreed that they would need computers and other educational technology in their classrooms at some point and agreed that they intended to use computers and

other educational technology in the near future, respectively. Educators seemed to disagree the most with the statement nine ($\bar{x}$ = *3.37, SD = 1.065*) which read "students must use computers and other educational technology in all subject matter" and thus believed ET was not appropriate in all contexts. Table 4.3 shows educator mean and standard deviation values for each item. Mean values closer to five indicate more positive attitudes.

4.3.2 Cultural relevance

This research question investigated educator's perceptions of the cultural relevance of ET. This was assessed using the cultural relevance scale, developed by Albirini (2006), which consists of 16 items, 6 of which had to be reverse scored prior to analysis. As explained previously, items 14 and 15 were removed in order to increase the reliability of the scale. Participants had five choices, ranging from Strongly Disagree (1) to Strongly Agree (5), therefore making the lowest possible score 16 and the highest possible score 80 for each educator. Higher scores thus indicated that educators more strongly about the fact that ET is culturally relevant in South Africa while lower scores indicated the opposite.

Results for cultural relevance items are presented in Table 4.4. The mean value for the total cultural relevance scale was reported at 49 thus indicating a somewhat neutral feeling from educators about whether or not ET is culturally relevant in a South African context. The highest scores were reported for questions one ($\bar{x}$ = *4.22, SD =.931*) and two ($\bar{x}$ = *4.69, SD = .484*) indicating that educators agreed with these statements. Item one asked educators their opinions about whether or not ET will make a difference in their classrooms, schools or lives and item two read: "students need to know how to use computers and other educational technology for their future jobs".

Table 4.4

Descriptive statistics for educator's perceptions of the cultural relevance of ET.

Item number	Mean	Standard deviation
1*	4.22	.931
2	4.69	.484
3*	2.95	1.126
4	3.41	.989
5	3.61	.979
6	3.74	.938
7	3.67	1.042
8*	2.72	1.255
9	3.84	.933
10*	3.49	1.037
11*	2.46	1.170
12	3.89	.779
13*	3.31	1.177
16	3.41	.995
Total	**49.18 (3.51)**	**6.515 (0.465)**

** Reverse scored*

4.3.3 Perceived usefulness

This research question investigated educator's perceived usefulness of ET. The scale measuring educators ideas on the usefulness of ET consists of 18 questions of which 8 questions were reverse scored prior to analysis. Again, five options ranging from Strongly Disagree (1) to Strongly Agree (5) was given. The lowest possible score was therefore 18 and the highest score obtainable by any educator was 90. Scores indicated how useful educators believe ET is with regards to teaching and learning purposes. Higher scores thus explain that educators believe ET's are very useful while lower scores indicate the opposite. Table 4.5 presents educators perceptions on the usefulness of ET.

Table 4.5

Descriptive statistics for educators perceived usefulness of ET.

Item number	Mean	Standard deviation
1	4.03	.753
2	3.88	.869
3*	3.99	.970
4	4.23	.669
5*	4.02	.974
6*	4.55	.686
7	3.88	.818
8*	3.61	1.151
9	3.64	.929
10	3.72	.815
11*	4.39	.814
12	4.37	.723
13*	4.02	.873
14	3.88	.926
15*	4.73	.660
16	4.06	.857
17*	4.68	.663
18	4.21	.849
Total	**73.65 (4.09)**	**8.850 (0.492)**

**Reverse scored*

A mean score of 74 (*SD = 8.850*) was recorded thus indicating that educators agree with the idea that ET may be a useful tool to enhance teaching and learning. Educators agreed most strongly with item 17 (*x = 4.68, SD = .663*) which asked whether educators have seen computers and other educational technology being used for educational purposes. Educators agree with this.

4.3.4 Perceived competence

This question asked about educator's level of perceived competence with regards to various computer related tasks. The final section of Albirini's (2006) scale was used to measure educator's level of competence. As this was a self-report questionnaire this score reflects their level of perceived rather than actual competence. This scale consisted of 15 questions with four

options ranging from No competence = 1 to Much competence = 4. As illustrated in Table 4.6, the lowest obtainable score by an educator was 15 while the highest possible score was 60. Higher scores thus indicate higher levels of competence while low scores indicate little to no perceived competence. Questions were phrased to gage educator's levels of competence in performing various computer related tasks. These tasks ranged from using computers for grade keeping to operating a spreadsheet program and removing computer viruses.

Table 4.6

Descriptive statistics for educators perceived competence regarding ET.

Item number	Mean	Standard deviation
1	2.92	.979
2	3.71	.526
3	3.81	.436
4	3.74	.497
5	3.34	.826
6	3.20	.869
7	2.45	.945
8	3.71	.507
9	3.70	.545
10	2.95	.872
11	2.54	.955
12	3.32	.833
13	2.55	.998
14	3.44	.809
15	2.42	1.054
Total	**51.36 (3.42)**	**8.339**

Table 4.6 presents educators perceived levels of competence. A mean score of 51 (*SD = 8.339*) was reported therefore indicating high levels of perceived competence by educators. Educators reported the lowest levels of competence with items seven (*x = 2.45, SD = .945*) and 15 (*x = 2.42, SD = 1.054*) which read "to operate a database program (e.g., Access)" and "to remove a computer virus", respectively. Educators reported the highest levels of competence for items

three ($x = 3.81$, $SD = .436$) and four ($x = 3.74$, $SD = .497$). These items asked about using a computer keyboard and operating a word processing program such as MS Word, respectively.

4.3.5 Cultural relevance, perceived usefulness and/ or perceived competence as predictors of educator attitudes

The final part of research question two asked about which of the above stated factors best predicts educator attitudes. Before conducting multiple linear regression analysis, assumptions of normality, multicollinearity and homoscedasticity had to be met (Osborne & Waters, 2002). Normality refers to whether or not the data is normally distributed. Visual inspection of a histogram indicated that the data in question is normally distributed. "Multiple regressions can only accurately estimate the relationship between dependent and independent variables if the relationships are linear in nature" (Osborne & Waters, 2002, p.1). The residual vs predicted plot for the current data depicts a linear relationship between independent and dependent variables, thus meeting the assumption of multicollinearity. "Homoscedasticity means that the variance of errors is the same across all levels of the IV" (Osborne & Waters, 2002, p.4). Through visual inspection of a predicted vs residual scatter plot it was observed that residuals were randomly scattered around the horizontal line rather than concentrated at a certain point, thus meeting the assumption of homoscedasticity.

After meeting all three assumptions a multiple linear regression was conducted in order to better understand the predictive nature of the above mentioned factors. This regression indicated that 65% of educator attitudes can be explained by these predictive factors. As depicted in Table 4.7, Perceived usefulness ($p < 0.01$) was the only significant predictor of educator attitudes. The

standardized Beta coefficient of perceived usefulness was .710 which is significantly larger compared to standardized Beta coefficients of cultural relevance and perceived competence.

Table 4.7

Multiple regression analysis for educator attitudes (DV) and perceived usefulness (IV), cultural relevance (IV) and perceived competence (IV)

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	20.177	4.545		4.440	.000**
Perceived usefulness	.707	.083	.710	8.524	.000**
Cultural relevance	.163	.106	.121	1.544	.125
Perceived competence	.027	.063	.026	.434	.665

*Note: * p < 0.05; ** p < 0.01*

4.4 Use and integration of ET

Educators rated their levels of ET use and integration by answering how often they use certain hardware and software items. Educators chose from three options: frequently, sometimes and never. An overall total for use and integration as well as totals for the five different contexts in which educators may use ET were calculated. As illustrated in Table 4.8, educators reported average levels of ET use and integration for educational and teaching purposes ($\bar{x}$ = 24.49, *SD* = 12.122), lesson planning purposes ($\bar{x}$ = 11.98, *SD* = 4.184), communication with principal and colleagues ($\bar{x}$ = 5.63, *SD* = 2.911) and for all personal and social communication ($\bar{x}$ = 7.87, *SD* = 3.239). However, poor levels of use and integration were reported for communication with parents and learners ($\bar{x}$ = 3.76, *SD* = 2.721) which may be due to ethical issues rules surrounding this communication. As each of these categories did not have the same number of items it is

important to understand where this mean fits in with regards to highest and lowest possible scores.

Table 4.8

Descriptive statistics for levels of use and integration in five different contexts

Context	Mean	Std. deviation	Used frequently	Used sometimes	Never used
Educational and teaching	24.49	12.122	50	25	0
Lesson planning	11.98	4.184	20	10	0
Comm. with parents and learners	3.76	2.721	14	7	0
Comm. with principal and colleagues	5.63	2.911	12	6	0
Personal social comm.	7.87	3.239	12	6	0

The highest levels of use and integration ET's for educational and teaching purposes were reported for software items such as word processors (74%), search engines (71%), electronic mail (71%) and chat forums such as WhatsApp (68%); and hardware items such as multimedia computers (64%) and projector systems (58%). High levels of usage were also reported for printed materials (63%) and the internet/ web environment (61%), as illustrated in Table 4.9, along with usage values for all 25 listed items.

Table 4.9

Educators reported levels of use and integration of ET for educational and teaching purposes.

Type of ET	Frequency			Percentage		
	Never	Sometimes	Frequently	Never	Sometimes	Frequently
Word Processors (Word etc.)	6	14	88	5	12	74
Spreadsheets (Excel etc.)	14	26	68	12	22	57
Presentation Software (PowerPoint)	21	37	49	18	31	41
Databases (Access etc.)	57	32	17	48	27	14
Computer Aided Instruction Software	48	33	22	40	28	19
Search Engines (google, yahoo)	7	16	84	6	13	71
Electronic Mail (e-mail)	13	10	84	11	8	71
Discussion Lists and Newsgroups	46	32	25	39	27	21
Chat and/or Forum - Whatsapp	11	16	81	9	13	68
Chat and/ or Forum – Facebook	34	23	50	29	19	42
School communicator	27	37	34	23	31	29
Electronic Encyclopedia and/or Atlas	32	39	33	27	33	28
Instructional Films (video, CD, VCD etc.)	21	41	44	18	35	37
Smart Board	47	12	34	40	10	29
Overhead Projector	48	25	24	40	21	20
Multimedia Computer	24	11	64	20	9	54
Projector System	25	16	58	20	13	49
Internet/Web Environment	12	19	73	10	6	61
Television/Video	3	35	34	28	29	29
Radio Cassette Recorder	66	25	7	56	21	6
Video Camera	67	23	8	56	19	7
Slide Projector	79	7	7	66	6	6
Printed Materials (journals, books, worksheets etc.)	10	19	75	8	16	63
Tablet	44	20	37	37	17	31
Smartphone	20	20	52	24	17	44

For lesson planning purposes, electronic mail (70%), the internet/web environment (71%) and printed material (79%) were amongst the most used. Educators seem to prefer printed materials for both educational and teaching purposes as well as lesson planning purposes. Educator's levels of reported ET usage for lesson planning purposes are presented in Table 4.10.

Table 4.10

Educators reported levels of ET use and integration for lesson planning purposes.

Type of ET	Frequency			Percentage		
	Never	Sometimes	Frequently	Never	Sometimes	Frequently
Search Engines (google, yahoo etc.)	8	28	83	7	24	70
Electronic Mail (e-mail)	28	37	54	24	31	46
Presentation Software (PowerPoint etc.)	25	46	48	21	39	40
Discussion Lists and Newsgroups	57	42	18	48	35	15
Electronic Encyclopaedia and/or Atlas	37	50	30	31	42	25
Multimedia Computer	22	27	68	19	23	57
Internet/Web Environment	9	22	85	8	19	71
Printed Materials (journals, books, etc.)	7	16	94	6	13	98
Tablet	60	27	30	50	23	25
Smartphone	42	35	38	35	29	32

For communication with the principal and other colleagues, electronic mail (48%), smartphones (50%) and WhatsApp (53%) were reported as the most popular methods while tablets (16%) and Facebook (20%) were the least used hardware and software items used. Frequencies and percentages of educators ET usage for communicating with the principal and other colleagues is presented in Table 4.11.

Table 4.11

Educators reported levels of ET use and integration for all communication with the principal and colleagues.

