EARLY INTRODUCTION OF COST-EFFECTIVE E-LEARNING ICTs IN SCHOOLS

by

Oyetade Kayode Emmanuel

(21347799)

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Supervisor: Professor Seraphin. D. Eyono Obono (Ph.D)

DECLARATION

I, Oyetade Kayode Emmanuel, declare that this dissertation is a representation of my own work both in conception and execution. This work has not been submitted in any form for another degree at any university or institution of higher learning. All information cited from published or unpublished works have been acknowledged.

_____ _____

Oyetade Kayode Emmanuel Date

APPROVED FOR FINAL SUBMISSION

_____ _____

Prof S.D Eyono Obono (Ph.D) Date

Supervisor

DEDICATION

This dissertation is dedicated to the memory of my late father, Deacon Ademola Oyetade, whose words of wisdom and encouragement inspired me. To my family, I am grateful for their support, encouragement and motivation throughout the period of this study.

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ABSTRACT

One of the fundamental characteristics of technology is its ever-changing nature with the continuous release of new models and products almost on a daily basis. It is interesting to note that these new technologies seem to appeal more to the youth than to the old. This might explain why the content of some Information and Communication Technologies (ICTs), such as films, TV, and games, are sometimes released with well-defined age ratings, in order to provide guidance to parents and guardians on the suitability of such content for their children. What is surprising is that there are age restrictions for the content presented by ICT devices, but devices themselves do not have any defined age restriction. For example, movies which can be played on computers, have a well-defined age restriction; but computers themselves do not have any defined age restriction. This non-definition of age ratings for ICT devices is certainly a general concern, but it is also a major concern for the education domain which needs to determine the minimum age from which learners should be allowed to use ICTs at school. This problem of the non-definition of age ratings for ICT devices serves as a motivation for this study, whose aim is to determine the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. The research objectives unfolding from this aim are: i) To select appropriate theories and models on the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school; ii) To design a conceptual model of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school; iii) To empirically test the above conceptual model of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school; and iv) To make recommendations on the design of eLearning initiatives in schools based on the results of the current study. These four objectives were achieved as follows through the content analysis of existing literature and a survey of 70 primary and secondary school educators from the Camperdown magisterial district in the KwaZulu-Natal province of South Africa: i) Specific personality and child development theories were selected as the theoretical foundation of this study; ii) The conceptual model proposed in this study gave rise to the following hypotheses:

The demographics of an educator affect the full functionality, the health, and the self-actualisation of his or her personality as well as his or her perceptions on the age from which learners should be allowed to start using ICTs at school. The full functionality, the health, and the self-actualisation of the personality of an educator all affect his or her perceptions on the age from which learners should be allowed to start using ICTs at school; iii) The empirical testing of the above hypothesized model yielded the following results: the grade or class taught by an educator is the only demographic factor that affects the full functionality, the health, and the self-actualisation of his or her personality; the subject specialisation of an educator is the only demographic variable that affects his or her perceptions on the age from which learners should be allowed to start using ICTs at school; the full functionality, the health, and the self-actualisation of the personality of an educator all affect his or her perceptions on the age from which learners should be allowed to start using ICTs at school; and iv) One of the recommendation of this study is that eLearning pilot projects be designed in ways that clearly consider differences between educators from various subject specialisations. This study identified the need for more research on the effect of personality on the perceptions of educators on the age from which learners should be allowed to start using ICTs, not only at school as it is the case for this study, but also at home. The main contribution of this research is to have found that educators' personality has an effect on their perceptions on the age from which learners should be allowed to start using ICTs at school, compared to the literature reviewed by this study which seems to be silent on the relationship between the personality of educators and the determination of the age when learners should be allowed to start using ICTs at school.

CHAPTER 1

INTRODUCTION

This aim of this study is to determine the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. Therefore, the purpose of the chapter is to describe how generations of youth enjoyed the ICTs of their times, especially in the learning context, despite the age restrictions set on the contents of some of these ICTs. The chapter ends with the presentation of the problem statement of this study on the non-regulation of age ratings of contemporary ICTs. This problem statement precedes the presentation of the aim, objectives, rationale, and research questions of this study on the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school.

1.1 ICTs, Learning, and the Youth

The dawn of the twenty-first century has seen an explosive growth and improvement of technologies such as movies, print, radios, television, cable television *etc*., which have been digitized over the decades (Gutnick *et al.* 2011). It is important to remember how these technologies were used in the past before presenting how this usage has evolved up to today. Such a presentation is done by Gutnick *et al.* (2011) from the year 1930 up to the new millennium, especially with the introduction in the 1990s of the Internet and cellular phones.

1.1.1 ICTs and the Youth from 1930 to 1990

This section will mainly describe the different types of ICTs used by the youth used between the years 1930 to 1990.

1.1.1.1 Types of ICTs from 1930 to 1990

These sections first describe the different types of ICTs that were used between 1930 and 1990 and how past generations of children and adolescents enjoyed these technologies for general purpose and for teaching and learning. Such technologies include radio, television, movies, cassettes, and video technologies. A discussion of

each of these technologies also includes the issue of age restrictions set for the content of these types of ICTs.

Movies: A movie is a story or occurrence, captured with a camera as a succession of moving pictures with sufficient rapidity as to produce the illusion of motion and continuity and established in a cinema or on television (Wood 1995). Watching movies is a source of entertainment and leisure when children sit and watch activities like cartoons, dance, and songs targeted at different age groups. Movies are watched on digital media like the video players, DVDs, and computers (Marsh *et al.* 2005). Movies also serve as a means of discovering children's identity, developing oral language and sense making as they observe movie characters. In schools, movies present language in a natural way than they are presented in books. Movies enhances collaboration between student and teacher, increase memory content as well as boost listening and aids understanding through their visual context (Berk 2009). Movies, played in classrooms, motivate and reinforce student interest to learn and illustrate ideas and principles that stimulate discussion, critical thinking or promote textual analysis skills (Hobbs 2006; Muller 2006). Age restrictions placed on movies and video content are regulated by regulation bodies in many countries in order to provide information on the suitability of such content for children. For example, in the United Kingdom (UK) and in the United States of America (USA), the British Board of Film Classification (BBFC) and the Motion Picture Association of America (MPAA), respectively, help to classify video and film contents distributed over digital media by setting certain guidelines to protect children and vulnerable adults from inappropriate contents and to empower consumers (parents) towards making informed viewing decisions for their children (Funk *et al.* 1999) (Table 1.1 and Table 1.2). It is also interesting to note that, in South Africa, the Film and Publication Board (FPB) (See Table 1.3) regulates the classification of films, computer games, and certain publications in order to provide consumer advice so that individuals and children can make informed choices on what to watch, on what to play, or on what to read (FPB 2012; FPB 2013).

Television: The television is an electronic device with a screen that receives, broadcast signals and turn them into pictures and sound over long distance. The television is a source of excitement and fun for children and youth when they watch programs on it. Activities that children and youth engage themselves on television include cartoons, literacy and numeracy programs, educational and general audience programs, singing and dancing shows, child stories, and movies (Livingstone and Bovill 1999; Marsh *et al.* 2005; Rideout 2013). These activities serves as a means of relaxation and escaping boredom (Marsh *et al.* 2005). In schools, television supports lecture materials as it lays a foundation for a common base of knowledge as well as enhance discussion and understanding among students (So *et al.* 2009). Also, the multiple forms such as images, motion, sound, and text that television offers, allow learners view actual objects and realistic scenes, learn through both verbal and visual means, and see sequences in motion (Fisch 2012) . Television allows learners to see viewpoints that are difficult to notice in real life. Television content is regulated by regulatory bodies in many countries in order to provide information on the suitability of television programs. For example, in the USA, TV parental guideline administers the television rating system by ensuring uniformity and consistency in applying parental guidelines. This rating system is designed to assist consumers' on the age appropriateness of TV programs as quite a number of new programs compete to capture viewers' interest and attention (Table 1.3).

Table1.1: BBFC classification categories (BBFC 2014)

Viewing classification	Meaning
U - Universal	Appropriate for all audiences aged 4 and above.
PG-(Parental Guidance)	Appropriate for age 8 and above and also depend on parental consideration.
12A/12:	Appropriate for age 12 years and above.
15	Appropriate for 15 years and older.
18	Appropriate for mature adults only.
R18 (Restricted)	Suitable for mature adults as it contains explicit works of consenting sex.

Table 1.2: MPAA ratings and meaning (Mosk 1997)

	Meaning
G	Films in this category are considered fit for all age groups.
PG	Films in this category leave the parent to make a decision as it contains inappropriate contents for children.
PG-13	Films in this category fit between the parental guidance category and the restricted category
R	Films contains adult content and not suitable for young children.
NC-17	Films in this category are considered too mature for children below 17.

Table 1.3: FPB classification guidelines and age categories (FPB 2012)

	Meaning
FPB A	All ages category and suitable for all.
FPB PG	Suitable for all age categories, but also indicates discretion by parents and caregivers in deciding whether or not a child may view contents.
FPB 7-9 PG	Indicates material is not suitable for children under the age of 7. Adult discretion is advised to decide if the material is appropriate for children from ages 7-9
FPB 10 - 12 PG:	Indicates material is not suitable for children under the age of 10. Adult supervision is advised to decide if the material is appropriate for children from ages 10-12
FPB 13	Indicates material is not suitable for children under the age of 13.
FPB 16	Indicates material is not suitable for persons under the age of 16.
FPB 18	Indicates material is not suitable for person under 18 years.
FPB X18	Indicates only a holder of a licence to conduct the business of adult premises, set out in section 24 of the Act, may distribute the film to persons older than eighteen or exhibit such content to such person within such premises.
FPB XX	Indicate the material may not be distributed or exhibited in public by anyone and also not in the adult premises set out in the section 24 of the act.

Table 1.4: TV parental guideline (Fleming 2002)

TV ratings:	Meaning
TV-Y	For all children between the ages of 2 to 6 years.
TV-Y7	Program targeted at children 7 years and above.
TV-Y7-FV	Content targeted at older children for more extreme or aggressive fantasy violence.
TV-G	The content is appropriate for all age groups.
TV-PG	Content with this rating depend on the discretion of the parents as it may contain
TV-14	Content suggested for age 14 and above.
TV-MA	Program designed for matured adults from ages 17 and above.

Computers: The computer is an electronic device that has the ability to manipulate, store, retrieve, and store data. Though not as common in the late 80's and early 1990's, children used computers to learn, watch videos, and play games which offer fresh opportunities and excitement. In schools, computers were seen as a potential catalyst for social interaction as well as adding variety to school curriculum (Wang and Carter Ching 2003). Content played on computers are regulated by suitable regulation bodies in many countries in order to provide information on the suitability of such content for children. For example, in the United States of America and in Europe, the Entertainment Software Rating Board (ESRB) and the Pan-European Game Information (PEGI) (Table 1.4 and Table 1.5), respectively, provide consumers with relevant information on age appropriateness for the use of computer games and of video content in making informed decisions (Pan European Game Information 2012; Entertainment Software Rating Board 2013).

Video Technology: Video technology mainly includes video tapes and recorders. The video recorder is a device that plays video and, amongst other things, sets time and pre-record interested programmes when connected to a television. It also has the play, rewind, record, and forward functions which children use for relaxation and entertainment. This rewind and recording option allows students and teachers to pause and emphasize on certain aspects of what is been taught (Imhoof 1983). In the classroom, video is used as a tool to help foreign born children learn English (Clovis 1997). The video also brings the reality of the world to the artificial classroom environment, thereby improving collaboration and interaction among students and

teachers (So *et al.* 2009). The use of the video in classrooms strengthens the connection between the abstract concepts and principles, creates a higher motivation to learn, and concretises application in cognitive development (Rosas *et al.* 2003). The video is used with technologies, like the television, whose contents have been rated by the TV parental guideline monitoring board.

Table 1.5: ESRB rating categories (ESRB 2013)

Categories	Age Scale
EARLY CHILDHOOD	Content in this category is appropriate for age 3+.
EVERYONE	Content in this category is appropriate for age 6+.
EVERYONE 10+	Content in this category is appropriate for age 10+.
TEEN	Content in this category is appropriate for age 13+.
MATURE	Content in this category is appropriate for age 17+.
ADULTS ONLY	Content in this category is appropriate for age 18+.
RATING PENDING	Contents having this rating have been submitted to ESRB and awaiting final rating.

Table 1.6: PEGI rating categories (PEGI 2013)

Categories	Meaning
PEGI 3	Content is considered suitable for all age groups.
PEGI 7	Content is considered suitable for ages seven and above.
PEGI 12	Content is considered suitable for ages twelve and above.
PEGI 16	Content is considered suitable for ages sixteen and above.
PEGI 18	Content is considered suitable for adults age eighteen and above.

Radio: The radio is a portable, simple, cheap, and accessible medium used all over the world to spread information to a larger group of people, thereby saving money, time, manpower, and energy in an effective way (Spiker 2004). It is a choice of relaxation, listening to music and, often times, listening to information, and imparting instruction. According to Rideout *et al.* (2003), the content played on radio strengthens the child's mind as it causes listeners to concentrate their attention and use their imagination or actively participate mentally, which serves as a source of learning and memory skills that makes the child smarter. The impact of radio is

immediate as it can both transmit events immediately, without delay resulting from print, and at the same time creates the feeling of being there (Spiker 2004; Starkey and Crisell 2009). In education, evidence exists that radio is used as an effective medium for learning. For example, it is reported by Imhoof (1983) that the Radio Mathematics project undertaken in Nicaragua, Thailand, Dominican republic, and Liberia towards the end of the 70's and the 80's was designed to teach Mathematics in primary schools and it was clearly a success especially among rural students. Another example is the Radio Language Arts project, which took place in the 80's in Kenya and whose students showed significant gains and achievement (Kinyanjui 1992).

1.1.1.2 Types of Generation of Children from 1930 to 1990

These sections describe the common names and peculiar characteristics that these generations of children are commonly referred to, such as the baby boomers, silent generation, and Generation X.

Silent Generation: Silent generations are those people born between 1925 and 1945 (Pennington-Gray and Lane 2002). They have been described as unadventurous, not inspiring, cautious, and quiet therefore, the name "Silents." (Johnson and Romanello 2005). They are an adaptive generation that respects authority and conforms to the belief of their parents easily. They do not like change and are not risk tolerant (Olson and Brescher 2011). Members of the silent generation take job security as a condition for working, value hard work and prudence, emphasize traditional morals, and hold work values of conformity, consistency, and uniformity (Johnson and Romanello 2005).

Baby Boomers: These generations of children, born between 1946 and 1964, are known to be a calm and satisfied generation (Howe and Strauss 2007). They grew up with both parent and with other kids. Also referred to as the chalk board and paper based generation, they enjoy working in a group and are not bothered about recognition by others but more concerned about personal fulfilment (Olson and Brescher 2011). Baby boomers are not comfortable with technological advances and

also prefer focusing on one goal at a time as they don't mix work with pleasure (Sithole *et al.* 2012).

Generation X: Children of Generation X were born between 1965 and 1981. As much as they value team work, they are independent problem solvers (Howe and Strauss 2007). They want personal recognition, question authority and are motivated by the possibility of the latest technological advances. They multi-task and want to achieve different goals at the same time (Sithole *et al.* 2012).

1.1.1.3 Learning Characteristics of Youth from 1930 to 1990

This section describes the general learning style of these generations of students with regard to teaching and learning in schools.

According to Cambiano *et al.* (2001), children in this era possess different characteristics relating to their learning style. For example, the silent generation has a preference to learn in the morning to allow them tap from their peak energy levels, while the baby boomers prefer a demonstrative, physically warm learning environment with a need for practical activities using realistic and manipulative materials. Generation X students prefer to learn in the evening and have a preference for an organized environment where learning activities are well laid out (Cambiano *et al.* 2001). This generation of students relied heavily on teachers as they want to be taught and engaged to retain information and instructions on various subjects and assignments (Sithole *et al.* 2012). Educational resources provided for students at that time were textbooks and reference materials (Oblinger and Oblinger 2005) as they preferred using library and printed documents instead of the web. They enjoy working in a group, are self-motivated and focussed on learning and also require feedback from what they do (Sithole *et al.* 2012).

1.1.2 Learning Technologies and the Youth from 1990 to Date

These sections will describe the different types of learning technologies used by the youth from 1990 to date and indicate the name given to these generations of students based on the available technologies.

1.1.2.1 Types of Learning Technologies from 1990 to Date

This section describes the different types of learning technologies used by the youth from 1990 to date and how the youth are enjoying the technologies of this era, such as mobile technologies and applications, computers, video games and digitized toys, and the Internet.

Mobile technology: These include mobile phones, smartphones, touch screens, and IPads. The mobile phone is a wireless handheld device that allows users to send text messages, make calls, and run applications (Sharon 2008) by allowing users to communicate with family members, keep in touch with friends as well as improve literacy practices using the text messaging functions (Marsh *et al.* 2005; Formby 2014). Mobile devices allow users to take and share pictures, songs, videos and contacts using the camera and Bluetooth device that offer much pleasure for youth (Marsh *et al.* 2005). Also, touch screens and iPads offer children the opportunity to use mobile devices to listen to music, play games, watch television, watch movies and video clips as well as play and explore letters, numbers, shapes and symbols, and surf the Internet (Duff and Leggett 2013; Formby 2014). These mobile devices open the child to a new world of experience as well as boost their communication and language outcomes (Formby 2014). In classrooms, mobile devices are used as a tool for collaborative learning where students connect with other classroom members or guest speakers' classrooms via text message or chat rooms to discuss academic activities. It is also used as a tool for reading books and storing entire libraries as an alternative to lugging around tons of heavy books as well as downloading free lectures and available short videos online (Robledo 2012).

Internet: The Internet is an inclusive network connecting millions of computers linked together into exchanging data and information**.** The Internet is seen as an opportunity by children and youth to communicate, work on homework, socialise, play games, watch videos and seek new information (Duff and Leggett 2013; Holloway *et al.* 2013) but the use of Internet varies by age group, judging by online activities. For example, according to Findahl (2009), watching video, playing different types of games and puzzles, using search engines and visiting social networks dominate usage among 2-6 year old, but this same activity increase

between the ages of 7 – 11 as they become active social network members and discover new things. By the age of 12 - 15, Internet use is multifaceted where girls prefer blogs and social networks while boys prefer to use the Internet to play games and watch videos. From age 16 – 19 years, the Internet is used for school work (Findahl 2009). At school, the Internet is used as a road map to help educators organize and bookmark Web sites for use in lessons as well as an innovative tool to undertake research tasks on interesting discipline (Murphy *et al.* 2003). It is also used in classrooms for activities like writing, drawing or design or playing games within their virtual world (Livingstone and Bovill 1999; Murphy *et al.* 2003).

Web 2.0 technologies: These technologies focus on creation, interaction, sharing, and collaboration of online information amongst users which encourage interactive uses of the Internet (Stone 2009). Examples include blogs, wikis, social networking site, such as Facebook, YouTube, *etc.*, podcasting and content hosting services. Web 2.0 technologies contribute to the creation of innovative activities and engage hard to reach young people who prefer these forms of communication to more traditional and institutional forms of contact (Stone 2009). They also enhance certain aspects of communication, teaching and learning. In schools, Web 2.0 technologies are applied to learning and training programs as a performance support mechanism to promote dissemination of knowledge, allowing teachers and students to share resources, information, and ideas on projects and assignments (Stone 2009; Barone 2012). These technologies also provide performance support via social network or Web 2.0 video conferencing services by allowing educators and students to communicate with experts (scientists, engineers, even astronauts) in an area where they require assistance who can help make real world connections to the curriculum (Stone 2009). Web 2.0 tools allow current events to be brought up to date by connecting students to newsfeed and news related blogs online and encouraging them to publish their comments (Rudd and Walker 2010).

Computers: Electronic devices composed of hardware and software that accept, process, retrieve, and store data. It can be programmed with instructions and exist in a variety of sizes and configuration. As a tool with lots of excitement, parents reported that their children use the computer to watch television or videos, play

music, play games online or on CD, socialise, and do homework (Livingstone and Bovill 1999; Marsh *et al.* 2005; Rideout 2013). When connected to the Internet, children use their computers to visit favourite websites to play games, watch videos, or watch television programs (Formby 2014) and, sometimes, send email with the help of parents (Rideout *et al.* 2003). In schools, computers give learners an opportunity to enhance language learning by bringing in the real world and, when used with the Internet, develop listening skills and improve speaking skills (Alsied and Pathan 2013). In the USA, teachers use computers in teaching and reading US history, social studies, and geography while students use the computers for school work to solve math problems, study maths through computer instruction, writing, learning new things like computer programming and data processing (Coley *et al.* 1997).

Laptops: A laptop computer is a small, portable computer (PC) that has a built-in display and keyboard that is smaller in size to sit on a person's lap (Professional Development Service for Teachers 2008). It runs the same operations as a desktop PC having the same operating system and software applications, but it is lightweight, portable, and convenient to carry around. Laptops offer the child an atmosphere to play music to relax, play videos and movies or connect to the internet to download, subscribe or stream online to play digital music and video, music, and short cartoons (Duff and Leggett 2013). The laptop helps the child to keep in touch with friends and families, and, when connected to the Internet, assists with school assignments as well as develops literacy and numeracy (Findahl 2009; Teuwen *et al.* 2012). In schools, laptops offer learners a world of knowledge where they can play learning games on maths, English, and brain teasing puzzles (Teuwen *et al.* 2012). The laptop is also used to perform efficient searches for information, develop students' writing skills, exercise student creativity through multimedia projects, make oral presentations with software such as PowerPoint, and improve day-to-day teaching and learning (Warschauer 2009).

Games and Toys: A game is a system which actively engages players in an artificial conflicts. It is defined by formulae and rules, and results in a measurable outcome (Salen and Zimmerman 2004). It could either be a computer game played on a

computer, a console game designed for gaming, and a video. Video games are used as a means of social interaction among peers and family members (Marsh *et al.* 2005) while computer games, by contrast, are chosen for both excitement and to counteract boredom. Also, toys like the interactive board games, puzzles, talking animals and interactive laptops are means of leisure activities by children to increase play experience and enrich learning (Marsh *et al.* 2005; Kafai and Giang 2007). At school, the use of the video games allows young children to develop their cognitive skills as trial and error seems to be part of learning which develops concentration and hand-eye co-ordination (Marsh *et al.* 2005). Video games allow participants to experience inquisitiveness, novelty, a contest that may stimulate learning and equip children with new technology which may help them overcome technophobia, which is common among many adults (Griffiths 2002). Games also serve as a vehicle for developing literacy skills and a reward for good behaviour (Kirriemuir and McFarlane 2003) while play experience with games and toys help children discover lots of ideas and experiences about themselves, which is a form of literacy and learning (Jarrett and Harvey 2013; Light *et al.* 2013).

1.1.2.2 Types of digital generation children

This section describes the common names and peculiar characteristics that new generations of children are commonly referred to, such as Generation Y or Millennials, Net Generation, Digital Native/Digital Immigrants, and new names coming up like the Instant Message Generation, Gamer Generation, Homo Zappiens, Google Generation, and I-Generation as a result of development in digital technologies.