Type of ET	Frequency			Percentage		
	Never	Sometimes	Frequently	Never	Sometimes	Frequently
Electronic Mail (e-mail)	22	36	57	19	30	48
Discussion Lists and Newsgroups	59	30	24	50	25	20
Chat and/or Forum-Whatsapp	13	40	63	11	34	53
Chat and, or Forum – Facebook	71	26	19	60	22	16
Tablet	71	18	24	60	15	20
Smartphone	30	26	60	25	22	50

Even though poor levels of ET use and integration were reported for communication with parents and learners, the preferred method was the school communicator (40%), as presented in Table 4.12. Chat forums such as WhatsApp (9%) and Facebook (4%) were among the least used means of communication. Also illustrated in Table 4.12, 86% of educators reported having never used Facebook to communicate with parents and learners.

Table 4.12

Educators reported level of ET use and integration for communication with parents and learners.

Type of ET	Frequency			Percentage		
	Never	Sometimes	Frequently	Never	Sometimes	Frequently
Electronic Mail (e-mail)	53	30	35	45	25	29
Discussion Lists and Newsgroups	96	15	5	81	13	4
Chat and/or Forum –WhatsApp	79	27	11	66	23	9
Chat and/ or Forum – Facebook	102	10	5	86	8	4
School communicator	34	33	48	29	28	40
Tablet	81	18	14	68	15	12
Smartphone	59	30	24	50	25	20

Lastly, for all personal and social communication educators reported the highest levels of ET usage for chat forums such as WhatsApp (84%) and e-mail (75%). As presented in Table 4.13, only 4% of educators reported having never either one of these two means of communication.

Table 4.13

Educators reported level of ET use and integration for all personal and social communication.

Type of ET	Frequency			Percentage		
	Never	Sometimes	Frequently	Never	Sometimes	Frequently
Electronic Mail (e-mail)	5	21	89	4	18	75
Discussion Lists and Newsgroups	52	27	33	44	23	27
Chat and/or Forum – Whatsapp	5	10	100	4	8	84
Chat and/ or Forum – Facebook	27	20	68	23	17	57
Tablet	56	12	43	47	10	36
Smartphone	17	14	83	14	12	70

4.5 Predictors of use and integration

After assumptions of normality, multicollinearity and homoscedasticity were met, as previously explained, a multiple linear regression was conducted to determine which of the above factors best predicted educators level of ET use and integration. As presented in Table 4.14, access ($p < 0.01$), perceived competence ($p < 0.05$) and attitudes ($p < 0.01$) were found to be significant predictors of ET use and integration. The standardized Beta coefficient for access (.592) is more than double that of perceived competence (.158) and attitudes (.218). 56% of the total variability for use and integration can be explained by these factors.

Table 4.14

Multiple regression analysis for use and integration of ET (DV) and access (IV), attitudes (IV) and perceived competence (IV)

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	-32.433	11.078		-2.928	.004**
Perceived competence	.345	.143	.158	2.415	.017*
Attitudes	.451	.138	.218	3.273	.001**
Access	1.151	.127	.592	9.092	.000**

Note: * $p < 0.05$; ** $p < 0.01$

In order for a more in-depth understanding of where the use and integration (DV) of ET takes place, this variable was further broken up into the following five categories: educational and teaching purposes; for lesson planning purposes; communication with parents and learners; communication with the principal and colleagues and all personal communication. Multiple linear regressions were conducted for each of these dependent variables and all results are

reported below. Assumptions of normality, multicollinearity and homoscedasticity were met for all regressions to follow.

4.5.1 Educational and teaching purposes.

A multiple linear regression was conducted in order to determine which variable/s (access, perceived competence, attitudes) best predicted use and integration of ET specifically for educational and teaching purposes. Table 4.15 shows that both access ($p < 0.01$) and attitudes ($p < 0.01$) were significant predictors. The standardized Beta coefficient for access (.572) was more than two times bigger than the value for attitudes (.224) indicating that it is a much stronger predictor. Perceived competence failed to be a significant predictor of use and integration for educational and teaching purposes.

Table 4.15

Multiple regression analysis for use and integration of ET for educational and teaching purposes (DV) and access (IV), attitudes (IV) and perceived competence (IV)

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	-26.775	8.343		-3.209	.002**
Access	.682	.095	.572	7.155	.000**
Perceived competence	.143	.107	.098	1.328	.187
Attitudes	.308	.104	.224	2.972	.004**

Note: * $p < 0.05$; ** $p < 0.01$

4.5.2 Lesson planning

Table 4.16 shows that for lesson planning purposes, both educator's attitudes ($p < 0.01$) and access ($p < 0.01$) to ET were significant predictors. Again, perceived competence was not a significant predictor.

Table 4.16

Multiple regression analysis for use and integration for lesson planning purposes (DV) and access (IV), attitudes (IV) and perceived competence (IV)

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	-3.775	3.259		-1.158	.249
Perceived competence	.019	.042	.037	.443	.658
Attitudes	.123	.041	.259	3.032	.003**
Access	.174	.037	.388	4.659	.000**

Note: * $p < 0.05$; ** $p < 0.01$

4.5.3 Communication with parents and learners.

As depicted in Table 4.17, both educator's perceived competence ($p < 0.05$) and access ($p < 0.01$) to ET significantly predicted use and integration of ET for communication with parents and learners. In this context, educator attitudes seem to play no significant role, unlike in the previous two contexts. Standardized beta coefficients indicate that access (.398) is a much stronger predictor than perceived competence (.187). These variables explained only 18% of the variance.

Table 4.17

Multiple regression analysis for use and integration communication with parents and learners (DV) and access (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.274	2.259		.564	.574
Perceived competence	.061	.029	.187	2.102	.038*
Attitudes	-.047	.028	-.152	-1.673	.097
Access	.116	.026	.398	4.483	.000**

Note: * $p < 0.05$; ** $p < 0.01$

4.5.4 Communication with the principal and colleagues

As reported in Table 4.18, only access to ET was a significant predictor of use and integration specifically for communication with the principal and colleagues. Only 9% of the total variability in this model can be explained by the independent variables.

Table 4.18

Multiple regression analysis for use and integration for communication with principal and colleagues (DV) and access (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.118	2.540		.047	.963
Perceived competence	.041	.033	.118	1.263	.209
Attitudes	.013	.032	.041	.425	.672
Access	.084	.029	.269	2.877	.005**

Note: * $p < 0.05$; ** $p < 0.01$

4.5.5 Personal and social communication

Finally, a multiple linear regression was conducted to determine which variable best predicts educators use and integration of ET for all personal and social communication. 19% pf the total variance in this model can be explained by independent variables. Perceived competence ($p < 0.01$) and educator's access ($p < 0.01$) to ET were both significant predictors as depicted in Table 4.19. Standardized beta coefficients for these significant variables illustrate a similar predictive strength.

Table 4.19

Multiple regression analysis for use and integration for personal and social communication (DV) and access (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-3.276	2.662		-1.230	.221
Perceived competence	.081	.034	.208	2.357	.020*
Attitudes	.053	.033	.145	1.607	.111
Access	.096	.030	.278	3.163	.002**

Note: * $p < 0.05$; ** $p < 0.01$

As access proved to be a significant predictor in each of the above contexts, multiple linear regression analysis was again conducted for each of these contexts. However, access was now separated into access at home and access at school for a more in depth understanding of what type of access may be important for each context.

4.5.6 Access and educational and teaching purposes.

Perceived competence, educator attitudes, access to ET at home and access at to ET school were the chosen independent variables in order to determine which of these best predicted ET use and

integration for educational and teaching purposes. Both, educator attitudes ($p < 0.01$) and access to ET at school ($p < 0.01$) were significant predictors. After dividing access into its two different contexts, it can be seen in Table 4.20 that access to ET at home is not a significant predictor of ET use for educational and teaching purposes. The standardized beta coefficients indicate show that access at school (.553) is a much more powerful predictor than educator attitudes (.216).

Table 4.20

Multiple regression analysis for use and integration for educational and teaching purposes (DV) and access at home (IV), access at school (IV) attitudes (IV) and perceived competence (IV)

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	-23.118	8.032		-2.878	.005**
Perceived competence	.126	.103	.087	1.227	.222
Attitudes	.297	.099	.216	2.999	.003**
Access at home	.172	.172	.071	1.002	.319
Access at school	1.036	.136	.553	7.612	.000**

Note: * $p < 0.05$; ** $p < 0.01$

4.5.7 Access and lesson planning purposes

As indicated in Table 4.21, educator attitudes ($p < 0.01$) and access to ET at home ($p < 0.01$) are significant predictors of ET uses and integration for lesson planning purposes. Dividing access into its two contexts allows one to see that access to ET at school is not a significant. It therefore appears that educators require sufficient access to ET in their homes for proper preparation to take place.

Table 4.21

Multiple regression analysis for use and integration for lesson planning purposes (DV) and access at home (IV), access at school (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-4.647	3.241		-1.434	.154
Perceived competence	.023	.041	.045	.545	.587
Attitudes	.126	.040	.264	3.140	.002**
Access at home	.295	.069	.351	4.253	.000**
Access at school	.089	.055	.138	1.642	.107

Note: * $p < 0.05$; ** $p < 0.01$

4.5.8 Access and communication with parents and learners.

This question investigated which variable best predicts use of ET for communication with parents and learners. Both, educator's perceived competence ($p < 0.05$) and access to ET at school ($p < 0.01$) were significant predictors with access at school being a much stronger predictor, as indicated in Table 4.22.

Table 4.22

Multiple regression analysis for use and integration communication with parents and learners (DV) and access at home (IV), access at school (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.747	2.263		.772	.442
Perceived competence	.059	.029	.181	1.039	.044*
Attitudes	-0.48	.028	-.157	-1.735	.085
Access at home	.050	.048	.091	1.025	.3017
Access at school	.162	.038	.384	4.214	.000**

Note: * $p < 0.05$; ** $p < 0.01$

4.5.9 Access and communication with the principal and colleagues

As presented in Table 4.23, all factors (access at home, access at school, attitudes and perceived competence) failed to significantly predict use and integration of ET for communication with the principal and colleagues.

Table 4.23

Multiple regression analysis for use and integration for communication with principal and colleagues (DV) and access at home (IV), access at school (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.012	2.571		-.004	.996
Perceived competence	.042	.033	.120	1.275	.205
Attitudes	.014	.032	.042	.435	.664
Access at home	.102	.055	.174	1.846	.068
Access at school	.071	.044	.158	1.629	.106

Note: * $p < 0.05$; ** $p < 0.01$

4.5.10 Access and personal and social communication

As presented in Table 4.24, perceived competence ($p< 0.05$) and access to ET ($p< 0.05$) at home both significantly predicted educator's use and integration of ET for personal and social communication.

Table 4.24

Multiple regression analysis for use and integration for personal and social communication (DV) and access at home (IV), access at school (IV), attitudes (IV) and perceived competence (IV)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-3.484	2.693		-1.294	.198
Perceived competence	.082	.034	.211	2.375	.019*
Attitudes	.054	.033	.147	1.621	.108
Access at home	.125	.058	.192	2.173	.032*
Access at school	.076	.046	.152	1.668	.098

Note: * $p < 0.05$; ** $p < 0.01$

4.6 Access at home, access at school, perceived competence (knowledge), perceived usefulness and /or cultural relevance as predictors of use and integration

In order for a more in depth understanding, question five further broke up attitudes into its predictive factors. After assumptions of normality, multicollinearity and homoscedasticity were met, a backwards linear multiple regression was conducted to determine which of the following factors best determined use and integration of ET by educators: access, perceived competence, perceived usefulness and cultural relevance.

While cultural relevance was not a significant enough predictor, perceived competence ($p < 0.01$), overall access ($p < 0.01$) and perceived usefulness ($p < 0.01$) were all significant predictors after cultural relevance was removed from the model. Table 4.25 shows these results. Overall access refers to a combination of access both at home and at school.