Digital Natives/Immigrants: Digital immigrants are a group of individuals born before the advent of new technologies, but adjusted themselves to using emerging technologies (Prensky 2001) while digital natives are a generation born after 1990 during the boom of social digital technologies (Palfrey and Gasser 2013). Digital natives are known for their fluency, reliance and dependence on technologies as they feel comfortable living their lives online and adopting new forms of communications (Prensky 2001; Palfrey and Gasser 2013). In many ways, they place high value on education and lifestyle balance.

Generation Y or Millenials: Generation Y or millennials comprises those born between 1982 and 2002 (Weiler 2005; McCrindle 2006; Howe and Strauss 2009). They have grown up with electronic screens such as television, movies, video games, computer monitors (Weiler 2005), and surrounded by iconic technology like Internet, Email, SMSing, DVD, and PlayStation (McCrindle 2006). They are generally described as "optimistic, team-oriented, talented, sociable, influential, and achievement-oriented", constantly using technologies, not just for work, but to maintain relationships (Raines 2002). They possess knowledge in the details of digital technology, thus this environment has shaped the way they view the world (Zemke *et al.* 2000) making them formally educated and culturally more diverse than previous generations before them as they are projected to be "the most educationally ambitious generation" (McCrindle 2006; Howe and Strauss 2009).

Google Generation: A generation born after 1993 that grew up in a world immersed with the use of the Internet (Rowlands *et al.* 2008). They are a generation whose main point of call for access to knowledge, educational or social activities is the Internet using search engines such as Google, Bing, Yahoo, Ask, *etc.*, to retrieve information and research content in new ways by scanning through retrieved content and, as such, leads to the emergence of a new culture of online reading as well as good parallel processing skills (Ipsos 2008).

I-Generation: I-Generation, according to Rosen (2010), are a group of children born between 1990 and 2009. Techies from birth, this new generation is unique and very different as they grew up surrounded by technologies such as iPod, iPhone, social media, such as Myspace, Facebook, YouTube, Twitter, and digital media, such as podcasts, DVDs and videos staying literally connected to the World Wide Web 24/7. I-Geners are unique in the way they act and daily use media and technologies to socialize, create new content and share opinions (Rosen 2010). This generation of children prefer new learning styles to old educational contents which are not exciting for their tech savvy minds (Balraj et al., 2010**).**

Net Generations: Tapscott (1999) referred to the net generations as a generation of young people surrounded by digital media while growing up and influenced by computers, Internet, and other digital media. According to Leung (2004), net geners

are skilful and at ease with digital technologies as the Internet is seen as a medium of choice. Net geners have a unique way of gathering and processing information and, as such, view the computer as a place to socialise with friends using online social networking sites, like Twitter, LinkedIn and Facebook, with their creative and savvy mind set (Tapscott 1999; Oblinger *et al.* 2005).

Instant Messaging Generation: According to Lenhart *et al.* (2001), this generation use, the Internet and Instant Messaging (IM) as a means of communication, entertainment and accessing information. They have adapted Internet and IM technologies for their own purposes, creating new styles of online identities to add context and meaning to their communication as well as learning in schools (Lenhart *et al.* 2001). IM geners prefer the online community rather than face to face communication to interact with friends and to see the wider world (Hardey 2002).

Homo Zappiens Generation: Homo zappiens are a special generation of children that grow and learn with technology via computer screens, games, icons, sound, exploration, *etc.* (Veen 2007). They represent a generation born into technologies and they use these technologies as an interface to the world (Tapscott 1999). Homo zappiens are known to manage flow of information and actively immersed in playing video games which provide them an environment to experiment with varieties of roles. The exploratory approach of this generation through gaming and information navigation has helped them to develop strong intellectual skills as well as being an experienced problem solver and a good communicator (Gee 2003; Veen 2007). Homo zappiens have also developed a sense of multitasking using tools, such as MSN and chat rooms, and smileys, to communicate (Veen 2007).

Gamers Generations: The Gamer Generation is a generation known for their interest in video games and everyday entertainment choices (Beck 2004). They are surrounded with personal technology such as computers, cell phones, more complex television and new media, like the Internet, cable TV, and radio (Prensky 2005). They learn using the trial and error approach, resulting in some accidental education, as they discover and repeat those actions by patiently processing information encountered in bits. Thus, this has led to improving their spatial visualization and visual attention (Prensky 2005). Gamers are also comfortable with taking risks which

they have learnt from hours of video game experience. They can multitask and easily shift mental gears between them to best achieve their goals (Carstens and Beck 2004).

1.1.2.3 Characteristics of digital learning

This section describes the learning characteristics of digital generation students to show how students have adapted the use of new technologies in their learning styles preferring a more portable learning environment and expect their teachers to be comfortable with technologies without which the class is boring (Berk 2009).

Technology Savvy: Digital generation students are referred to as tech savvy because they are comfortable and proficient with the use of technologies, like computers, blogs, and videos for assignments or projects (Caruso and Kvavik 2005; Oblinger and Oblinger 2005). They already know how to use tools, like PowerPoint and excel, to work (Caruso and Kvavik 2005) and are open to learn about everything with technologies (Reilly 2012).

Multitasking: Digital generation students succeed at doing several things at a time (Frand 2000). This allows them to speed up learning by efficiently utilising their time and performing tasks simultaneously (Sweeney 2006). For example, a student may download lecture material on his/her cell phone and listen to his/her lecturer in his/her lecture hall at the same time.

Experiential learners and learning by trial and error: Digital generation students are experimental in their approach to learning (Frand 2000). They learn by doing and interacting with friends using games, computer simulators rather than reading manuals for direction (Sweeney 2006). This experiential approach makes learning interactive and interesting for students. With their intellectual speed, they jump right into any skill and figure out a way to solve a problem using trial and error. They repeat the same process over and over until they figure out the solution (Prensky 2001) and would only seek help only if they can‘t come up with the solution.

Interest in multimedia: Digital generation students enjoy using interactive full motion multimedia content, colour images, podcast, vodcast, and text to learn in classrooms and share contents with each other as they allow students to actively

engage them in learning and demonstrate learning beyond a specific topic under study (Oblinger and Oblinger 2005)

Team work: A major characteristic of the digital generation is collaboration. They have mastered the act of effectively working with other people at home and in schools, when playing games and doing other outdoor activities (Oblinger *et al.* 2005). This has assisted students in solving critical problems as they learn from each other using collaborative technologies, such as chat rooms, wikis, blogs, podcasts, videos, *etc.* (Oblinger and Oblinger 2005).

Heavy reliance on search engines: As time changes and new systems evolve, digital generation students have shifted their reliance on the old ways of teaching in getting information to relying heavily on search engines to access new information that open them up to a whole new world of experiences, which the traditional system of education do not offer (Manuel 2002; De Rosa 2006).

Creating Internet content: Not only are digital generation students ardent users of digital technologies, most especially the Internet for homework purposes; they contribute to its content via innovation by designing web sites, posting blogs with pictures and creative drawing, and making videos for YouTube daily (Berk 2009).

1.2 Problem Statement

It can be seen from the previous section that the age ratings have been well defined for the content of ICTs, such as movies, television, and games, but the age ratings for devices such as computers and cellphones, in which youth and children are heavily immersed, have not yet been defined. This raises the problem of the non-regulation of age ratings for the use of ICT devices from which learners should be allowed to use ICTs at school, in particular, and life, in general. For example, in the USA, evidence from existing literature reveals that children start using computers for educational enrichment as early as age 3 (Godnig 2002). Lynch and Warner (2004) also reports that child care centers children start using computers between the age of 2 and 4. As for the use of Internet, the youngest age where it is used for learning is the age of 13 (Lenhart *et al.* 2001). Evidence from Belgium and Sweden reveals that preschoolers have their first internet experience between age 3-4 years old (Findahl 2009; Teuwen *et al.* 2012). In Australia, a survey by Zevenbergen and Logan (2008)

reports that young children use computers in early childhood settings as early as age 4 - 5 years and age 5 – 8 for the use the Internet in schools for learning (Australian Bureau of Statistics, 2012). This problem of the non-definition of age ratings for the use of ICTs by learners in schools raises the following main research question followed by its sub-questions, and the study's subsequent research aim and objectives.

1.3 Research Questions, Aim, and Objectives

This section presents the aim, objectives, and research questions for the research on the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school.

1.3.1 Main Research Questions

It can be seen from the previous section that the issue of the regulation of the suitable age for the use of ICT devices for learners is not yet resolved; hence, the relevance of the following question: From which age can ICTs be safely used by children for various application domains?

1.3.2 Research Sub Question

The above formulated main research question is pursued in this study through the following set of research sub-questions.

- Research question 1: Which theories can help to understand educators' perceptions on the age from which learners should be allowed to use ICTs at school?
- Research question 2: How can the factors that can contribute to educators' perceptions on the age from which learners should be allowed to use ICTs at school be shaped into a conceptual model?
- Research question 3: How can the conceptual model of research question 2 be empirically validated?
- Research question 4: Which recommendations can be suggested from the knowledge of the factors that affect educators' perceptions on the age from which learners should be allowed to use ICTs at school?

1.3.3 Research Aim

The aim of this study is to determine the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. This would be achieved by answering the above formulated research question on the age when ICTs can be safely used by children for various application domains in an attempt to contribute towards solving the identified problem of the non-definition or non-regulation of age ratings for new forms of ICTs in schools. One can think of two ways of measuring the age from which learners should be allowed to use ICTs at school: i.e., the earliest age versus the earliest grade. This study has chosen to measure the age from which learners should be allowed to use ICTs at school in terms of the earliest age for learners for two reasons: firstly, because of the link between this study and technology age ratings, and, secondly, because of the equivalence between age and school grades, as explained below. From the review of literature on the existing system of education from different countries, there exists a corresponding relationship between minimum entrance ages to starting school and the first year of primary school, known as grade 1. For example, in Great Britain, children start going to school at the age of 5 years old where they enrol in grade 1. Results from USA, Nigeria, Ukraine, UAE, Cuba, and Zimbabwe reveal that learners begin schooling at age 6 when they enrol in grade 1. In Canada, evidence reveals that children begin schooling between ages 6 – 7 when they enrol in grade 1. In addition, results from South Africa, Malaysia, Finland, and China's education department show that children begin school at age 7 at grade 1**.**

1.3.4 Research Objectives

The above announced aim of this study is carried is sub-divided into the following set of research objectives:

1. To select relevant theories that can be applied to the examination of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school;
2. To design a conceptual model of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school;

3. To empirically test the above conceptual model of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school; and
4. To make recommendations on the design of eLearning initiatives in schools based on the results of the current study.

1.4 Research Rationale

This research is motivated by the need to identify the age from which learners should be allowed to use ICTs at school since existing literature tend to disagree (Lenhart *et al.* 2001; Godnig 2002; Teuwen *et al.* 2012) on the most appropriate age at which ICTs can be introduced for use in schools for teaching and learning purposes with regards to dealing with the characteristics and new learning styles of this digital generation students (Zemke *et al.* 2000; Howe and Strauss 2009; Rosen 2010).

1.5 Structure of the Dissertation

This dissertation comprises six chapters which are briefly described below.

Chapter 1 - Introduction

This chapter presents the aim, objectives, research questions and rationale of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school as an attempt to contribute towards solving the identified problem of the non-definition or non-regulation of age ratings for new forms of ICTs in schools. Types of learning technologies and ICTs and how each generation of youth enjoyed these technologies as well as the learning characteristics in terms of the technologies available for their era are introduced.

Chapter 2 - Theoretical Frameworks

Theoretical frameworks related to theories of personalities and child development are presented in the second chapter of this dissertation. These theoretical frameworks are then analysed in order to identify the relevance of their constructs that are then used for the design of a new theoretical model of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. This newly proposed conceptual model is then translated and explained in terms of research questions and in terms of research hypotheses.

Chapter 3 - Research Design

This chapter presents the design of the empirical study conducted in this researcher in pursuit of its third objective on the empirical testing of the proposed conceptual model, and presents a detailed description of the research methods used in fulfilment of the objective without presenting its results.

Chapter 4 - Research Results

This chapter presents results of the survey and experiment carried out on the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school for teaching and learning.

Chapter 5 - Discussion, Recommendations, Summary, and Conclusion

This chapter compares the research results of chapter four with existing empirical studies, and discusses strategies for the successful implementation eLearning initiatives of schools based on the results of this study. A summary of the study as well as possible avenues for future research are also presented.

1.6 Conclusion

This chapter describes how generations of youth have been enjoying the different types of learning technologies and ICTs of their times, especially in the learning context, going back as early as the 1930's till today. These technologies include movies, video technologies, television, games, computers, Internet, *etc.* The content of some of these technologies have age restrictions set on them by regulatory bodies like PEGI and ESRB to guide users on their appropriate use. Historical contexts and technologies' types for the different eras gave different appellations to generations of youth, as well as different learning characteristics or styles. Examples of names given to generations of youth include the silent generation, the baby boomers, the Generation Y, and the Google generation. The learning characteristics for these generations include: reliance on teachers, on team work, on multitasking, and on ICTs. As already mentioned above, different age restrictions have been set for the contents of some of these ICTs, such as games content, television content, and movies content, but not for ICT devices, such as mobile phones and computers. This concern of the non-regulation of age restrictions for these ICT devices is the main

problem at the origin of this study of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school

1.7 Research Publications

This work has resulted in the development of various models and the following research publications are published or submitted to peer-reviewed journals and conference proceedings.

- Oyetade, K. E. and Obono, S. D. E. 2014. Perceptions of Educators on the Learners' Youngest Age for the Introduction of ICTs in Schools: A Personality Theory Approach. *World Academy of Science, Engineering and Technology, International Journal of Social, Management, Economics and Business Engineering*, 8 (11): 3310-3316.
- Oyetade, K. E. and Obono, S. D. E. 2015. Modeling Child Development Factors for the Early Introduction of ICTs in Schools. *World Academy of Science, Engineering and Technology.* (Accepted)
- Oyetade, K. E. and Obono, S. D. E. 2015. On the Factors Affecting the Low Levels of Adoption of ICTs in Schools. *International Journal of Advanced Computer Technology*. (Accepted)

CHAPTER 2

REVIEW OF EXISTING THEORIES

This study aims to determine the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. This aim is hiding two aspects; Children's age, and educators' perceptions. The main assumption of this chapter is that child development theories are suitable to determine the age from which learners should be allowed to use ICTs at school. This assumption relies on the fact that child developmental theories can provide insights into how children learn and grow (Armstrong *et al.* 2014). The other main assumption of this chapter is that personality theories are suitable to explain educators' perceptions on the age from which learners should be allowed to use ICTs at school. This assumption relies on the fact that theories of personality aim to understand people, their conduct and their behaviour (Hunt 1965); and this is in line with the aim of this research to understand educators' with regards to their opinions on the age from which learners should be allowed to use ICTs at school. This also fulfils the first objective of this study to select relevant theories that can be applied to the examination of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. These child development theories and personality theories are presented in the first part of this chapter, and some of their constructs are used in the second part of this chapter for the fulfilment of the second objective of this research which is to design a conceptual model of the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school.

2.1 Child Development Theories

Child development theories aim at explaining how children learn and grow. It is important to remember that this study aims to examine factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. It is possible for such perceptions to emanate from educators' perceptions on how children learn and grow. This might justify how child development theories are relevant to this study since these theories aim at how children learn and grow.

According to Armstrong *et al.* (2014), there are four main early childhood development theories: the attachment developmental theory, cognitive developmental theory, behaviorist developmental theory, and ecological developmental theory.

2.1.1 Attachment Developmental Theory

The attachment theory is based on the emotional and healthy attachment that develops between children and their parent or caregivers (Ainsworth and Bell 1970; Armstrong *et al.* 2014). An attachment is an affectionate tie that an individual forms between himself/herself and another individual that binds them and endures over time involving both intimacy and independence (Armstrong *et al.* 2014). Attachment also comes in the form of the child's need for protection and for comfort from parents (Ryan and Smith 2010). Another form of attachment is manifested when a child starts crying, and protesting when left alone with strangers (Ainsworth and Bell 1970; Bowlby 2005; Bowlby 2012). According to the attachment theory, the attachment of children to their parent or caregivers affect the development, the behaviour or the personality of these children in the sense that it structures their brains for later successes and develops in them the confidence to explore the world and to create relationships with others.

2.1.2 Cognitive Developmental Theory

Cognitive development is concerned with the relationship between the changes that occur in an individual's cognitive structure, abilities, and processes as well as the development of that individual (Von Glasersfeld 1989; Littlefield-Cook *et al.* 2005). Influential theories of cognitive development include the stage theory of Jean Piaget and the sociocultural theory of Lev Vygotsky.

2.1.2.1 Jean Piaget's Developmental Theory

Piaget based his theory on the understanding that children create and construct their own ideas and knowledge from their own life discoveries and experiments through assimilation (fitting new experiences or knowledge into an existing mental structure) and accommodation (adapting new information and automatically applying them when new information is added to the old schema) (Von Glasersfeld 1989; Cole and

Wertsch 1996; Lutz and Huitt 2004; Armstrong *et al.* 2014). According to Piaget, four sequential stages were identified in cognitive development of children and adolescents: sensorimotor, preoperational, concrete operational and formal operational. Each stage provide children with new intelligent abilities towards an improved understanding of the world (Wood, K *et al.* 2001). Piaget's theory believes that far-reaching interaction with the surroundings is utterly indispensable for each person's cognitive development (Littlefield-Cook *et al.* 2005). Piaget also believes that children make sense of their world or learn by making meaning of their mental structure using a principle called equilibration, the process of seeking cognitive stability (Schultz and Schultz 2012)

2.1.2.2 Lev Vygotsky Sociocultural Theory

Vygotsky theory is concerned with the role of social interactions and culture on human development and learning (Vygotsky 1980; Alpay 2001; Lutz and Huitt 2004; Lui 2012). This theory states that children make use of languages to establish social interactions with key figures in their lives such as parents, peers, teachers, and other adults; and these interactions profoundly shape their mental processes and their interpretations of the world (Vygotsky 1978; Littlefield-Cook *et al.* 2005; Lui 2012). It is important to note that the need for a child to be assisted for certain aspects of his or her development by interacting with others does not exclude the fact that there are other aspects of development that can be achieved by the child without any external assistance. The Zone of Proximal Development (ZPD) (See Figure 2.1) is defined by Vygotsky theory as the midpoint between aspects where children need assistance and aspects where they do not (Wood, D *et al.* 1976; Vygotsky 1978; Chaiklin 2003; Lui 2012). At this stage, instruction or scaffolding such as suggesting, questioning, and reminding, comes in to help the child.

2.1.3 Behaviourist Developmental Theory

Behaviourist theory is a theory that posits that most life events are shaped by the environment. The development of a child depends on his or her interactions with his or her environment. Adults play an important role in these interactions of the child with his and her environment in the sense that children learn from the behaviour of adults (Trawick-Smith 1997).

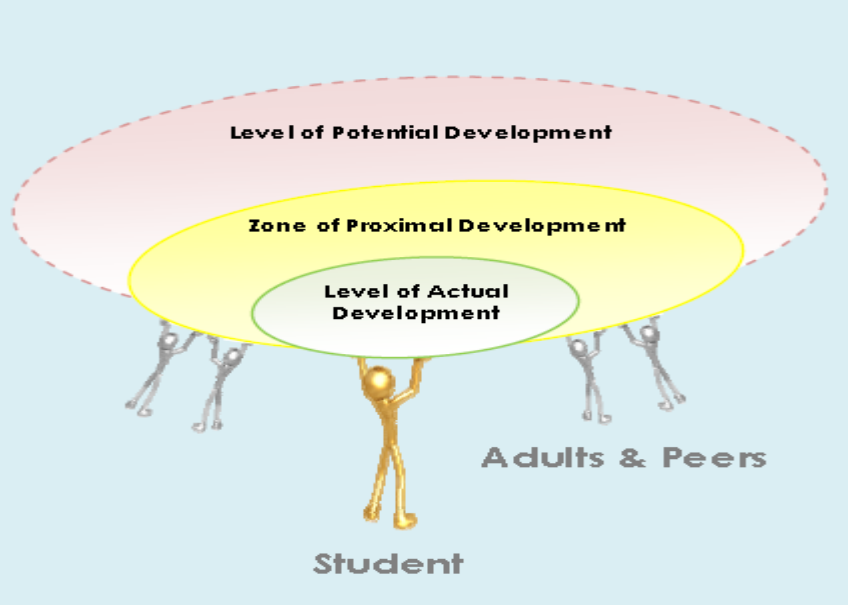

Figure 2.1: Vygotsky's zone of proximal development (Lui 2012)

2.1.4 Ecological Developmental Theory

According to the ecological system theory, the development of a child is influenced by the reciprocal relationship between him or her and the many institutions and settings in his or her surroundings (the family, the community, the school, the political system) (Bronfenbrenner 1995; Krishnan 2010) (See Figure 2.2). Bronfenbrenner believes the various components in the child's environment can be classified into five layers hereby listed from the closest to the farthest from the child: the microsystem, mesosystem, exosystem, macrosystem, and the chronosystem (Bronfenbrenner 1995). The microsystem refers to the social system of the child's daily life with actors such as parents, teachers and peers (Bronfenbrenner 1995; Bronfenbrenner 1997; Krishnan 2010). The mesosystem refers to the links between actors from the child's microsystem. Examples of such links are the level of exchange between parents and teachers or between parents and peers (Bronfenbrenner 1995; Eileen 2008). The ecosystem refers to the aspects of the microsystem in which children have no say, but that, nevertheless, influence their actions. Examples of such aspects include school policies on children's behaviour and dressing (Eileen 2008; Coleman 2012). The fourth component of the Bronfenbrenner's model of child development is the macrosystem which is the societal plan for a particular culture or subculture that indirectly impacts on the child

(Bronfenbrenner 1995). The last and fifth component is the chronosystem and it is made up of dynamic physical and human ecologies influencing children's behaviour (Coleman 2012). Technologies, for example, form part of the chronosystem mainly because they keep on changing over time and they influence the behaviour of children (Krishnan 2010).