Table 4.25

Backwards multiple regression analysis for use and integration (DV) and perceived usefulness (IV), cultural relevance (IV) perceived competence (IV) and overall access (IV).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1. (Constant)	-31.915	10.497		-3.040	.003**
Perceived competence	.334	.146	.153	2.283	.024**
Overall access	1.115	.130	.573	8.605	.000**
Cultural relevance	.271	.244	.097	1.109	.270
Perceived usefulness	.333	.198	.162	1.683	.095
2. (Constant)	-28.432	10.027		-2.836	.005**
Perceived competence	.311	.145	.143	2.147	.034*
Overall access	1.111	.130	.571	8.569	.000**
Perceived usefulness	.484	.144	.235	3.363	.001**

Note: * $p < 0.05$; ** $p < 0.01$

As overall access proved to be a significant predictor, another regression was conducted for a more in-depth understanding. Independent variables therefore included: access at home, access at school, perceived usefulness, cultural relevance and perceived competence. Table 4.26 shows that perceived competence ($p < 0.05$), access at home ($p < 0.01$), access at school ($p< 0.01$) and perceived usefulness ($p < 0.01$) were all significant predictors once cultural relevance was removed.

Table 4.26

Backwards multiple regression analysis for use and integration (DV) and perceived usefulness (IV), cultural relevance (IV), perceived competence (IV), and access at home (IV) and access at school (IV).

Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
1. (Constant)	-30.365	11.875		-2.557	.012*
Home access	.746	.240	.204	3.103	.002**
School access	1.392	.201	.495	6.933	.000**
Perceived competence	.337	.147	.154	2.293	.024*
Cultural relevance	.252	.268	.082	.942	.348
Perceived usefulness	.317	.200	.154	1.581	.117
2. (Constant)	-24.671	10.216		-2.415	.017*
Home access	.788	.236	.216	3.344	.001**
School access	1.349	.195	.480	6.904	.000**
Perceived competence	.310	.144	.142	2.150	.034*
Perceived usefulness	.448	.145	.218	3.092	.003**

4.7 Conclusion

After conducting appropriate statistical analysis for each research question the results show that educators reported varying levels of access to different ET's both at home and at school. Access to hardware items such as smartboards and tablets at school were moderate while high levels of access were reported for software items such as MS Word and search engines both at home and at school.

Educators also reported positive attitudes towards ET and seem to have every intention of using ET for educational purposes. Their ideas about the cultural relevance of ET in South Africa was largely neutral, while many agreed that ET is useful for teaching and learning purposes. A large majority of these educators have seen ET being successfully used for teaching purposes at some point in time. Educators reported a moderate level of perceived competence and felt most

competent with using a keyboard as well as operating MS Word. Educators reported little competence with more complex operations such as removing computer viruses.

Regression analysis showed that 65% of educator attitudes, in this study, is explained by the previously outlined predictive factors. This regression analysis also showed that educator's perceptions of the usefulness of ET's are the only significant predictor of their attitudes towards ET. Educator perceptions about the level of competence as well as the cultural relevance of ET was not significant.

Educators reported average levels of ET use and integration for educational and teaching purposes, lesson planning purposes, communication with principal and colleagues and for all personal and social communication. Poor levels of use and integration were reported for communication with parents and learners which may be due to ethical issues rules surrounding this communication. Through regression analysis, access, perceived competence and educator attitudes were all found to be significant predictors of use and integration of ET in various contexts. Access to ET at school significantly predicted use and integration for educational and teaching purposes while access at home significantly predicted use and integration of ET for lesson planning purposes. Attitudes to ET significantly predicted use and integration for educational and teaching and lesson planning purposes while perceived competence significantly predicted use and integration for communication with parents and learners and educator's personal and social communication.

Lastly, the study further broke up attitudes into its predictive factors which again showed that access at home, access at school, perceived competence and the perceived usefulness of ET all significantly predicted use and integration. These results are discussed in relation to both South African and international literature for a deeper and more contextualized understanding in Chapter five.

CHAPTER FIVE: DISCUSSION

The current study explored educator's attitudes towards ET, their perceptions of the cultural relevance of ET, the usefulness of ET and their level of competence when completing various tasks using ET. These variables were measured using the Attitudes towards Computers Scale developed by Albirini (2006) based on Rogers Diffusion of Innovations Theory.

The study also investigated educator's levels of access to various ET's both at home and at school as well as their levels of ET use and integration in five different contexts. These contexts included usage for: educational and teaching purposes, lesson planning purposes, communication with parents and learners, communication with colleagues and educator's personal and social communication. Use and integration was divided into different contexts allow for more clarity and so that educators were able to clearly specify where and when they use specific ET's, rather than providing a general response. A revised version of the Information and Communication Survey developed by Gulbahar and Guven (2008) was used to measure both access and use and integration.

Specific research questions were devised in order to investigate all of the above mentioned factors both separately and in relation to each other as indicated in Chapter one. A discussion of the specific methodology followed this in Chapter three, after which, results were presented in Chapter four. Provided in this chapter, is a more in-depth discussion of these results, in relation to both international and South African literature, under four headings: access, attitudes, use and integration and the effects of access and attitudes on ET use and integration. The implications for policy, theory and practice is explored thereafter.

5.1 Access

According to Roger's Diffusion of Innovations Theory (2003), access is an extremely important factor in the adoption of technology. Research question one therefore investigated educators levels of access to various hardware and software items both at home and at school. Access was recorded for various hardware and software items, as listed in Chapter four. Through analysis, a significant difference was evident between educator's levels of ET access at home and ET access at school, with educators reporting significantly higher levels of access to ET at home.

Similarly, in a South African study, Hart and Laher (2015) found that more educators had access to ET's at home rather than at school or in the classroom. They reported that 100% of educators had daily access to computers at home while 93% reported daily access to computers at school. More specifically, only 51% of these educators reported having access to computers in their classrooms on a daily basis (Hart & Laher, 2015). The National Education Association (2008, p.2) in America obtained similar results and added that "access to the Internet and instructional software at school was adequate for most educators, but technical assistance and support in using the equipment and software were often inadequate" and that educators reported "receiving little support for technology access outside of school".

In the current study, educators reported high levels of access to different ET's at home (Word, spreadsheets, search engines, emails, televisions, smartphones and printed materials) and at school (presentation software and the internet). The National Education Association (2008) in America found that the highest levels of access were reported for computers and the internet. Gray (2010, as cited in Kusano, et al., 2013) adds that even though many educators in the United

States report high levels of access to ET in their classrooms, this may not directly translate to high levels of effective use and integration.

In an international study conducted by Shimizu, Yamamoto, Horita, Koizumi, and Yoshii (2007, as cited in Kusano, et al., 2013) reported that approximately 30% of educators in Japan had been provided with computers at school. Similarly, Zehra and Bilwani (2016) and Chen (2008) report that due to limited access to ET at school many educators resort to using personal laptops and devices for teaching purposes. Educators explained that using one laptop, without any display equipment, such as projector systems, makes incorporation of this ET into lessons, even more challenging.

Al-Ruz and Khasawneh (2011, as cited in Zehra & Bilwani, 2016, p.15) again highlights that a "lack of access to computers, inadequate administrative and technical support are the most common external factors that affect technology integration".

Samak (2006), Albirini (2006) and Norris, Sullivan, Poirot and Soloway (2003) all report average to low levels of access and explain that with no access, no proper use and integration can take place. Chen (2008, p.70) further explains that "various external factors such as lack of access to computers and software, insufficient time to plan instruction, and inadequate technical and administrative support" all contribute to low levels of use and integration. Norris and colleagues (2003) add that simply placing a computer in a classroom cannot be defined as access and that proper training needs to accompany it.

Compared to the current study, Hart and Laher (2015) reported lower levels of access to both tablets (29.9%) and smartphones (9.4%). As reported in Chapter four, the current study found higher levels of access to smartphones both at home (64%) and at school (57%). In a South African report compiled by Telkom (2015) it is proposed that increased educator access to ET's may lead to more efficient record keeping, quicker communication between colleagues and little wastage of paper. The White Paper on E-education (DoE, 2004, p.6) ensured that every school will have "access to a wide choice of diverse, high-quality communication services which will benefit all learners and local communities", thus explaining that access to ET is a priority for all South African schools.

As explained, in Chapter two, by both, Rogers Diffusion of Innovations Theory (Rogers, 2003) and Theory of Reasoned Action and Theory of Planned Behaviour (Ajzen, 1991; Ajzen, 2001; Ajzen & Fishbein, 1980) access is a crucial element in the process adoption or rejection of innovation. The above mentioned theories also emphasised the importance of one's attitude and identified this as a major influence on ones behaviour.

5.2 Attitudes

Educator's attitudes, perceived usefulness, cultural relevance and perceived competence were measured on a scale developed by Albirini (2006). The scale is based on Roger's Diffusion of Innovations Theory which explains that knowledge, perceived usefulness and cultural relevance all influence ones attitudes. Research question two therefore first investigated each of these factors separately and then asked whether cultural relevance, perceived usefulness and/ or

perceived competence were able to significantly predict educator attitudes. Table 5.1 summarizes these results in terms of mean values.

Table 5.1

Summary of results on educator's attitudes and predictive factors

	Minimum	Maximum	Mean	Std. deviation
Attitudes	1	5	4.08	.441
Perceived competence	1	4	3.42	.056
Perceived usefulness	1	5	4.09	.492
Cultural relevance	1	5	3.51	.465

In keeping with previous studies (Cavas, et al., 2009; Du Rand, 2015; Hart & Laher, 2015; Hong & Koh, 2002; Mosely & Higgins, 1999; Samak, 2006; Stover, 2015; Teo, 2008), the majority of educators in the current study reported positive attitudes towards ET. Teo (2008, p.419) explains that educators positive attitudes "could be attributed to the availability and accessibility to computers". Educators in the current study agreed most strongly with statements concerned about their need for and intention to use ET currently and in the near future. In a South African study, Hart and Laher (2015), using the ATCS by Albirini (2006), reported an overall mean score of 4.02 for the attitude scale which is comparable to a mean score of 4.08 reported in the current study. Samak (2006), reported a similar, positive mean score using the ACTS.

A Malaysian study also reported that educators in rural schools have positive attitudes towards ET (Hong & Koh, 2002). They further explain that there was a positive correlation between educators who owned computers and their attitudes. Hong and Koh (2002, p.27) add that "there was a negative linear relationship between computer anxiety and attitudes towards computers". Therefore, educators who reported more positive attitudes had lower levels of computer anxiety.

In a sample of 139 Singaporean educators Teo (2008) reported no differences in attitudes in educators of different genders and age groups. The study did however find significant differences in educator's attitudes between different subject areas as well as years of computer use (Teo, 2008). The study found that those educators teaching different subjects had similar attitudes while those teaching general classes (primary) had different attitudes.

Yildirim (2000, as cited in Teo, Luan & Sing, 2008, p. 268) adds that educators "who used computers more would tend to develop positive attitudes that promote further use of the computer in their daily teaching tasks and conduct activities that require computers to play a major role". An educator's positive attitude may not only reduce their resistance with regards to using ET but also plays an essential role in the extent to which they allow for ET integration to occur (Watson, 1998).

Similarly, Isleem (2003) found a strong positive correlation between educator's attitudes, use of ET and level of expertise, thus also illustrating the importance of ET competence (Isleem, 2003). In a South African study, Msila (2015, p.1979) concluded that "teacher attitudes will be positive when the attempts are made to improve their ICT skills" and that "the success of digital technology in classrooms will depend more on teacher competence as well as positive attitudes towards ICT" (Msila, 2015, p.1973).

5.2.1 Perceived Competence

According to Rogers Diffusion Innovations Theory, a number of factors are said to influence ones attitude. Some of these factors include competence, usefulness and cultural relevance.

These three factors were first investigated separately and then in relation to attitudes. They are each discussed in the next three sections. Educators in the current study reported adequate high levels of perceived competence with a mean score of 3.42. They appear to be most competent when using programs such as MS Word or operating simple hardware such as a key-board. However, they feel less competent performing more complex operations such as removing computer viruses. Hart and Laher (2015) also reported adequate levels of ET competence (3.14). Samak (2006) found similar results in a sample of Jordanian educators who were most comfortable using a keyboard and word processing programs as well as performing grade keeping tasks and searching the World Wide Web. Contrary to this, Albirini (2006) found that a majority educators in a Syrian sample reported "little competence" as an overall result.

Jones (2004, as cited in Buabeng-Andoh, 2012, p.139) "reported that teachers competence relate directly to confidence. Teachers' confidence also relate to their perceptions of their ability to use computers in the classroom, particularly in relation to their children's perceived competence".

In a South African study, educators "argued about their lack of competence in computers" (Msila, 2015, p.1967). These educators also stated that "the call for use of tablets in Gauteng schools comes at a time when they were still trying to understand the revised curriculum in South Africa referred to as Curriculum Assessment Policy Statements (CAPS)" (Msila, 2015, p. 1967). This curriculum was a revision of the previous South African school curriculum known as the National Curriculum Statement (NCS). Msila's (2015) qualitative study involving 25 Gauteng educators revealed that many of the older educators felt incompetent to use various ET's as so isolated themselves to avoid embarrassment. In conjunction with competence, theory as well as

a number of studies also highlight the importance of educator's perceived usefulness in the formation of positive attitudes.

5.2.2 Perceived Usefulness

"People tend to use or not to use an application to the extent that they believe it will enhance their job performance" (Davis et al., 1989, as cited in Teo, et al., 2008, p.267).

In the current study, educators believed that ET is useful as they agreed with many of the statements and produced an overall positive result. Educators most strongly agreed with the fact that they have witnessed ET being successfully used for educational and teaching purposes. The mean score of 4.09 obtained for perceived usefulness in the current study is similar to but higher than the mean score of 3.72 obtained by Samak (2006) in a sample of Jordanian educators, also using the ATCS. In the current study educators strongly agreed that ET can be used as an effective learning tool and have seen ET being used for teaching and learning purposes.

In a Singaporean study conducted by Teo (2008), educator's responses showed a negative correlation between perceived usefulness and years of computer use. Although, not based exclusively on educators, two meta-analytic studies reported that perceived usefulness was commonly found to be a significant factor in one's behavioral intention to use technology (King & He, 2006; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). Similarly, Teo and colleagues (2008) investigated a sample of Singaporean and Malaysian pre-service educators and found that their perceived usefulness of computers was significantly influenced by their perceived ease of use of computers. Results in the current study therefore echo results presented in previous literature.

In contrast, cultural relevance is not as widely researched, as perceived usefulness, in terms of educator attitudes and usage of ET, however, as it forms part of Rogers Diffusion of Innovations Theory, it is discussed below (Rogers, 2003).

5.2.3 Cultural Relevance

Educators in the current study, as seen in Table 5.1, reported neutral perceptions about the cultural relevance of ET in South Africa with a mean score of 3.51. Educators did not agree nor disagree with many of the items but rather remained neutral or indecisive. Similar results were found in previous studies both internationally and in South Africa (Albirini, 2006; Hart & Laher, 2015). With a mean score of 3.22, Samak (2006) reported neutral perceptions about the cultural relevance of ET in a Jordanian sample of educators. Samak (2006, p.113) added that "a considerable positive relationship existed between respondent attitudes towards ICT and their cultural perceptions". Given this, cultural relevance may need to be rethought in terms of how and where it fits into understanding computer attitudes.

5.2.4 Influence on attitudes

The final section of question two was concerned with which of the following factors: perceived usefulness; perceived competence and cultural relevance, best predicted educator attitudes. As outlined in Chapter four, perceived usefulness was found to be the only significant predictor. Similar results were obtained by Hart and Laher (2015) who explain, that in a sample of 117 Gauteng educators, perceived usefulness was the only significant predictor of educator attitudes. In agreement, Du Rand (2015) found a strong correlation between educator attitudes and both ease of use and perceived usefulness in a sample of 108 educators from four secondary schools

in Pretoria. Samak (2006), who also made use of Albirini's (2006) Attitudes towards Computer Scale reported that perceived usefulness, cultural relevance, perceived competence and access significantly predicted educators attitudes. In contrast some studies report competence (Msila, 2015; Ndlovu & Lawrence, 2012) and computer experience (Rozell & Gardner, 1999, as cited in Buabeng-Andoh, 2011) as the most influential factors with regards to educator attitudes. These differences may be as a result of differences in samples as well as included factors. For example, the current study did not investigate computer experience. Future research may therefore benefit for investigating a wider range of factors.

As outlined in Chapter two, perceived usefulness, as defined in the current study, can be explained as a combination of four factors: relative advantage, compatibility, complexity and observability (Albirini, 2006; Rogers, 1995). This combination of factors may explain why perceived usefulness was a significant predictor of educator attitudes. Sahin (2006) argued that:

> *"innovations offering more relative advantage, compatibility, simplicity, trialability, and observability will be adopted faster than other innovations. Rogers' does caution, "getting a new idea adopted, even when it has obvious advantages, is difficult" (p. 1), so the availability of all of these variables of innovations speed up the innovation-diffusion process". (Sahin, 2006, p.18)*

In conjunction with these above mentioned factors, Rogers (2007) further explains that there are additional variables that may influence the rate of adoption of an innovation. These include: communication channels, type of innovation-decision and "the extent of the change agents' promotion efforts". Rogers (2007) highlights that these variables have not received the same

amount of attention with regards to research in the field of ET. The concepts of both, educator attitudes and use and integration of ET still has room for more investigation.

5.3 Use and integration

Educators were given a self-report scale, with the options “frequently”, “sometimes” and “never”, to note their levels of use and integration with regards to various hardware and software ET items. Use and integration was measured in five different contexts in order for an in-depth understanding. For educational and teaching purposes, lesson planning purposes, communication with the principal and colleagues and all personal and social communication, educators displayed average levels of use and integration by reporting that they used most ET items “sometimes” as opposed to “frequently” or “never”. The most frequently used ET’s for educational and teaching purposes included Word processors, electronic mail and printed materials. However, the usage of hardware items such as smartboards and projector systems were not as high. Stover (2015) found that, in a sample of ten educators, iPads, Apple TV’s and MacBook pros were the three most commonly used items while du Rand (2015) reported that Facebook and WhatsApp were the most commonly used software items in a South African sample.

Kusano (2013) conducted a cross cultural comparative study using educators from the United States and Japan. These results showed that US educators used ET’s for instructional purposes more frequently than the Japanese educators. These differences were attributed to varying levels of access. In a Taiwanese study conducted at 12 high schools, Chen (2008) found low levels of use and integration even though educators believed that ET should be used. Chen (2008, p.72)

explains that “instruction remained teacher centered and lecture based”. Chen (2008, p.72) offers a reason for low levels of ET integration by explaining that many educator’s may be “immersed in traditional educational systems” thus leading to a rejection of proper ET use and integration which may explain their preference towards printed materials.

In the current study low levels of use and integration were reported for communication with parents and learners. These low levels may be attributable to school and ethical policies surrounding communication with learners and parents using chat forums and other informal methods of communication. This is strongly discouraged by many schools and thus the school communicator was reported as the most frequently used method communication. Some studies report higher levels of usage for administrative tasks, rather instructional use (Cohen, 2003; Wilson-Strydom, et al., 2005). Reasons provided by educators to account for low levels of use and integration for instructional purposes included: the necessary computers not being available, unavailability of software, no internet connection and too little preparation time (Wilson-Strydom, et al., 2005).

Contrary to this Gray, Thomas and Lewis (2010) found that, in a sample of 1519 public schools across all 50 states, 91% of the computers accessible to educators were used for instructional purposes. Lastly, in a South African study conducted in four Pretoria secondary schools, du Rand (2015) found that with enough technical support, a perceived ease of use and perceived usefulness, educators are willing to use and integrate ET into teaching and learning. As reported in Chapter four, the current study not only broke down use and integration into five different contexts but also into exact hardware and software items. Use and integration levels were

recorded for each of these items. For adequate comparison, there is a need for more detailed data in the field. This data will allow schools and training facilitators an opportunity to understand where educators lack experience and which hardware and software items would be most beneficial to invest in.

After having discussed each of the above factors separately and in relation to educator attitudes, the final section will focus on their relation to use and integration.

5.4 Effects of access and attitudes on use and integration

In order to determine the most significant predictors of ET use and integration, multiple linear regressions were conducted using the following independent variables: access, perceived competence and attitudes. Expanding on studies that investigate use and integration of ET as a whole, the current study aimed to gain a better understanding by dividing this independent variable into five contexts. Five regressions were therefore conducted, with each one using a different use and integration context as the dependent variables. According to these results, access continued to present as a strong predictors in each of the five contexts. A summary of these regressions are presented in Table 5.2 under regression A, with only significant predictors shown. Along with access, educator attitudes were also significant predictors of educators use and integration of ET for both teaching and lesson planning purposes. However, this was not the case for communication purposes. Similarly, positive correlations were found in previous studies between educator attitudes and use and integration (Sang, et al., 2009; Msila, 2015). Tabata and Johnsrud (2008, as cited in Kusano, et al., 2013, p.31) concur with these results and explain that

"the attitude of the teacher toward using technologies in the classrooms is a major factor in how successful technology integration will be".

In order to gain a better understanding of the access variable, another five regressions were conducted using the following independent variables: access at home, access at school, perceived competence and attitudes. Again, each of the use and integration contexts were used as the dependent variables. Regression B, also in Table 5.2, summarizes these results. Again, only those variables that were significant predictors are represented.

Table 5.2

Summary of multiple regression analysis results for use and integration in five contexts and access at home and school, perceived competence (knowledge) and educator attitudes

Use and Integration	**Predictors (Regression A)**	**Significance**	**Predictors (Regression B)**	**Significance**
1. Educational and teaching purposes	Attitudes	.004**	Attitudes	.003**
	Overall access	.000**	School access	.000**
2. Lesson planning purposes	Attitudes	.003**	Attitudes	.002**
	Overall access	.000**	Home access	.000**
3. Communication with parents and learners	Perceived competence	.038*	Perceived competence	.044*
	Overall access	.000**	School access	.000**
4. Communication with the principal and colleagues	Overall access	.005**		
5. Personal communication	Perceived competence	.020*	Perceived competence	.019*
	Overall access	.002**	Overall access	.032*

Note: * $p < 0.05$; ** $p < 0.01$

As presented in Table 5.2 one can see that after further dividing the variable of access, one can see that while school access may be important for educational and teaching purposes, home access is important for lesson planning purposes. Limited access at home may hinder educators

with regards to being thoroughly prepared to use the appropriate technology in the classroom. In some contradiction to the summary presented in Table 5.2, Kusano (2013, p. 39) found that "educators perceived ease of use and usability in the U.S. and attitude towards using technology in Japan significantly predicted the frequency of computer use in class". Also based on the Theory of Reasoned Action, Teo and colleagues (2008) found that perceived usefulness significantly predicted educator attitudes.

A study conducted in the Netherlands by Drent and Meelissen (2008), on a sample of 210 educators, shows that positive attitude towards computers, computer experience, and personal entrepreneurship have a direct positive influence on use of ET by educators. In a sample of 125 educators, Chiou (2011) found that, in conjunction with computer attitudes, and perceived ease of use, perceived usefulness was a significant predictor of an educator's behavioral intention to use a specific ET application (Web 2.0).

Contrary to the current study, Msila (2015) found that in a qualitative study conducted in five schools around Gauteng, educator competence influenced the use and integration of ET in the classroom. According to the results presented in Table 5.2, this was not the case for the current study, as perceived competence only significantly predicted use and integration of ET for communication purposes. Tire and Mlitwa (2007) investigated educators and learners levels access and usage to ET in rural areas of the Northern Cape. This study concluded that

> *"access to, and usage of, ICT in rural schools is inadequate. Where computers exist, they are not put to adequate use due to lack of relevant programs, problematic learner/ computer*

ratios, and most disturbingly, a lack of computer skills among educators"(Tire & Mlitwa, 2007, p.141).

Overall, the current study, found similar results to previous studies conducted in the field. The most distinct findings were predictive links between educators levels of access to ET at home and at school and educators use and integration of ET's in various contexts. While these findings were made possible using through quantitative research using educators from Gauteng school, it must be acknowledged that certain limitation did exist. These limitations are discussed in more detail below.