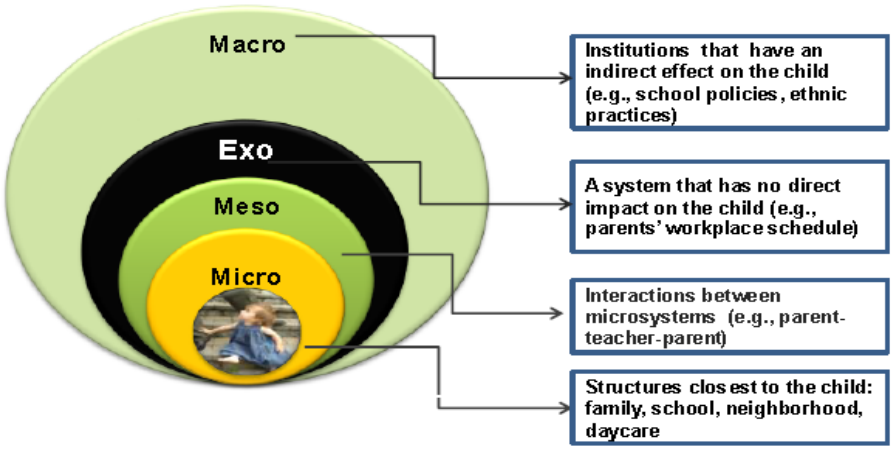

Figure 2.2: Bronfenbrenner's bio-ecological model of child development (Krishnan 2010)

2.2 Theories of Personality

Personality theories are concerned with the factors behind people's personalities and behaviours. It is important to remember that the aim of this study is to examine the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. It is possible for such perceptions to emanate from educators own personalities or how educators understand the personality or behaviour of learners. This might justify how personality theories are relevant to this study since these theories aim at understanding people's personalities and behaviours which influences their perceptions on the early introduction of ICTs in schools. According to Feist *et al.* (2006) , there are four main types of personality theories: psychodynamic theories, humanistic/existential theories, dispositional theories, and learning theories.

2.2.1 Psychodynamic Theories

Psychodynamic theories propose that the behaviour of people mainly depends on their unconscious mind rather than on their conscious mind (Frankl 2000; Bargh and Morsella 2008). It is possible for educators' perceptions to emanate from their conscious or their unconscious mind or to base their perceptions on the possible influence of ICTs on the conscious and on the unconscious mind of learners. This might justify how psychodynamic theories are relevant to this study since these theories focus on the role of the conscious and of the unconscious mind in the analysis of people's personalities and behaviours. According to Feist *et al.* (2006), psychodynamic theories include Freud's psychoanalytic theory and Jung's analytic psychology.

2.2.1.1 Sigmund Freud Psychoanalytic Theory

Freud's theory tries to explain personality, motivation, and abnormal behaviours by focusing on the unconscious causes of behaviour (Weiten 2007), especially with regard to the ways that people use in order to cope with their aggressive and sexual urges (Weiten 2007; Ryckman 2012). According to Freud, the mind consists of three levels: the purely unconscious, the preconscious, and the conscious (Feist *et al.* 2006; Schultz and Schultz 2012). Freud also divided the mind into three structures: the ego, the superego and the id. It is interesting to note that these mind levels and structures share some various degrees of intersection (Feist *et al.* 2006; Schultz and Schultz 2012). The conscious mind and the preconscious mind share a small degree of intersection with the ego and the superego and they do not intersect at all with the id. This may explain why the conscious mind and the preconscious mind do not account for most of the behaviour of a person even though the conscious mind is well aware of the realities of the external world through senses, such as sight, hearing, taste, smell, and touch and it intentionally interacts with these realities. On the other hand, the purely unconscious mind has a large intersection with the id, with the superego, and with the ego; and this may explain why the purely conscious mind, the id, and the superego can account for most of the behaviour of a person even though the purely unconscious mind is not aware of the realities of the external world (See Figure 2.3). The preconscious mind can simply be seen as the midpoint between the

conscious and the unconscious (Feist *et al.* 2006; Bargh and Morsella 2008).To Freud, the unconscious which comprises our memories, desires, and thoughts well below the surface of the conscious awareness exerts the greatest influence on behaviour (Weiten 2007).

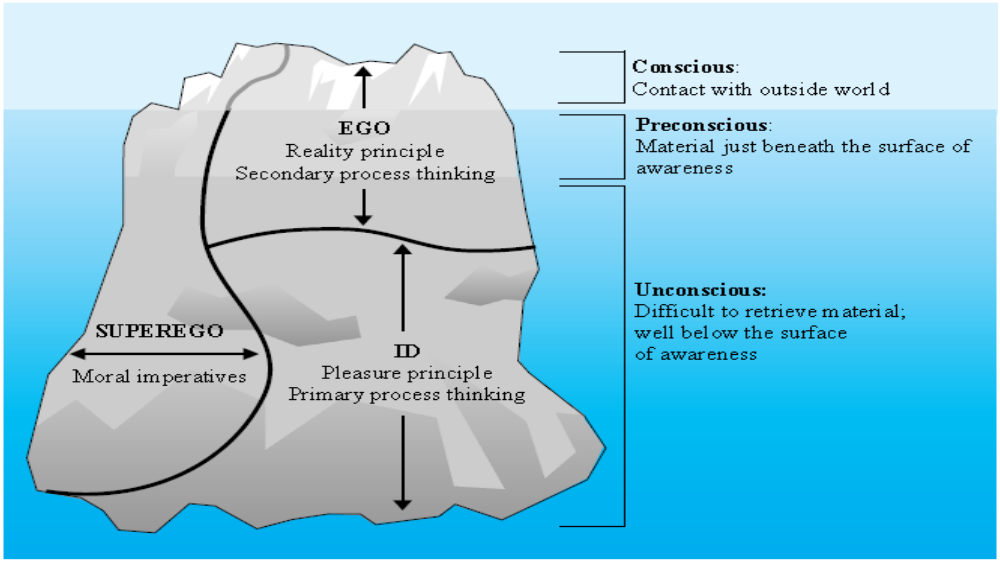

Figure 2.3: Freud's models of personality structure (Schultz and Schultz 2012)

2.2.1.2 Jung's Analytical Psychology

Jung's personality theory assumes the mind has both a conscious or ego upper level and an unconscious lower level (Feist *et al.* 2006). The conscious is in direct contact with realities through the senses. The unconscious can be subdivided into the collective unconscious and the personal unconscious (Figure 2.4). The collective unconscious is below the personal unconscious and it is inherited from ancestral or collective experiences. The personal unconscious is formed by supressed and forgotten experiences of an individual (Feist *et al.* 2006; Schultz and Schultz 2012). Contents of the collective unconscious are not dormant but full of life and influences a person's actions, emotions, and thoughts. Collective unconsciousness has four components: the persona, the shadow, the anima, and the animus (Feist *et al.* 2006; Ryckman 2012; Schultz and Schultz 2012). The persona is the part of the collective unconscious dealing with positive attributes that a person wants to exhibit to others in public (Ryckman 2012). It is the opposite of the shadow which refers to private and negative traits that a person does not want others to know about (Ryckman 2012). The animus refers to the male or strong attributes of a person as compared to

the anima which is the female or soft and caring character of a person (Feist *et al.* 2006; Schultz and Schultz 2012)

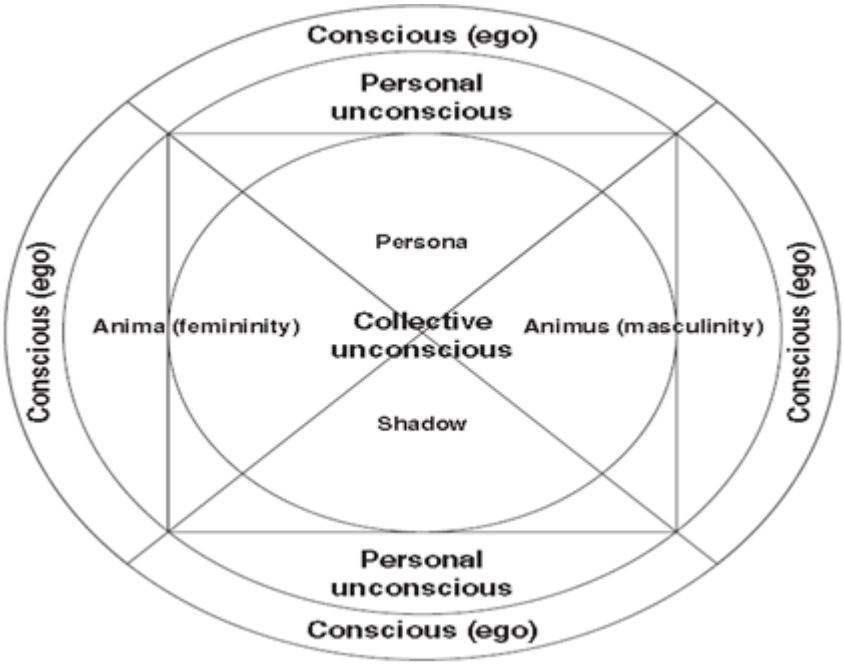

Figure 2.4: Jung's conception of personality (Feist et al. 2006)

2.2.2 Humanistic Theories

Humanistic theories are mainly based on the assumption that our personality is determined by the extent to which we believe that we are succeeding in combining all our unique attributes when attempting to reach our constant quest to fully develop our human potential (Frankl 2000; Schultz and Schultz 2012). It is possible for educators' perceptions to emanate from the extent to which they believe that they are succeeding in fulfilling their own potential or they might also emanate from the concerns of educators on how ICTs may affect learners' capabilities to succeed in fulfilling their potential. This might justify how humanistic theories are relevant to this study since these theories focus on the extent to which people believe that they are fulfilling their potentials in the analysis of people's personalities and behaviours. Humanistic theories include Maslow's self-actualization theory and Roger's person-centred theory (Schultz and Schultz 2012).

2.2.2.1 Maslow's Self-Actualization Theory

According to Maslow, the constant quest to fully develop our human potential presents itself in the form of a hierarchy of tendencies and needs from the physiological needs at the lowest level of the pyramid to the self-actualization needs at the highest level of the pyramid which an individual must satisfy (Heylighen 1992; Ryckman 2012). An individual fulfils these needs by first satisfying his or her physiological needs for hunger, thirst, and sex and then moves to satisfy his or her safety needs in order to feel secure and safe from danger. Next, he or she must satisfy his or her needs for belongingness and love by associating with others and then moves to satisfy the self-esteem needs by achieving and winning the approval and acceptance of others (See Figure 2.5). The self-actualization need, which is the need for an individual to fulfil one's own potential, is only relevant once a person has satisfied all the above identified needs (Oyetade and Obono 2014). According to Maslow, characteristics of people that have fulfilled their self-actualization needs include: "Having a clear perception of reality, acceptance of others, self and nature, being spontaneous, simple, and natural, being dedicated to a cause, independence and need for privacy, freshness of appreciation, peak experiences, social interest, deep interpersonal relationship, tolerance and acceptance of others, creativeness and originality, resistance to social pressures" (Feist *et al.* 2006; Schultz and Schultz 2012).

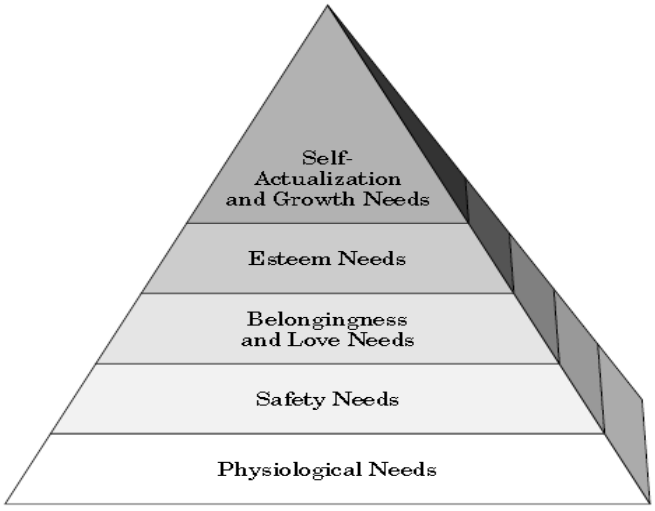

Figure 2.5: Maslow's hierarchy of needs (Ryckman 2012)

2.2.2.2 Carl Rogers Self Actualizing or Fully Functioning Theory

According to Carl Rogers, two of the main needs that people continuously try to fulfil and which affect the development of their personality is the need to be recognised and approved by others and the need to define on their own their unique tendencies (Ryckman 2012; Plotnik and Kouyoumdjian 2013). According to Rogers, characteristics of people that have fulfilled their need for approval and self-actualization include: "Awareness of all experiences, being open to positive and negative feelings, freshness of appreciation for all experiences, trust in one's behaviour and feelings, freedom of choice, without inhibitions, creativity and spontaneity, and a continual need to grow, to strive to maximize one's potential" (Boeree 1997; Feist *et al.* 2006; Patterson and Joseph 2007).