5.5 Limitations

Limitations of this study include a limited sample size, a minimal return rate and incomplete questionnaires. Due to the limited number of schools willing to participate, only a certain number of educators were available to approach. The main reason given for schools not willing to participate in the study was that educators do not have the time to complete questionnaires. A number of schools failed to respond to the initial principals approach letter and as well as a follow up email.

A minimal return rate as well as educators returning semi-complete questionnaires may be attributable to the length of the questionnaire. This may explain why a number of educators left the end of the questionnaire blank. After questionnaires were delivered to the various schools, educators completed them on a voluntary basis, even though permission was received from the principal. It was then the principal's responsibility to explain the study to the educators and

encourage them to fill in and return the questionnaires. Principals explained that many educators seemed unwilling, despite numerous reminders. As the explanation of the study and questionnaire handout was left to the principal, controlling the information relayed to educators before handing out questionnaires could not be controlled. Presence of the researcher may be required to control this process as this will ensure better control and encouragement to participate.

It appeared that some educators wanted to share more information than just simply ticking a box. For example, educators wrote more in depth reasons for choosing certain answers next to the respective questions. This information cannot be truly accessed through a purely quantitative study and so a mixed methods approach may extract a more in-depth understanding.

Lastly, the majority of the schools that were willing to participate in the current study are located in the Ekurhuleni Area of Gauteng. Therefore, this sample does not represent the province as a whole but rather a section.

Despite the above mentioned limitations, this study has found interesting insight into the minds of educators. To further expand this trajectory of research some recommendations, based on the limitations experienced in the current study, are offered below.

5.6 Recommendations

Based on the limitations outlined above, future studies may want to make use of larger more diverse samples in order for more representative conclusions to be reached. Schools throughout

the province should be a part of the sample as educator opinions may vary. The topic of ET may be better understood through the use of a mixed methods approach in which educators thoughts and ideas are explored together with quantitative data to substantiate these thoughts. A larger sample size may be accessible through a Department of Basic Education project, leading to a more in depth understanding. Future studies may want to exert better control over the handing out and collection process of questionnaire. A higher response rate may be achieved if the researcher is present, at the school, while questionnaires are being completed within a specific time frame (for example, during a break).

As significantly higher levels of access to ET were reported at home rather than at school, this study recommends that increased access to ET at school be further investigated. A suggestion offered by Hersalman (2003, p.951) is to "create educational networks, which provide disadvantaged schools with Internet access at low cost and high performance". These collaborations may include the pairing of schools in order to increase both access and expertise available to educators. As access to ET at home significantly predicted use and integration of ET for lesson planning, relevant software needs to be installed onto educator's personal laptops and computers in order for sufficient lesson planning to take place.

As educators reported little competence on certain items, training targeting areas such as virus removal and the installing of software programs needs to take place routinely. This will allow educators a platform to clarify issues as they arise. Educators need to be encouraged to use various ET's by illustrating its benefits and usefulness. For example, reducing administration time through computer generated mark sheets. Tire and Mlitwa (2007, p.141) suggest "a vibrant

computer literacy program for educators in South Africa, together with the provision of the necessary programs for teaching, as well as measures to protect the infrastructure".

As discussed under the discussion section of Chapter five, future research may want to expand to other areas of Roger's Diffusions of Innovations Theory and focus on all factors said to influence rate of adoption, for a broader understanding of how Roger's Theory may explain ET use and integration in schools.

Future research may also benefit from investigating educators use and integration of ET and its effect on student understanding by using various groups of students and testing their level of understanding before and after concepts are taught with and without the use of various ET's. A study of this nature would need to involve control and experimental groups with various manipulations. This will allow for investigation into the usefulness of ET, which was found to be a significant predictor of educator attitudes. Educator attitudes were in turn a predictor of use and integration.

5.7 Conclusion

Implications of the current findings for South African policy begin with the significant difference between educator's current access to ET at home and at school, showing a lower level of access at school. The study also investigated educator's level of usage with regards to specific ET items in five different contexts. This finding allows policy makers and schools a chance to look at exactly what ET's educators use and how often they use it. This information may assist with the

purchasing of relevant ET's as well as in understanding which areas educators require more training.

Access to ET at school is a significant predictor of educators use and integration of ET for educational and teaching purposes while access to ET at home is a significant predictor of educator's level of use and integration of ET for lesson planning purposes. South African policies need to therefore further investigate how ET's can be available to educators, both at home and at school, in order for effective use and integration to take place in the classroom.

Training courses need not only focus on those applications educators feel competent in but need to shift to providing more advanced skills, such as the removal of a computer virus; the installation of new software; and the operation of graphic programs, in order for educators to continue using ET even when problems may arise. On call technical support may also aid in combating this. As educator attitudes were significantly predicted by perceived usefulness, training programs may want to focus on this element to promote and build the positive attitudes of educators.

Finally, the results presented in this study can be used by educators, principals, school governing bodies and policy makers in order for a better understanding of educators levels of access to ET at home and at school, their attitudes towards ET, and their levels of use and integration of various hardware and software items in different school related contexts. This study was based solely on educator perceptions, thoughts and ideas and so it acts as lens into the minds of

educators, and thus requires due consideration. These results may be used as a platform for future research concerned with ET integration.

REFERENCES

Albirini, A. (2006a). Cultural perceptions: The missing element in the implementation of ICT in developing countries. *International Journal of Education and development using ICT, 2*(1).

Albirini, A. (2006b). Teacher's attitudes towards information and communication technologies: The case study of Syrian EFT educators. *Computers and Education, 47*, 373-398.

Allport, G. M. (1935). Attitudes. In C. Murchison (Ed.), *Handbook of Social Psychology*. Worchester, Mass: Clark University Press.

Al-Zaidiyeen, N. J., Mei, L. L., & Fook, F. S. (2010). Teachers' attitudes and levels of technology use in classrooms: The case of Jordan schools. *International Education Studies, 3*(2), 211.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Ajzen, I. (2001). Nature and operation of attitudes. *Annual Review of Psychology, 52*, 27-58.

Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*.

Aziz, H. (2010). The 5 keys to educational technology. *The Journal: Transforming Education through Technology.*

Babbie, E. R. (2010). *The Practice of Social Research*. 12th ed. Belmont, CA: Wadsworth Cengage.

Babbie, E., & Rubin, A. (2011). *Research methods for social work*. Cengage Learning: USA

Baloyi, S. (2015). *Gauteng is ready for the big switch on*. Retrieved December 01, 2016, from http://www.gautengonline.gov.za/News/Pages/Gauteng-is-ready-for-the-big-switch-on.aspx

Bordbar, F. (2010). English teachers' attitudes toward computer-assisted language learning. *International Journal of Language Studies, 4*(3), 27-54.

Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology, 8*(1), 136.

Burton, D. (Ed.). (2000). *Research training for social scientists: a handbook for postgraduate researchers.* Sage: London.

Butler, D. L. & Sellbom, M. (2002). Barriers to adopting technology. *Educause Quarterly, 2*, 22-28

Cavas, B., Cavas, P., Karaoglan, B. & Kisla, T. (2009). A study of science teacher's attitudes toward information and communication technologies in education. *The Turkish Online Journal of Educational Technology, 8*(2), 20-32.

Chen, C. H. (2008). Why do teachers not practice what they believe regarding technology integration? *Journal of Educational Research, 102*(1), 65-75.

Chiles, M. (2012). The state of IT education in South African schools. *Institute of Information Technology Professionals*. Retrieved December 06, 2016, from https://www.iitpsa.org.za/the-state-of-it-education-in-south-african-schools/

Chiou, Y. F. (2011). *Perceived usefulness, perceive ease of use, computer attitude, and using experience of Web 2.0 applications as predictors of intent to use Web 2.0 by pre-service teachers for teaching*. Doctoral dissertation: Ohio University.

Cohen, S. 2003. *Report on the Use of ICTs in Schools Research Project*. Johannesburg: South African Institute for Distance Education (SAIDE).

Cope, C., & Ward, P. (2002). Integrating learning technology into classrooms: The importance of teachers' perceptions. *Educational Technology & Society*, *5*(1), 67-74.

Czerniewicz, L. & Brown, C. (2005). Access to ICTs for teaching and learning: From single artefact to inter-related resources. *International Journal of Education and Development using ICT*, *1*(2).

Delcourt, M. A. B. & Kinzie, M. B. (1993). Computer technologies in education: The measurement of attitudes and self-efficacy. *Journal of Research and Development in Education*, *27*(1), 35-41.

Department of Education (2004). *White Paper on e-Education. Transforming Learning and Teaching through Information and Communication Technologies*. Pretoria: Department of Education.

Drent, M. & Meelissen, M. (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Computers & Education*, *51*(1), 187-199.

Du Rand, A. J. (2015). *Teachers' attitude to using information and communication technologies in the classroom*. Doctoral dissertation: University of the Witwatersrand.

Dwyer, D. (1995). *Changing the conversation about teaching learning and technology: A report about ten years of ACOT research*. Cupertino, CA: Apple Computer.

Eagly, A. H. & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt, Brace, Javanovich.

Ertmer, A. P. (2005). Teacher Pedagogical Beliefs: The final Frontier in our Quest for Technology Integration? *Educational Technology Research and Development*, *53*(4), 25-39.

Eyyam, R. & Yaratan, H. S. (2014). Impact of use of technology in mathematics lessons on student achievement and attitudes. *Social Behavior and Personality: an international journal, 42*(1), 31S-42S.

Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Godfrey, C. (2001). Computers in school: Changing technologies. Australian Educational *Computing, 16*(2), 14–17.

Goosen, L. & Van Der Merwe, R. (2015, June). E-Learners, teachers and managers at e-Schools in South Africa. In *Proceedings of the International Conference on e-Learning, ICEL* (pp. 127-134).

Gray, D. E. (2005*). Doing research in the real world*. Sage: London.

Gray, L., Thomas, N. & Lewis, L. (2010). *Teachers' use of educational technology in U.S. public schools: 2009. National Center for Education Statistics*. Institute of Education Science, U.S. Department of Education. Washington DC.

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.

Hale, J. L., Householder, B. J. & Greene, K. L. (2002). *The theory of reasoned action*. The persuasion handbook: Developments in theory and practice, 259286.

Hart, S. A. & Laher, S. (2015). Perceived usefulness and culture as predictors of teacher's attitudes towards educational technology in South Africa. *South African Journal of Education, 35*(4), 01-13.

Heinssen, R.K., Glass, C.R. & Knight, L.A. (1987). Assessing computer anxiety: Development and validation of the Computer Anxiety Rating Scale. *Computers in Human Behavior, 3,* 49-59.

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.

Hermans, E., Tondeur, J., van Braak, J. & Valcke, M. (2008). The impact of primary school teachers' educational beliefs on the classroom use of computers. *Computers & Education, 51*(4), 1499-1509.

Herselman, M. E. (2003). ICT in rural areas in South Africa: various case studies. *Informing Science Proceedings*, 945-955.

Hew. K., F & Brush, T. (2007). Integrating Technology into K-12 Teaching and Learning: Current Knowledge Gaps and Recommendations for Future Research. *Springer, 55*(3), 223-252.

Hogg, M. & Vaughan, G. (2005). *Social Psychology (4th edition).* London: Prentice-Hall

Hokanson, B. & Hooper, S. (2000). Computers as cognitive media: examining the potential of computers in education. *Computers and Human Behavior, 16*, 537-552.

Hong, K. S. & Koh, C. K. (2002). Computer anxiety and attitudes toward computers among rural secondary school teachers: A Malaysian Perspective. *Journal of Research and Technology in Education, 35*(1), 27-48.

Howie, S., Muller, A. & Paterson, A. (2005). *Information and communication technologies in South African secondary schools.* Cape Town: HSRC.

Huck, S. W. (2012). *Reading statistics and Research.* Boston: Pearson Education.

IBM Corp. Released 2016. *IBM SPSS Statistics for Windows*, Version 23.0. Armonk, NY: IBM Corp.

Isleem, M. I. (2003). *Relationships of selected factors and the level of computer use for instructional purposes by technology education teachers in Ohio public schools: a statewide survey*. Doctoral dissertation: The Ohio State University.Januszewski, A., & Molenda, M. (Eds.). (2013). *Educational technology: A definition with commentary*. Routledge.

King, W. R. & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & management*, *43*(6), 740-755.

Khine, M. S. (2001). Attitudes toward computers among teacher education students in Brunei Darussalam. *International Journal of Instructional Media, 28*(2)147–153.

Knabe, A. (2012). *Applying Ajzen's theory of planned behavior to a study of online course adoption in public relations education.* Marquette University, Milwaukee, Wisconsin. Retrieved from http://epublications.marquette.edu/dissertations_mu/186 (Paper 186)

Koc, M. (2005). Implications of learning theories for effective technology integration and pre-service teacher training: A Critical Literature Review. *Journal of Turkish Science Education, 2(*1).

Kusano, K., Frederiksen, S., Jones, L., Kobayashi, M., Mukoyama, Y., Yamagishi, T. & Ishizuka, H. (2013). The effects of ICT environment on teachers' attitudes and technology integration in Japan and the US. *Journal of Information Technology Education*, *12*(1), 29-43.

LaPiere, R. T. (1934). Attitudes vs. actions. *Social forces*, *13*(2), 230-237.

Lui, S.H. (2011). Factors related to pedagogical beliefs of teachers and technology integration. *Computers & Education, 56,* 1012-1022.

Maharaj, M. & Govender, W. (2005). The Attitudes of educators to Information Technology Adoption in Schools Settings. *Alternation, 12*(2), 79-91.

Mikusa, M. E. (2015). *The effect of technology self-efficacy and personal engagement on students and teachers attitudes toward technology and use in education.* Doctoral dissertation, Appalachian State University.

Moersch, C. (1995). Levels of technology implementation (LoTi): A framework for measuring classroom technology use. *Learning and Leading with technology*, *23*, 40-40.

Moseley, D. & Higgins, S. (1999) *Ways Forward with ICT: effective pedagogy using information and communications technology for literacy and numeracy in primary schools.* London: Teacher Training Agency.

Msila, V. (2015). Teacher Readiness and Information and Communications Technology (ICT) Use in Classrooms: A South African Case Study. *Creative Education, 6*(18), 1973.

National Education Association. (2008). Access, adequacy, and equity in education technology. *Results of a survey of America's teachers and support professionals on technology in public schools and classrooms*.

Ndlovu, N. S. & Lawrence, D. (2012, September). The quality of ICT use in South African classrooms. In *Conference Paper presented at "Towards Carnegie III Strategies to Overcome Poverty and Inequality*.

NEIMS. (2011). *National Education Infrastructure Management System*. Department of Basic Education: South Africa.

NEIMS. (2015). *National Education Infrastructure Management System*. Department of Basic Education: South Africa.

Nkula, K. & Krauss, K. E. (2015, November). *The integration of ICTs in marginalized schools in South Africa: Considerations for understanding the perceptions of in-service teachers and the role of training.* Paper presented at the 8th International Development Informatics Association (IDIA) conference, Port Elizabeth, South Africa. Retrieved December 05, 2016, from http://www. development informatics. org/conferences/2014/papers/20-Nkula-Kirsten. pdf. Accessed.

Norris, C., Sullivan, T., Poirot, J. & Soloway, E. (2003). No access, no use, no impact: snapshot surveys of educational technology in K# x2013; 12. *Journal of research on technology in education*, *36*(1), 15-27.

Oslen, C. & George, M. M. M. (2004). *Cross-Sectional Study Design and Data Analysis: The Young Epidemiology Scholars Program*, Walden University: Chicago, Illinois

Osborne, J. & Waters, E. (2002). Four assumptions of multiple regression that researchers should always test. *Practical assessment, research & evaluation*, *8*(2), 1-9.

Pamuk, S., Çakır, R., Ergun, M., Yılmaz, H. B. & Ayas, C. (2013). The use of tablet PC and interactive board from the perspectives of teachers and students: evaluation of the FATIH project. *Educational Sciences: Theory & Practice*, *13*(3), 1799-1822.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & education*, *37*(2), 163-178.

Petty, R. E., Wheeler, S. C. & Tormala, Z. L. (2003). In T. Millon & M. J. Lerner (Eds.), *Comprehensive handbook of psychology* (2nd Ed). New York: John Wiley & Sons.

Probst, K., Hoffmann, V. & Christinck, A. (2007). Farmers and researchers: How can collaborative advantages be created in participatory research and technology development?. *Knowledge and Innovation Management*, 120.

Rao, A. (2013). What's the Difference Between "Using Technology" and "Technology Integration". Retrieved from https://teachbytes.com/2013/03/29/whats-the-difference-between-using-technology-and-technology-integration/

Reiser, R. A. & Ely, D. P. (1997). The field of educational technology as reflected through its definitions. *Educational technology research and development. 45*(3), 63-72.

Rogers, E.M. (1995). *Diffusion of Innovations* (4th Ed). The Free Press: New York.

Rogers, E. M (2003). *Diffusion of Innovations* (5th Ed). The Free Press: New York.

Rogers, E. M. (2007). Models of knowledge transfer: critical perspectives. *Knowledge and Innovation Management*, 23.

Samak, Z. A. (2006) *An Exploration of Jordanian English Language Teachers 'attitudes, Skills, and Access As Indicator of Information and Communication Technology Integration in Jordan.* Unpublished Doctoral Thesis. Florida State University.

Sang, G., Valcke, M., van Braak, J. & Tondeur, J. (2009). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education, 54*(1), 103-112.

Sahin, I. (2006). Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *TOJET: The Turkish Online Journal of Educational Technology, 5*(2).

Stangor, C. (2011). *Research Methods for the Behavioural Sciences* (4th Ed). Cengage Learning: Wadsworth.

Stover, G. (2015). *Teachers' Attitudes toward Technology*. Theses, Dissertations and Capstones. Paper 977. Retrieved December 19, 2016 from Marshal Digital Scholar.

Telkom (2015). *Technology in Education: Considerations and Trends for the Education Sector*.

Teo, T., Su Luan, W. & Sing, C. C. (2008). A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: an application of the Technology Acceptance Model (TAM). *Educational Technology & Society, 11*(4), 265–280.

Teo, T. (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. *Australasian Journal of Educational Technology, 24*(4), 413-424.

Tire, T. & Mlitwa, N. (2007). ICT access and use in rural schools in South Africa-Northern Cape Province. *Faculty of Informatics and Design, Cape Peninsula University of Technology*.

Tondeur, J., Valcke, M. & Van Braak, J. (2008). A multidimensional approach to determinants of computer use in primary education: r and school characteristics. *Journal of Computer Assisted Learning, 24*(6), 494-506.

Turner, M., Kitchenham, B., Brereton, P., Charters, S. & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology*, *52*(5), 463-479.

Usluel, Y. K., Askar, P. & Bas, T. (2008). A Structural Equation Model for ICT Usage in Higher Education. *Educational Technology & Society*, *11*(2), 262-273.

Vannatta, R. & Banister, S. (2009). Validating a measure of teacher technology integration. *Society for Information Technology & Educator Education International Conference, 1*, 1134-1140.

Watson, D. M. (1998). Blame the technocentric artifact! What research tells us about problems inhibiting teacher use of I.T. In G. Marshall, & M. Ruohonen (Eds.), *Capacity Building for IT in Education in Developing Countries* (pp. 185-192), London: Chapman & Hall.

Wilson-Strydom, M., Thomson, J. & Hodgkinson-Williams, C. (2005). Understanding ICT integration in South African classrooms. *Perspectives in education, 23*(4), 71-85.

Woodrow, J. E. (1990). Locus of control and student educator computer attitudes. *Computers & Education, 14*(5), 421-432.

Zehra, R. & Bilwani, A. (2016). Perceptions of Teachers Regarding Technology Integration in Classrooms: A Comparative Analysis of Elite and Mediocre Schools. *Journal of Education and Educational Development*, *3*(1), 1-29.

APPENDICES

A: Principals Approach letter

Psychology

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January 2016

Dear Principal

My name is Avika Daya. I am currently completing my Masters in Educational Psychology degree at the University of the Witwatersrand. As part of the degree, I am conducting research on educator's attitudes towards Educational Technology (ET) and ET usage in the classroom. ET is thought to have a positive impact on student learning and a critical aspect of ET implementation is educator's perceptions of the utility of ET. However, the factors that influence educator perceptions are not well understood. There is a need for more research to be undertaken in South Africa to ensure that future implementation of ET in the classroom is effective and beneficial to both educators and students. I would like to invite the educators at your school to participate in my study and would appreciate your assistance in facilitating this.

My study will make use of a questionnaire considering various factors linked to the perception of ET usage in schools. The questionnaire will take approximately 20 minutes to complete and it will be dropped off at your school early in the second term. Educators may complete the questionnaire at their own convenience. The completed questionnaires will be collected after two weeks of being dropped off. I require the voluntary participation of approximately 150 educators from various schools and I am hoping that your school will consider participating in my study

I have applied for ethical clearance to conduct this study from the University of the Witwatersrand and have received GDE permission to conduct the study at public schools in Gauteng. I will begin data collection thereafter and I would like to complete data collection as soon as possible.

There are no risks or benefits associated with participation in this study. The questionnaires require no identifying information thus maintaining the anonymity and confidentiality of the educators. Given the anonymous response format, individual feedback cannot be given. However, this study may provide useful insights into the integration, acceptance and usage of ET in teaching and learning in South Africa. Upon completion of the study, I will be able to provide each school with a summary of the findings if requested.

It would be much appreciated if you could assist me by informing your educators of this study and facilitate the hand out and collection of questionnaires at your school. Should your school wish to participate in this study, please complete the attached consent form and email or fax it to either my supervisor Prof. Sumaya Laher or myself. Alternatively, I can come and collect it from the school. My contact details and those of my supervisor appear below.

I look forward to hearing from you.

Kind regards,

Ms. Avika Daya
Cell: 083 648 6810
E-mail: **aviks14@gmail.com**

Prof. Sumaya Laher
Tel: 011 717 4532, **Fax: 086 553 4913**
E-mail: **sumaya.laher@wits.ac.za**

Psychology

School of Human & Community Development

University of the Witwatersrand

Private Bag 3, Wits, 2050

Tel: 011 717 4503 Fax: 086 553 4913

I, _____principal of _____ (name of school), grant consent for Avika Daya to conduct research at this school. I agree to assist Ms. Daya by informing the educators of her study and facilitating the handing out and collection of questionnaires. I understand that educators' participation in this study is voluntary and that all details will be kept confidential at all times. The school's name will also not be mentioned in the study further preserving the anonymity of responses. The school will/will not require a summary of the results of the study.

Name: _____

Signed: _____

Date: _____

B: Participant Information sheet

Psychology

School of Human & Community Development

University of the Witwatersrand

Private Bag 3, Wits, 2050

Tel: 011 717 4503 Fax: 086 553 4913

01 April 2016

Dear Sir/Madam

Hello! My name is Avika Daya. I am currently completing my Masters in Educational Psychology degree at the University of the Witwatersrand. As part of the degree, I am conducting research on educator's attitudes towards Educational Technology (ET) and ET use within schools. As part of the degree, I am conducting research on educator's attitudes towards Educational Technology (ET) and ET usage in the classroom. ET is thought to have a positive impact on student learning and a critical aspect of ET implementation is educator's perceptions of the utility of ET. However, the factors that influence educator perceptions are not well understood. There is a need for more research to be undertaken in South Africa to ensure that future implementation of ET in the classroom is effective and beneficial to both educators and students. I would therefore like to invite you to participate in my study.

Participation will involve completion of the attached questionnaire. It should take approximately 20 minutes to complete and you can complete it in your own time. Your participation is voluntary. There are no risks or benefits associated with participation in this study. The questionnaires contain no identifying information, so your responses will remain strictly confidential and anonymous at all times. As I will only focus on group trends and there is no way of linking an individual to their questionnaire, no individual feedback can be given. However, upon completion of the study, I will be able to provide you with a summary of the findings. Completion and return of the questionnaire will be taken as consent for me to use your responses in the context of my study. If you have any further questions or would like feedback on the results of this study, please feel free to contact me. My details appear below.

Thank you for considering taking part in my research project. Please detach and keep this sheet.