2.2.3 Dispositional or Trait Theories

Dispositional or trait theories describe how people differ from one another in terms of emotions, concepts of self, physiological propensities, and cognitive mechanisms (Mischel and Shoda 1995). Educators' perceptions might originate from the unique personality traits of each of these educators or from the concerns of these educators that ICTs might tamper with the unique personality traits of learners. This might justify why dispositional or trait theories are relevant to this study since these theories focus on the importance of individual unique traits in shaping the people's personality. According to Feist *et al.* (2006), trait theories include Allport's theory, Catellel's theory, and Eyesenck's theory.

2.2.3.1 Allport's Trait Theory

Allport's trait theory posits that every individual has a unique and consistent personality. Allport also believes social situations affect people, but the influence is unique to each person (Allport *et al.* 2003). According to Allport, people are driven towards the acquisition of a healthy or matured personality by a conscious motivation (Allport *et al.* 2003; Feist *et al.* 2006). Allport listed the following qualities for a healthy or matured personality: "Having an extended sense of self; relating warmly to others; accepting themselves for who they are; having a realistic perception of the world; having a sense of humour and self-objectification; and

subscribing to a unifying philosophy of life" (Feist *et al.* 2006; Schultz and Schultz 2012).

2.2.3.2 Catell's Structure Based System Theory

Cattell sees personality as a complex structure of traits resulting from interactions between personal attributes (traits) and the environment (Ryckman 2012). He defines a trait as a relatively permanent tendency of an individual to respond to a given situation (Ryckman 2012; Schultz and Schultz 2012). Some of the traits identified by Catell include common traits, unique traits, source traits, and surface traits (Schultz and Schultz 2012). Common traits are shared by all members of a given society as opposed to unique traits that are distinctive to every individual and which structure the components of a personality. Surface traits are personality characteristics that are open to the external world as opposed to source traits which are hidden within the basic internal structural units of personality. Moreover, Cattell's theory posits that overall, 30 percent of our personality traits are genetically based, and 60 percent are determined by social and environmental influences.

2.2.3.3 Eysenck's Biological Typology

Eysenck believes that our personality is made up of dispositions that are organized in an ordered manner, based on their level of generality (Feist *et al.* 2006; Schultz and Schultz 2012). To Eysenck, personality dimensions and traits are determined mainly by heredity and learned behaviour. Hans Eysenck believes that personality is split up into three different dimensions: introversion/extroversion, neuroticism/emotional stability, and psychoticism (Schultz and Schultz 2012). Introversion is the extent to which a person keeps to his or herself to the extent where he or she is not very social as opposed to an extrovert person who is outgoing and friendly (Feist *et al.* 2006; Schultz and Schultz 2012). Neuroticism is the extent to which a person is anxious, hostile, depressed, and obsessive compared to an emotionally stable person who is enthusiastically constant and friendly. Psychoticism is the extent to which a person displays mentally unstable characteristics and have difficulties with relationships (Feist *et al.* 2006).

2.2.4 Learning Theories of Personality

According to the learning theories of personalities, personality is learned in any given situation (Schultz and Schultz 2012). Let us recall that this study purposed to examine educators perceptions on the age from which learners should be allowed to use ICTs at school. It is possible for such perceptions to be influenced by what these educators have learnt from their past and present experiences, or by their concerns on the possible influence of ICTs on how children learn. This might justify how learning theories of personalities are relevant to this study since these theories have shown the importance of learning in shaping the people's personality. Examples of existing theories of personalities are Skinner's operant analysis, Rotter's expectancy-reinforcement value model, and Bandura's social-cognitive theory (Feist *et al.* 2006).

2.2.4.1 Skinner's Behavioural Analysis

Skinner believes that people's personality and behaviour in a given situation largely depends on their learning experiences from similar past situations and on their interaction with the current environment (Putwain and Sammons 2013). This happens through the processes of operant and classical conditioning. Operant conditioning means that people learn new behaviours through the consequences of their interactions with their environment. In classical conditioning, people learn to produce existing responses to new situations (Feist *et al.* 2006; Schultz and Schultz 2012).

2.2.4.2 Rotter's Expectancy – Reinforcement Value Model

To Rotter, personality and behaviour is a function of the expectation of reward and of the value placed on the expected reward in situations where individuals interact with their environment (Feist *et al.* 2006; Rotter 2012). According to Rotter, our behaviour is affected by expectancies, but expectancies are themselves affected by the level of control of the situation by an individual. Therefore, Rotter sees personality, and, hence, behaviour, as always changeable: change people's expectations, or change their environment, and their behaviour or personality will change (Ryckman 2012).

2.2.4.3 Bandura's Social Cognitive Theory

Bandura believes that new behaviours are acquired through learning new responses by observing the behaviour of other people or through direct experiences (Bandura and McClelland 1977; Feist *et al.* 2006; Schultz and Schultz 2012). Such learning experiences are mostly governed by the evaluation of the satisfying and punishing consequences that follow any given action (Bandura and McClelland 1977).

2.3 A New Conceptual Model

The theoretical model designed by this study is the result of the selection of personality theories presented above in order to examine the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. This fundamental hypothesis of this study is represented by Figure 2.6. The hypothesis states that the demographics of educators affect their perceptions on their personality and their perceptions on child development. Similarly, perceptions on educators' personality affect their perceptions on child development. The question to be answered now is to find out which personality theories are most suitable for the study?

Even though there are many personality theories presented in this chapter for their relevance to this study, this study has chosen Maslow's self-actualization model, Carl Rogers's Model and Allport's traits model as its theoretical framework to build a new conceptual model of the factors that affect educators' perceptions on the age from which learners should be allowed to use ICTs at school. The Maslow's self-actualization model, Carl Rogers's Model and Allport's traits model are selected instead of the psychodynamic theory, Cattel structure based theory, Eysenck's biological typology, and learning theories because they are fully developed and are contemporary in their appeal. Each of these model describes a level or characteristics of personality development which is beyond normality leading to a matured personality. Furthermore, the motivation for the choice of the Maslow's self-actualization model in this study is the prerequisite for satisfying a hierarchy of needs, arranged in a pecking order from strongest to weakest which must be at least partially satisfied before the demand for self- actualization appears. Also, the motivation for the Carl Roger's model in this study is the one central need in his

theoretical account of personality: to maintain, actualize, and enhance all aspects of the person. In conclusion, the motivation for the selection of Allport's trait theory is based on the belief by Allport that healthy individuals function on a rational and conscious level, who are aware and in control of the forces that guide them. They are likewise guided by the present and by their intentions toward the future, not backward to childhood traumas and conflicts as with neurotics.

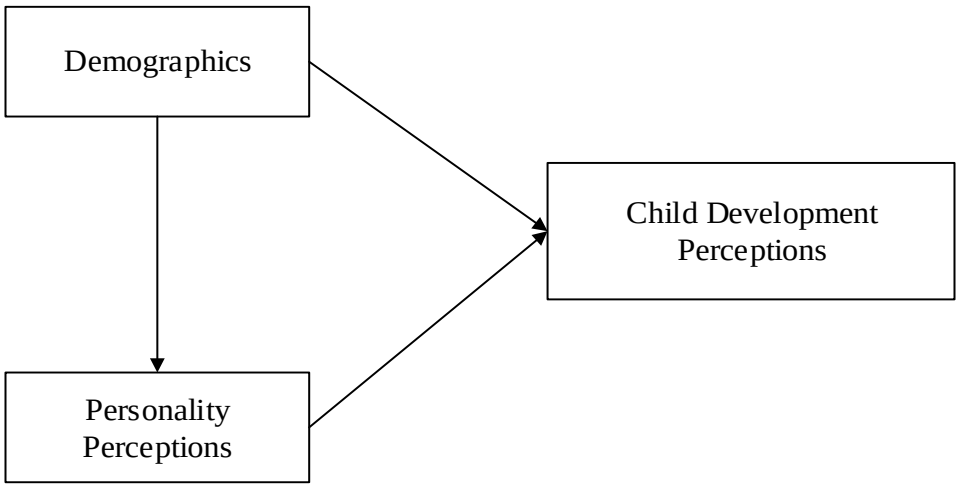

Figure 2.6: General theoretical model

The new conceptual model uses the constructs of self-actualized personality characteristics from the Maslow's self-actualization model of humanistic theories, fully functioning personality characteristics from the Carl Rogers model of humanistic theories, and healthy personality characteristics from the Allport's traits model of dispositional/traits theories, and child development theories as potential factors that can affect the age from which learners should be allowed to use ICTs at school. The implication is that this new model assumes that educators' perceptions on the age from which learners should be allowed to use ICTs at school depend on the demographics of these educators. These perceptions also depend on how self-actualized these educators see themselves, and on how they perceive their personality as being fully functioning. This new model finally assumes that the educators' perceptions on the age from which learners should be allowed to use ICTs at school depend on how healthy they perceive their personality. These choices of self-actualization personality, healthy personality, fully functioning personality, and child

development theories for this study, when applied to Figure 2.6, result in the new conceptual model depicted by Figure 2.7. The model presented in figure 2.7 represents the following hypotheses to be empirically tested by the third objective of the current research.

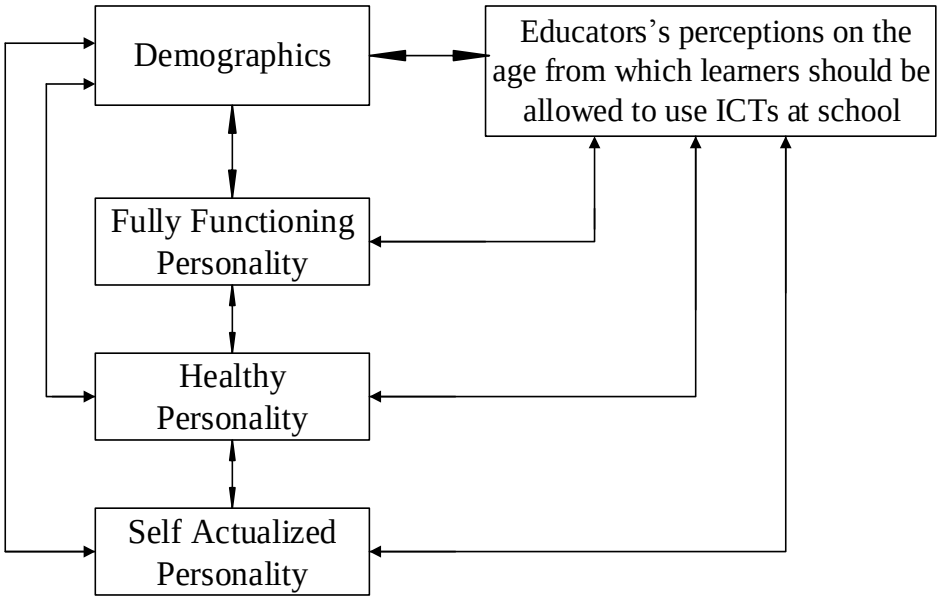

Figure 2.7: A new conceptual model

Ha0: There is a direct relationship between the demographics of an educator, and his or her perceived self-actualized.

Hb0: There is a direct relationship between the demographics of an educator and his or her perceived fully functioning personality.