Kind regards,

Ms. A. Daya
Cell: 0836486810
E-mail: aviks14@gmail.com

Prof. S. Laher
Tel: 011 717 4532
E-mail: sumaya.laher@wits.ac.za

C: Questionnaire

The items presented in this questionnaire explore your opinions about the use of computers and other educational technology in classrooms today. Other educational technology includes all forms of information and communication technologies used in the classroom for teaching purposes. This includes smartboards, laptops and/or tablets amongst others.

A) Please indicate your responses to the following questions by ticking the appropriate boxes.

1. **What is your gender?**
   □ Male □ Female

2. **What is your age?**
   □ 20-29 □ 30-39 □40-49 □50-59 □60+

3. **What is your highest completed academic degree?**
   _____

4. **Including the current year, how many years have you been teaching?**
   □ 1-5 □ 6-10 □ 11-15 □ 16-20 □ 20+

5. **In what type of school do you teach?**
   □ Private □ Public

6. **What grades do you teach?**
   □ 1-3 □ 4-7 □ 8-9 □10-12

7. **Does your school use ECT?**

   ☐ Yes ☐ No

   If yes, what types of ECT are used?

   _____

   _____

8. **For how long has ECT being used at your school?**

   _____

9. **What is the teaching method you use most often? (Please tick the appropriate box)**
   Method:

Active Discussion	□	Collaborative activities	□
Demonstration	□	Hands-on learning	□
Lecturing	□	Role Playing	□
Computer assisted instruction	□		

Other (please specify)_____

B) Please indicate your reaction to the following statements by circling the number that represents your level of agreement or disagreement with it. Please make sure to respond to every statement.

		Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	Computers and other educational technology does not scare me at all	1	2	3	4	5
2	Computers and other educational technology makes me feel uncomfortable	1	2	3	4	5
3	I am glad there are more computers and other educational technology these days	1	2	3	4	5
4	I do not like talking with others about computers and other educational technology	1	2	3	4	5
5	Using computers and other educational technology is enjoyable	1	2	3	4	5
6	I dislike using computers and other educational technology in teaching	1	2	3	4	5
7	Computers and other educational technology saves time and effort	1	2	3	4	5
8	Schools would be a be a better place without computers and other educational technology	1	2	3	4	5
9	Students must use computers and other educational technology in all subject matter	1	2	3	4	5
10	Learning about computers and other educational technology is a waste of time	1	2	3	4	5
11	Computers and other educational technology would motivate students to do more studying	1	2	3	4	5
12	Computers and other educational technology are a fast and efficient means of getting information	1	2	3	4	5
13	I do not think I would ever need a computer and other educational technology in my classroom	1	2	3	4	5
14	Computers and other educational technology can enhance students' learning	1	2	3	4	5
15	Computers and other educational technology do more harm than good	1	2	3	4	5
16	I would rather do things by hand than with a computer and other educational technology	1	2	3	4	5
17	If I had the money I would buy a computer and other educational technology	1	2	3	4	5
18	I would avoid computers and other educational technology as much as possible	1	2	3	4	5
19	I would like to learn more about computers and other educational technology	1	2	3	4	5

20	I have no intention to use computers and other educational technology in the near future	1	2	3	4	5

C) Please indicate your reaction to the following statements by circling the number that represents your level of agreement or disagreement with it. Please make sure to respond to every statement.

		Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1	Computers and other educational technology will improve education	1	2	3	4	5
2	Teaching with computers and other educational technology offers real advantages over traditional methods of instruction	1	2	3	4	5
3	Computers and other educational technology cannot improve the quality of students' learning	1	2	3	4	5
4	Using computers and other educational technology in the classroom would make the subject matter more interesting	1	2	3	4	5
5	Computers and other educational technology are not useful for language learning	1	2	3	4	5
6	Computers and other educational technology have no place in schools	1	2	3	4	5
7	Computers and other educational technology use fits well into my curriculum goals	1	2	3	4	5
8	Class time is too limited for computer and other educational technology use	1	2	3	4	5
9	Computers and other educational technology use suits my students' learning preferences and their level of computer and other educational technology knowledge	1	2	3	4	5
10	Computers and other educational technology use is appropriate for many language learning activities	1	2	3	4	5
11	It would be hard for me to learn to use a computer and other educational technology in teaching	1	2	3	4	5
12	I have no difficulty in understanding the basic functions of computers and other educational technology	1	2	3	4	5
13	Computers and other educational technology complicate my task in the classroom	1	2	3	4	5

14	Everyone can easily learn to operate a computer and other educational technology	1	2	3	4	5
15	I have never seen computers and other educational technology at work	1	2	3	4	5
16	Computers and other educational technology has proved to be effective learning tools worldwide	1	2	3	4	5
17	I have never seen computers and other educational technology being used as an educational tool	1	2	3	4	5
18	I have seen some South African teachers use computers and other educational technology for educational purposes	1	2	3	4	5

D) Please indicate your reaction to the following statements by circling the number that represents your level of agreement or disagreement with it. Make sure to respond to every statement.

		Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1	Computers and other educational technology will not make any difference in our classrooms, schools or lives	1	2	3	4	5
2	Students need to know how to use computers and other educational technology for their future jobs	1	2	3	4	5
3	Students prefer learning from teachers to learning from computers and other educational technology	1	2	3	4	5
4	Knowing about computers and other educational technology earns one the respect of others	1	2	3	4	5
5	We need computers and other educational technology that better suit the South African culture and identity	1	2	3	4	5
6	Computers and other educational technology will improve our standard of living	1	2	3	4	5
7	Using computers and other educational technology would not hinder South African generations from learning their traditions	1	2	3	4	5
8	Computers and other educational technology are increasingly becoming part of schooling at too fast a rate.	1	2	3	4	5
9	People who are skilled in computers and other educational technology have privileges not available to others	1	2	3	4	5

10	Computers and other educational technology will increase our dependence on other countries	1	2	3	4	5
11	There are other social issues that need to be addressed before implementing computers and other educational technology in education	1	2	3	4	5
12	The increasing presence of computers and other educational technology will make our lives easier.	1	2	3	4	5
13	Computers and other educational technology dehumanise society	1	2	3	4	5
14	Working with computers and other educational technology does not diminish people's relationships with one another	1	2	3	4	5
15	Computers and other educational technology encourage unethical practices	1	2	3	4	5
16	Computers and other educational technology should be a priority in education	1	2	3	4	5

E) Please indicate your current computer and other Educational Technology competence level (i.e. both your knowledge of and your skill in using computers and other Educational Technology) regarding each of the following statements. Make sure to respond to every statement.

		No competence	**Little competence**	**Moderate competence**	**Much Competence**
1	Install new software on a computer	1	2	3	4
2	Use a printer	1	2	3	4
3	Use a computer keyboard	1	2	3	4
4	Operate a word processing program (e.g., Word)	1	2	3	4
5	Operate a presentation program (e.g., PowerPoint)	1	2	3	4
6	Operate a spreadsheet program (e.g., Excel)	1	2	3	4
7	Operate a database program (e.g., Access)	1	2	3	4
8	Use the internet for communication (e.g., email and chat room)	1	2	3	4
9	Use the World Wide Web to access different types of information	1	2	3	4

10	Solve simple problems in operating computers	1	2	3	4
11	Operate a graphics program (e.g., Photoshop)	1	2	3	4
12	Use computers for grade keeping	1	2	3	4
13	Select and evaluate educational software	1	2	3	4
14	Create and organise computer files and folders	1	2	3	4
15	Remove computer viruses	1	2	3	4

F. Please indicate your level of access and usage for <u>educational and teaching purposes</u> by ticking the appropriate boxes. Please complete the access and usage columns.

Software	**Access**				**Usage for educational and teaching purposes**		
	At home		**At school**				
	Yes	**No**	**Yes**	**No**	**Frequently**	**Sometimes**	**Never**
1. Word Processors (Word etc.)							
2. Spreadsheets (Excel etc.)							
3. Presentation Software (PowerPoint etc.)							
4. Databases (Access etc.)							
5. Computer Aided Instruction Software							
6. Search Engines (google, yahoo etc.)							
7. Electronic Mail (e-mail)							
8. Discussion Lists and Newsgroups							
9. Chat and/or Forum - WhatsApp							
10. Chat and/ or Forum – Facebook							
11. School communicator							
12. Electronic Encyclopaedia and/or Atlas							
13. Instructional Films (video, CD, VCD etc.)							
14. Other:_____							
Usage of Instructional Tools and Materials							
1. Smart Board							
2. Overhead Projector							
3. Multimedia Computer							
4. Projector System							
5. Internet/Web Environment							
6. Television/Video							
7. Radio Cassette Recorder							
8. Video Camera							

9. Slide Projector							
10. Printed Materials (journals, books, worksheets etc.)							
11. Tablet							
12. Smartphone							
13. Other:_____							

G. Please complete the following table by ticking the correct boxes under usage with regards to <u>lesson planning (research)</u>.

Software	**Usage for lesson planning (research)**		
	Frequently	**Sometimes**	**Never**
1. Search Engines (google, yahoo etc.)			
2. Electronic Mail (e-mail)			
3. Presentation Software (PowerPoint etc.)			
4. Discussion Lists and Newsgroups			
5. Electronic Encyclopaedia and/or Atlas			
6. Other:_____			
Usage of Instructional Tools and Materials			
1. Multimedia Computer			
2. Internet/Web Environment			
3. Printed Materials (journals, books, etc.)			
4. Tablet			
5. Smartphone			
6. Other:_____			

H. Please complete the following table by ticking the appropriate boxes indicating level of usage of technology with regards to <u>communication with parents and learners</u>.

Software	**Usage for communication with parents and learners**		
	Frequently	**Sometimes**	**Never**
1. Electronic Mail (e-mail)			
2. Discussion Lists and Newsgroups			
3. Chat and/or Forum –WhatsApp			
4. Chat and/ or Forum – Facebook			
5. School communicator			
6. Other:_____			
Usage of Instructional Tools and Materials			
1. Tablet			
2. Smartphone			
3. Other:_____			

I. Please complete the following table by ticking the correct boxes under usage with regards to <u>communication with the principal and colleagues</u>.

Software	**Usage for communication with principal and colleagues**		
	Frequently	**Sometimes**	**Never**
1. Electronic Mail (e-mail)			
2. Discussion Lists and Newsgroups			
3. Chat and/or Forum-WhatsApp			
4. Chat and, or Forum – Facebook			
5. Other:_____			
Usage of Instructional Tools and Materials			
1.Tablet			
2. Smartphone			
3. Other: _____			

J. Please complete the following table by ticking the correct boxes under usage with regards to <u>all personal social communication</u>.

Software	**Usage for personal social communication**		
	Frequently	**Sometimes**	**Never**
1. Electronic Mail (e-mail)			
2. Discussion Lists and Newsgroups			
3. Chat and/or Forum – WhatsApp			
4. Chat and/ or Forum – Facebook			
5. Other: _____			
Usage of Instructional Tools and Materials			
1.Tablet			
2. Smartphone			
3. Other:_____			

Thank you for your participation!

Please place this questionnaire in the envelope.

D: Ethical Approval Letter: Human research ethics committee (Non-medical)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (SCHOOL OF HUMAN & COMMUNITY DEVELOPMENT

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: MEDP/16/005 IH**
PROJECT TITLE:	Educators' attitudes towards and perceptions of education technology use and integration in Gauteng schools
INVESTIGATORS **DEPARTMENT**	Daya Avika Psychology
DATE CONSIDERED	30/05/16
DECISION OF COMMITTEE*	Approved

This ethical clearance is valid for 2 years and may be renewed upon application

DATE: 30 May 2016

CHAIRPERSON
(Prof. Brett Bowman)

cc Supervisor: Prof. Sumaya Laher
Psychology

DECLARATION OF INVESTIGATOR (S)

To be completed in duplicate and **one copy** returned to the Secretary, Room 100015, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure, as approved, I/we undertake to submit a revised protocol to the Committee.