Hc0: There is a direct relationship between the demographics of an educator, and his or her perceived healthy personality.

Hd0: There is a direct relationship between the demographics of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

He0: There is a direct relationship between the perceived self-actualized personality of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

Hf0: There is a direct relationship between the perceived fully functioning personality of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

Hg0: There is a direct relationship between the perceived healthy personality of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

2.4 Conclusion

This chapter presented personality theories and child development theories for their relevance in the examination of the perceptions of educators on how early ICTs can be introduced in schools. Personality theories are concerned with the factors behind people's personalities and behaviours while child development theories aim at explaining how children learn and grow. Personality theories selected for the conceptual model of this study are Maslow's self-actualization theory, Carl Rogers's theory, and Allport's traits theory. Maslow's self-actualization theory explains that people's personality grows from their constant quest to reach their full potentials. Carl Rogers's theory posits that people's personality is driven by the quest to fulfil the need to be recognised and approved by others and the need to define their own unique tendencies. Allport's traits theory claims that individuals have a unique and consistent personality even in the way that they are affected by incoming situations and they consciously motivate themselves towards the acquisition of a healthy personality whereby they have a sense of humour, relate warmly with others, and have a realistic perception of the world, *etc.* This conceptual model presented in this chapter will be empirically tested in the remaining part of this dissertation.

CHAPTER 3

RESEARCH DESIGN

The previous chapter was dedicated to the first two objectives of this study on the selection of suitable theories that can explain educators' perceptions on the age from which learners should be allowed to use ICTs at school. This chapter will now describe the research methods used by this study in pursuit of its third objective on the empirical testing of the proposed conceptual model. This empirical testing was accomplished through a survey of educators selected from the public schools of the Camperdown magisterial district of the Pinetown district, KwaZulu-Natal province in South Africa. This survey is described in this chapter in terms of its population and sampling, and in terms of its data collection and data analysis methods.

3.1 Research population

The Camperdown magisterial district had a population of 584 educators from 37 primary and secondary schools (DEPARTMENT OF EDUCATION 2013) at the time this survey was conducted (between June and July 2014).

3.2 Sampling

The sample size of this research was calculated using the formulae proposed by Naing *et al.* (2006) for finite populations as shown by the equation below with the following values as parameters: Z = 1.96, P = 0.05, d = 0.048, and N = 584 which gives a sample size of 70.

$$n = \frac{Z^2 P(1-P)}{d^2(N-1) + Z^2 P(1-P)} \qquad \text{..... (Equation 1)}$$

The stratification of the sample for the 70 educators surveyed by this study was done as follows: First, the proportion of the number of educators from urban schools in the Camperdown magisterial district was calculated from the total number of educators in the Camperdown magisterial district, and the proportion of the number of educators' from rural schools was calculated from the total number of educators in

the Camperdown magisterial district. The application to the sample size of these two proportions of the populations of educators from rural schools and from educators from urban schools gave a sample size of 24 educators for rural schools and 46 educators for urban schools (Table 3.1).

Table 3.1: Total population and sample size of Camperdown educators

	Educators	Proportion	Sample Size
Rural	200	0.34	24
Urban	384	0.66	46
TOTAL	584	1	70

The stratification of the sample for the 24 rural educators surveyed by this study was done as follows: First, the proportion of the number of educators from big rural schools in the Camperdown rural magisterial district was calculated from the total number of rural educators in the Camperdown rural magisterial district, and the proportion of the number of educators from small rural schools was calculated from the total number of educators in the Camperdown rural magisterial district (See Table 3.2). The application to the sample size of these two proportions of the populations of educators from big rural schools and from educators from small rural schools gave a sample size of 15 educators for big rural schools and 9 educators for small rural schools.

Table 3.2: Sample Size of Camperdown rural educators

	Educators	Proportion	Sample Size
Small Schools	72	0.36	9
Big Schools	128	0.64	15
TOTAL	200	1	24

The stratification of the sample for the 46 urban educators surveyed by this study was done as follows: First, the proportion of the number of educators from big urban schools in the Camperdown urban magisterial district was calculated from the total number of urban educators in the Camperdown urban magisterial district, and the proportion of the number of educators from small urban schools was calculated from the total number of educators in the Camperdown urban magisterial district. The application to the sample size of these two proportions of the populations of educators from big urban schools and from educators from small urban schools gave

a sample size of 29 educators for big urban schools and 17 educators for small urban schools. In each of the schools, the school's principal was requested to select the required number of teachers to participate in the survey (Table 3.3).

Table 3.3: Sample size of Camperdown urban educators

	Educators	Proportion	Sample size
Small schools	144	0.38	17
Big schools	240	0.62	29
TOTAL	384	1	46

For each of the six rural small schools in Camperdown, the ratio of the number of educators in the school was calculated compared to the total number of educators in the Camperdown rural small schools, and this ratio was multiplied by the sample size for the Camperdown rural small schools in order to get the number of educators to be included in the sample for that school. This sampling stratification method was applied to Camperdown rural big schools, urban small schools, and urban big schools as shown by Table 3.4 to Table 3.7. In each of the schools, the school's principal was requested to select the required number of teachers to participate in the survey.

Table 3.4: Sample size of Camperdown educators per rural small schools

Camperdown rural small schools				
	Schools	**Educators**	**Proportion**	**Sample Size**
	RACING&EQUESTR	8	0.11	1
	EMNGCWINI JP	8	0.11	1
	UKUSAKWABASHA PRI SCH	16	0.22	2
	CLIFFDALE PRIMARY SCH	8	0.11	1
	EMPILWENI PRIMARY SCH	16	0.22	2
	MABHILA PRI SCH	16	0.22	2
TOTAL		**72**	**1**	**9**

Table 3.5: Sample size of Camperdown educators per rural big schools

Camperdown rural big schools				
	SCHOOLS	**Educators**	**Proportion**	**Sample Size**
	KEARSNEY COLLEGE	24	0.19	3
	ALBINI H	24	0.19	3
	GEORGE CATO PRI SCH	16	0.13	2
	HILLCREST HIGH	24	0.19	3
	NTSHONGWENI PRI SCH	28	0.22	3
	INCHANGA PRI SCH	12	0.09	1
TOTAL		**128**	**1**	**15**

Table 3.6: Sample size of Camperdown educators per urban small schools

Camperdown urban small schools				
	SCHOOLS	**Educators**	**Proportion**	**Sample Size**
	NCINCI JP	8	0.06	1
	INDLULAMITHI SP	8	0.06	1
	ENTENDELENI PRI SCH	4	0.03	1
	ZAMINHLANHLA SP	16	0.11	2
	WOZANAZO SP	8	0.06	1
	ENYOSINI JP	8	0.06	1
	HALALA SP	16	0.11	2
	INTANDO LP	20	0.14	3
	EKWENAMENI PRI SCH	4	0.03	1
	UBHEDU JP	8	0.06	1
	ISIQALO JP	20	0.14	3
	ESIHONQENI JP	8	0.06	1
	INGEDE SP	16	0.11	2
TOTAL		**144**	**1**	**20**

Table 3.7: Sample size of Camperdown educators per urban big schools

Camperdown urban big schools				
	SCHOOLS	**Educators**	**Proportion**	**Sample Size**
	KHALAWEMUKE PRI SCH	12	0.05	2
	UXOLOPHAMBILI S	12	0.05	2
	ELANGABINI JP	16	0.07	2
	NAZARETH PRI SCH	16	0.07	2
	VUKUZIPHATHE JP	12	0.05	2
	UKUSA SS	88	0.37	11
	ISIBUKOSEZWE H	12	0.05	2
	EMAXULWINI CP	16	0.07	2
	KWAMYEZA PRI SCH	12	0.05	2
	LUTHAYI H	12	0.05	2
	PHEZULU H	12	0.05	2
	SIKHETHUXOLO H	20	0.08	3
TOTAL		**240**	**1**	**34**

3.3 Data Collection

The data for the survey conducted in this study was collected using a five variables questionnaire on the educators' demographics, their self-actualized personality, fully functioning personality, healthy personality, and educators' perceptions on the age from which learners should be allowed to use ICTs at school as outlined by the new conceptual model proposed at the end of the previous chapter. Apart from the demographic variable, data for all the items of the other four variables were collected using the following five point Likert-scale in order to record the level of agreement of the respondents with the item in question: strongly disagree, fairly disagree, weakly agree, fairly agree, and strongly agree.

3.3.1 Demographics

This section of the questionnaire on the educators' demographics was designed to identify which demographic items affect their perceptions on the age from which learners should be allowed to use ICTs at school. These following items were then captured in the demographic section of the questionnaire:

- A1. Gender: This questionnaire item was designed for the identification of the gender of educators. These educators could choose either male or female gender as it applied to them.
- A2. School Location: This questionnaire item was designed for the identification of the location of the school where the educator is teaching. These educators could select one of the options of urban or rural.
- A3. Age group: This questionnaire item was designed for the identification of the age of educators. These educators could select one of the following age groups if it applied to them: Less than 30, 31 - 40, 41 - 50, and 50 and above.
- A4. Grade (Class): This questionnaire item was designed for the identification of grades or class taught by educators. Educators could select one or more of the grades ranging from R-3, 4-6, 7-9, and 10-12.
- A5. Current class size: This questionnaire item was designed for the identification of the number of learners or students currently in the class taught by educators. Educators could select one or more of the class size/s as applicable to them: 1- 20; 21 – 40; 41 – 60; and Above 61.
- A6. Highest level of education: This questionnaire item was designed for the identification of the qualification level of the educators. These educators could select one of the following qualification levels if it applied to them: Diploma; Bachelors; Honours; and Masters.
- A7. Subject specialisation: This questionnaire item was designed for the identification of subjects taught by the educators. These educators could select one or more of the following subjects if it/they applied to them: Languages; Mathematics; Science and Technology; and Social Science.
- A8. Computer usage: This questionnaire item was designed for the identification of the use of computers of these educators. These educators could select one or more of the following if it/they applied to them: None; Daily; Weekly; and Monthly.
- A9. Ethnicity: This questionnaire item was designed for the identification of the race of these educators. These educators could select one of the following

ethnic groups if it applied to them: African; White; Indian; Coloured; and others.

- A10. Teaching experience: This questionnaire item was designed for the identification of the length of years these educators have been teaching. These educators could select one of the following: 0-5; 6-10; 11-15; 16-20; and Above 20.

3.3.2 Self-Actualised Personality

The aim of this section of the questionnaire is to measure how self-actualised an educator perceives himself or herself. The identification of these self-actualised personality items was done through the translation of Maslow's self-actualisation personality characteristics and theory (Feist *et al.* 2006; Schultz and Schultz 2012), as evidenced in the following list of ten self-actualised personality items:

- B1. Perception of reality: This questionnaire item was designed for the identification of the perceptions of an educator on the clarity with which he or she perceives reality.
- B2. Acceptance of self, others, and nature: This questionnaire item was designed for the identification of the perceptions of an educator on how he or she accepts himself or herself, as well as others and nature.
- B3. Spontaneity and simplicity: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as spontaneous, simple, and natural.
- B4. Dedication to a cause: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as being dedicated to certain causes.
- B5. Independence and privacy: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as an independent or a private person.
- B6. Prejudgement of situations: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who prejudges situations.

- B7. Enjoyment of new experiences: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who enjoys new experiences.
- B8. Socialisation: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who enjoys socialising.
- B9. Depth of interpersonal relationships: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person with profound interpersonal relationships.
- B10. Tolerance towards others: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who is tolerant towards others.