This ethical clearance will expire on 31 December 2018

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

E: Faculty of Humanities: Proposal approval letter

University of the Witwatersrand, Johannesburg
Faculty of Humanities – Postgraduate Office
Private Bag 3, Wits 2050, South Africa • Tel: +27 11 717 4002 • Fax: +27 11 717 4037 • Email: Sarah.Mfupa@wits.ac.za

Student Number: 438894

Miss Avika Daya
P O Box 1154
Springs
Johannesburg 1560
Gauteng South Africa

19 May 2016

Dear Miss Daya

APPROVAL OF PROPOSAL FOR THE DEGREE OF MASTER OF EDUCATION IN EDUCATIONAL PSYCHOLOGY

I am pleased to be able to advise you that the readers of the Graduate Studies Committee have approved your proposal entitled "*Educators' attitudes towards and perceptions of educational technology use and integration in Gauteng schools*". I confirm that Professor Sumaya Laher has been appointed as your supervisor in the School of Human and Community Development.

The research report is normally submitted to the Faculty Office by 15 February, if you have started the beginning of the year, and for mid-year the deadline is 31 July. All students are required to RE-REGISTER at the beginning of each year.

You are required to submit 2 bound copies plus 1 CD in pdf (Adobe) format of your research report to the Faculty Office. The 2 bound copies go to the examiners and are retained by them and the CD is retained by the Faculty Office as back up.

Please note that should you miss the deadline of 15 February or 31 July you will be required to submit an application for extension of time and register for the research report extension. Any candidate who misses the deadline of 15 February will be charged fees for the research report extension.

Kindly keep us informed of any changes of address during the year.

Note: All MA and PhD candidates who intend graduating shortly must meet your ETD requirements at least 6 weeks after your supervisor has received the examiners reports. **A student must remain registered at the Faculty Office until graduation.**

Yours Sincerely

SD Mfupa

Sarah Mfupa
Postgraduate Division
Faculty of Humanities
Private Bag X 3
Wits, 2050

F: Gauteng Department of Education: Research approval form

For administrative use only:
Reference no: D2016 / 413
enquiries: Diane Buntting 011 843 6503

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVAL LETTER

Date:	**26 February 2016**
Validity of Research Approval:	**26 February 2016 to 30 September 2016**
Name of Researcher:	**Daya A.**
Address of Researcher:	**P.O. Box 1154; Springs; 1560**
Telephone / Fax Number/s:	**011 733 4970; 083 648 6810**
Email address:	**aviks14@gmail.com**
Research Topic:	**Teachers attitudes towards and perceptions of ET use and integration in Gauteng schools**
Number and type of schools:	**FOUR Primary and FIVE Secondary Schools**
District/s/HO	**Gauteng East and Johannesburg East**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. *The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.*
2. *The Researcher will make every effort to obtain the goodwill and co-operation of the GDE District officials, principals, SGBs, teachers, parents and learners involved. Participation is voluntary and additional remuneration will not be paid;*
3. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*

2016/02/29

Office of the Director: Education Research and Knowledge Management ER&KM)
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506

4. *Research may only commence from the second week of February and must be concluded by the end of the THIRD quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
5. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
6. *It is the researcher's responsibility to obtain written consent from the SGB/s; principal/s, educator/s, parents and learners, as applicable, before commencing with research.*
7. *The researcher is responsible for supplying and utilizing his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institution/s, staff and/or the office/s visited for supplying such resources.*
8. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research title, report or summary.*
9. *On completion of the study the researcher must supply the Director: Education Research and Knowledge Management, with electronic copies of the Research Report, Thesis, Dissertation as well as a Research Summary (on the GDE Summary template). Failure to submit your Research Report, Thesis, Dissertation and Research Summary on completion of your studies / project – a month after graduation or project completion - may result in permission being withheld from you and your Supervisor in future.*
10. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned;*
11. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director/s and school/s concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

.....

Dr David Makhado

Director: Education Research and Knowledge Management

DATE: 2016/02/29

Office of the Director: Education Research and Knowledge Management ER&KM)
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506

Fifthdraftturnitin.docx

ORIGINALITY REPORT

%10	%8	%3	%4
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	sajournalofeducation.co.za Internet Source	%1
2	ifets.info Internet Source	%1
3	Submitted to University of Witwatersrand Student Paper	<%1
4	www.mdpi.com Internet Source	<%1
5	Submitted to Bridgepoint Education Student Paper	<%1
6	lib.euser.org Internet Source	<%1
7	uir.unisa.ac.za Internet Source	<%1
8	ir.canterbury.ac.nz Internet Source	<%1
9	eprints.qut.edu.au Internet Source	<%1
10	eprints.ru.ac.za Internet Source	<%1
11	ijbnpa.biomedcentral.com Internet Source	<%1
12	www.tojet.net Internet Source	<%1
13	etd.lib.metu.edu.tr Internet Source	<%1
14	arno.uvt.nl Internet Source	<%1
15	Hustvedt, Gwendolyn, Mira Ahn, and JoAnn Emmel. "The adoption of sustainable laundry technologies by US consumers : Sustainable laundry technology", International Journal of Consumer Studies, 2013. Publication	<%1
16	media.proquest.com Internet Source	<%1
17	hydra.hull.ac.uk Internet Source	<%1
18	crosscentre.tungwahcsd.org Internet Source	<%1
19	Boateng, Agyenim Glaister, Keith W.. "Strategic motives for international joint venture formation in Ghana (1).", Management	<%1

	International Review, April 2003 Issue Publication	
20	ijedict.dec.uwi.edu Internet Source	<%1
21	roar.uel.ac.uk Internet Source	<%1
22	Submitted to EDMC Student Paper	<%1
23	lauda.ulapland.fi Internet Source	<%1
24	Submitted to Queen's University of Belfast Student Paper	<%1
25	eprints.lancs.ac.uk Internet Source	<%1
26	mazziotti.uchicago.edu Internet Source	<%1
27	www.suomenpankki.fi Internet Source	<%1
28	Submitted to Higher Education Commission Pakistan Student Paper	<%1
29	Submitted to Anglia Ruskin University Student Paper	<%1
	144.214.55.140	
30	Internet Source	<%1
31	www.waelbasri.com Internet Source	<%1
32	www.eric.ed.gov Internet Source	<%1
33	phd.lib.uni-corvinus.hu Internet Source	<%1
34	Eingereicht an De Montfort University am 2012-04-24 Student Paper	<%1
35	digital.library.okstate.edu Internet Source	<%1
36	Submitted to Goldsmiths' College Student Paper	<%1
37	people.umass.edu Internet Source	<%1
38	Submitted to Northern Consortium UK Student Paper	<%1
39	Submitted to UKTA Student Paper	<%1
40	researcharchive.vuw.ac.nz Internet Source	<%1
	www.edutopia.org	

51	Submitted to University of Pretoria Student Paper	<%1
52	Submitted to University of Western Sydney Student Paper	<%1
53	aut.researchgateway.ac.nz Internet Source	<%1
54	Arun S. Rao. "Elderly Indo-Caribbean Hindus and End-of-Life Care: A Community-Based Exploratory Study", Journal of the American Geriatrics Society, 4/18/2008 Publication	<%1
55	www.ukessays.com Internet Source	<%1
56	Submitted to University of Leicester Student Paper	<%1
57	Submitted to University of Northumbria at Newcastle Student Paper	<%1
58	"Census Bureau: 2013 Information and Communication Technology Survey.", PR Newswire, March 12 2015 Issue Publication	<%1
59	scholar.lib.vt.edu Internet Source	<%1
	Submitted to University of Derby	
60	Student Paper	<%1
61	Submitted to Ohio University Student Paper	<%1
62	Submitted to Kenyatta University Student Paper	<%1
63	lrd.yahooapis.com Internet Source	<%1
64	Shyu, S.H.P.. "Elucidating usage of e-government learning: A perspective of the extended technology acceptance model", Government Information Quarterly, 201110 Publication	<%1
65	performwell.org Internet Source	<%1
66	www.pcouncil.org Internet Source	<%1
67	tdx.cat Internet Source	<%1
68	uhra.herts.ac.uk Internet Source	<%1
69	citeseerx.ist.psu.edu Internet Source	<%1
70	doras.dcu.ie	

	Internet Source	<%1
71	digitalcommons.andrews.edu Internet Source	<%1
72	wiredspace.wits.ac.za Internet Source	<%1
73	www.mona.uwi.edu Internet Source	<%1
74	id.scribd.com Internet Source	<%1
75	www.sagepub.com Internet Source	<%1
76	libdcms.nida.ac.th Internet Source	<%1
77	tees.openrepository.com Internet Source	<%1
78	David C. Geary. "Sexual selection and sex differences in mathematical abilities", Behavioral and Brain Sciences, 06/1996 Publication	<%1
79	researchbank.rmit.edu.au Internet Source	<%1
80	Submitted to Midlands State University Student Paper	<%1
81	issuu.com Internet Source	<%1
82	etd.lsu.edu Internet Source	<%1
83	www.opr.princeton.edu Internet Source	<%1
84	researchspace.ukzn.ac.za Internet Source	<%1
85	www.stat.cmu.edu Internet Source	<%1
86	www2.uwe.ac.uk Internet Source	<%1
87	journal-archieves8.webs.com Internet Source	<%1
88	mak.ac.ug Internet Source	<%1
89	researchrepository.murdoch.edu.au Internet Source	<%1
90	ulir.ul.ie Internet Source	<%1
91	herkules.oulu.fi Internet Source	<%1
92	prr.hec.gov.pk Internet Source	<%1

93	www.eurochrie.org Internet Source	<%1
94	www.forestry.gov.uk Internet Source	<%1
95	ijettcs.org Internet Source	<%1
96	epubl.luth.se Internet Source	<%1
97	lup.lub.lu.se Internet Source	<%1
98	www.inderscience.com Internet Source	<%1
99	mro.massey.ac.nz Internet Source	<%1
100	Akinde, Taiwo Adetoun. "Theoretical modelling to explain lecturers' use of educational support systems for teaching in unive", Library Philosophy and Practice, May 2016 Issue Publication	<%1
101	archive.org Internet Source	<%1
102	Journal of Educational Administration, Volume 52, Issue 6 (2014-09-16) Publication	<%1
103	dr.library.brocku.ca Internet Source	<%1
104	Dalgety *, Jacinta, and Richard K. Coll. "The influence of normative beliefs on students' enrolment choices", Research in Science & Technological Education, 2004. Publication	<%1
105	en.wikipedia.org Internet Source	<%1
106	American Journal of Business, Volume 19, Issue 1 (2012-08-06) Publication	<%1
107	Althabe, Fernando, Alicia Alemán, Agustina Mazzoni, Mabel Berrueta, Paola Morello, Mercedes Colomar, Alvaro Ciganda, Ana Becú, Luz Gibbons, Laura Llambi, María G Bittar Gonzalez, Van T Tong, Sherry L Farr, Ruben A Smith, Patricia M Dietz, Carolyn Johnson, Pierre Buekens, and José M Belizán. "Tobacco cessation intervention for pregnant women in Argentina and Uruguay: study protocol", Reproductive Health, 2013. Publication	<%1
108	Yetisen, Ali K., Lisa R. Volpatti, Ahmet F. Coskun, Sangyeon Cho, Ehsan Kamrani, Haider Butt, Ali Khademhosseini, and Seok	<%1

	Hyun Yun. "Entrepreneurship", Lab on a Chip, 2015. Publication	
109	Submitted to Southern Cross University Student Paper	<%1
110	Hofhansl, F., W. Wanek, S. Drage, W. Huber, A. Weissenhofer, and A. Richter. "Controls of hydrochemical fluxes via stemflow in tropical lowland rainforests: Effects of meteorology and vegetation characteristics", Journal of Hydrology, 2012. Publication	<%1
111	trace.tennessee.edu Internet Source	<%1
112	www.cast-eu.org Internet Source	<%1
113	Submitted to South Bank University Student Paper	<%1
114	dro.deakin.edu.au Internet Source	<%1

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G: Approval of title change

Lebo Mokone 11:29 AM (8 hours ago)

to 438894, me

Good Day

I'm pleased to inform you that the Assistant Dean has approved your application for Title change to: **The impact of access to educational technology and educator's attitudes towards educational technology on the use and integration of educational technology in South African schools**

Thanks,

Lebo Mokone
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