3.3.3 Fully Functioning Personality

The aim of this section of this section of the questionnaire is to measure how fully functioning an educator perceives his or her personality. The measurement of these fully functioning personality items was done through the translation of Carl Rogers fully functioning personality characteristics and theory (Feist *et al.* 2006; Schultz and Schultz 2012), as evidenced in the following list of ten fully functioning personality items:

- C1. Awareness of surrounding experiences: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who is aware of his or her surrounding experiences.
- C2. Expression of positive feelings: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who easily expresses positive feelings towards others.
- C3. Expression of negative feelings: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who easily expresses negative feelings towards others.

- C4. Absence of inhibitions: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person without inhibitions.
- C5. Trust in one's behaviour: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who always trusts his or her own behaviour.
- C6. Trust in one's feelings: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who always trusts his or her own feelings.
- C7. Insistence on one's freedom: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who always insists on his or her freedom.
- C8. Creativity: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a creative person.
- C9. Spontaneity: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a spontaneous person.
- C10. Fulfilment of one's potential: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who always strives to grow towards his or her full potential.

3.3.4 Healthy Personality

The aim of this section of the questionnaire is to measure how mature an educator perceives his or her personality. The measurement of these maturity levels was done through the translation of Allport's traits healthy personality characteristics and theory (Feist *et al.* 2006; Schultz and Schultz 2012), as evidenced in the following list of ten healthy personality items:

- D1. Extension of self to others: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who reaches out to others.

- D2. Compassion and tolerance: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who is compassionate and tolerant towards others.
- D3. Acceptance of self: This questionnaire item was designed for the identification of the extent to which an educator accepts himself or herself for who he or she is.
- D4. Sense of reality: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who has a clear sense of reality.
- D5. Commitment to self-development: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who is committed to his or her self-development.
- D6. Sense of humour: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person with a good sense of humour.
- D7. Understanding of self: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person with a clear understanding of himself or herself.
- D8. Life philosophy: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person who clearly subscribes to a unifying philosophy of life.
- D9. Optimism: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as an optimistic person.
- D10. Uniqueness: This questionnaire item was designed for the identification of the extent to which an educator perceives himself or herself as a person with a unique behaviour.

3.3.5 Educators' perceptions on the age from which learners should be allowed to use ICTs at school

The aim of this section of this section of the questionnaire is to measure educators' perceptions on the age from which learners should be allowed to use ICTs at school.

The design of these items was done from the adaptation of child development features identified from existing child development theories (Hess *et al.* 2011).

- E1. Ability to multitask: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to handle many concepts at a time.
- E2. Ability to apply logic: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to apply logic to classify objects and ideas.
- E3. Ability to analyse hypotheses: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners analyse hypotheses using abstract thinking and deductive reasoning.
- E4. Ability to handle information: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to receive, process, remember, and present information.
- E5. Ability to develop physical fitness: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to develop physical fitness including during puberty.
- E6. Ability to handle sensitive information: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to handle sensitive information with others.
- E7. Ability to deal with conflicts and behavioural challenges: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to deal with conflicts and behavioural challenges.

- E8. Ability to deal with moral issues: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to deal with moral issues such as sex, abortion, *etc.*
- E9. Ability to differentiate themselves: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners on how to differentiate themselves as individuals.
- E10. Ability to auto-assess their actions: This questionnaire item was designed for the identification of educators' perceptions on the age from which learners should be allowed to use ICTs at school in order for them to optimally assist learners to auto-assess their actions.

3.4 Data Analysis

The perceptions of educators' that were surveyed in this study were analysed using version 22.0 of Statistical Package for Social Sciences (SPSS). Data collected in this survey was tested for reliability and validity using the Cronbach's alpha coefficient for all the four Likert scale variables of this study: educators perceived self-actualised personality, their perceived fully functioning personality, their perceived healthy personality, and their perceptions on the age from which learners should be allowed to use ICTs at school. Some descriptive and inferential tests were then performed on this data for these Likert scale variables as well as on the demographic data of the surveyed educators mainly in terms of frequencies and means analysis. Inferential analysis was performed in the form of Pearson's correlation tests between Likert scale variables, and linear regression equations were calculated for the variables with positive Pearson's correlation tests. The impact of the demographics of educators on their perceptions on the age from which learners should be allowed to use ICTs at school was tested using ANOVA. The confidence level of 95% is applicable to all the tests conducted in this study with a significance p-value between 0.00 and 0.05.

3.5 Conclusion

This chapter has described the third phase of this study as a survey with a stratified sample of 70 educators selected from the population of 584 Camperdown magisterial

district educators during the period between June 2014 and July 2014. This chapter also explains in detail each of the 50 items used for the construction of the demographic variable and of the four Likert-scale research variables of the self-administered questionnaire of this survey: educators demographics, their perceived self-actualized personality, their perceived fully functioning personality, their perceived healthy personality, and their perceptions on the age from which learners should be allowed to use ICTs at school. Each of these four Likert scale variable items was coded from 1 to 5 and their identification was done through the adaptation of personality characteristics and theories from Maslow, Carl Rogers, Allport's (Feist *et al.* 2006; Schultz and Schultz 2012) and through the adaptation of child development theories (Hess *et al.* 2011). The different inferential tests used for the analysis of the data collected by this study in SPSS are also introduced in this chapter: Cronbach alpha coefficients for data reliability and validity testing; ANOVA for testing relationships between demographics and Likert scale variables; Pearson's correlation for testing relationships between two Likert scale variables; and slinear regression for linking two Likert scale variables in a linear equation. The different descriptive statistical methods used by these study are mean analysis and frequency analysis. The findings for all these tests are presented in the next chapter of this dissertation.

CHAPTER 4

RESEARCH FINDINGS

This chapter presents the results obtained from the analysis of the data of this study on the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school in fulfilment of the third objective of this study. Three main types of results are presented below, as introduced in the previous chapter: reliability and validity results, descriptive statistics, and inferential statistics.

4.1 Validity and Reliability Results

Table 4.1 shows that the data collected by this survey is reliable judging by the fact that all the Likert scale variables have a Cronbach's alpha (α) coefficient greater than 0.75.

Table 4.1: Reliability table for the research variables

Research Variable	No of items	Cronbach's Alpha (α)
B: Self-Actualized Personality	10	0.934
C: Fully Functioning Personality	10	0.885
D: Healthy Personality	10	0.929
E: Educators' perceptions on the age from which learners should be allowed to use ICTs at school	10	0.752

4.2 Descriptive Statistics

This section will present descriptive statistics of the responses on the demographics of the surveyed educators and on how they perceive their personality to be self-actualized, fully functioning, and healthy. It also presents their perceptions on how early ICTs can be introduced in schools for teaching and learning.

4.2.1 Demographics

Descriptive statistics on the demographics of the educators who participated in this study (Table 4.2) indicate that the overpowering majority of these educators are

female whose age and teaching experience are almost evenly spread among the years. There is also an equilibrium between the number of educators who use computers and those who do not. In the majority of cases, the class size is manageable for most of the educators that participated in this survey. It is also interesting to note that almost the entire sample of educators is made up of Africans, two thirds of them are from primary schools, they teach either languages or mathematics, and all the educators surveyed are suitably qualified with at least a Diploma.

Table 4.2: Demographics of surveyed educators

A		**Percentage**
A1	Male	20
	Female	80
A2	Urban	61.4
	Rural	38.6
A3	Less 30	22.9
	30-40	27.1
	41-50	34.3
	Above 50	15.7
A4	Grade R-3	35.7
	Grade 4-6	31.4
	Grade 7-9	17.1
	Grade 10-12	7.2
	Grade 4-6, Grade 7-9	4.3
	Grade 7-9, Grade 10-12	4.3
A5	1-20	7.2
	21-40	57.1
	41-60	27.1
	Above 61	7.2
	21-40, 41-60	1.4
A6	Diploma	47.1
	Bachelors	25.7
	Honours	24.3
	Masters	2.9

A7	L	25.7
	M	4.3
	ST	4.3
	SS	7.1
	LM	24.3
	LST	5.7
	LSS	8.6
	MST	5.7
	MSS	1.4
	STSS	4.3
	LMST	1.4
	LSTSS	4.3
	LMSTSS	2.9
A8	None	45.7
	Daily	17.1
	Weekly	24.3
	Monthly	12.9
A9	African	94.3
	Indian	4.3
	White	1.4
A10	0-5Years	25.7
	6-10Years	18.6
	11-15Years	21.4
	16-20Years	18.6
	Above 20 Years	15.7

4.2.2 Self-Actualized Personality

Results from Figure 4.1 indicate that almost all the educators who participated in this study perceive themselves as having a self-actualized personality. The result of these educators is confirmed for all the items used to measure self-actualization, as evidenced by Table 4.3 and by Figure 4.2. In fact, findings from Table 4.3 indicate that educators' perceive themselves as having a very strong self-actualized personality when they enjoy new experiences. They also perceive themselves to have

a very strong self-actualized personality when they accept themselves, others and nature; and when they socialize with others. Moreover, educators' who participated in this study perceived themselves not to have a very strong self-actualized personality when they are independent and private or when they do not prejudge others.

Table 4.3: Proportion distribution table for items on educators' perceived self-actualized personality

B	S1	S2	S3	S4	S5	Mean	SD
B1	4	4	3	29	60	4.36	1.036
B2	3	1	3	23	70	4.56	0.862
B3	3	0	6	30	61	4.47	0.847
B4	3	3	7	26	61	4.40	0.954
B5	6	4	9	37	44	4.10	1.105
B6	4	3	4	46	43	4.20	0.972
B7	3	1	1	21	73	4.60	0.841
B8	3	0	7	24	66	4.50	0.864
B9	3	1	4	34	57	4.41	0.876
B10	4	1	3	27	64	4.46	0.958
TOTAL	**4**	**2**	**5**	**30**	**60**	**4.00**	

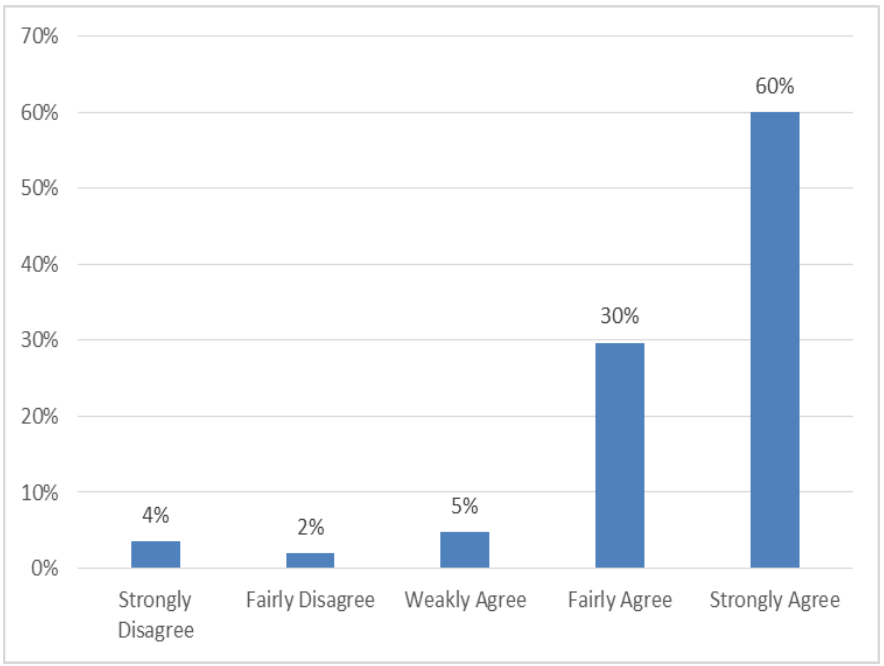

Figure 4.1: Proportion distribution histogram on educators' overall perceived self-actualized personality

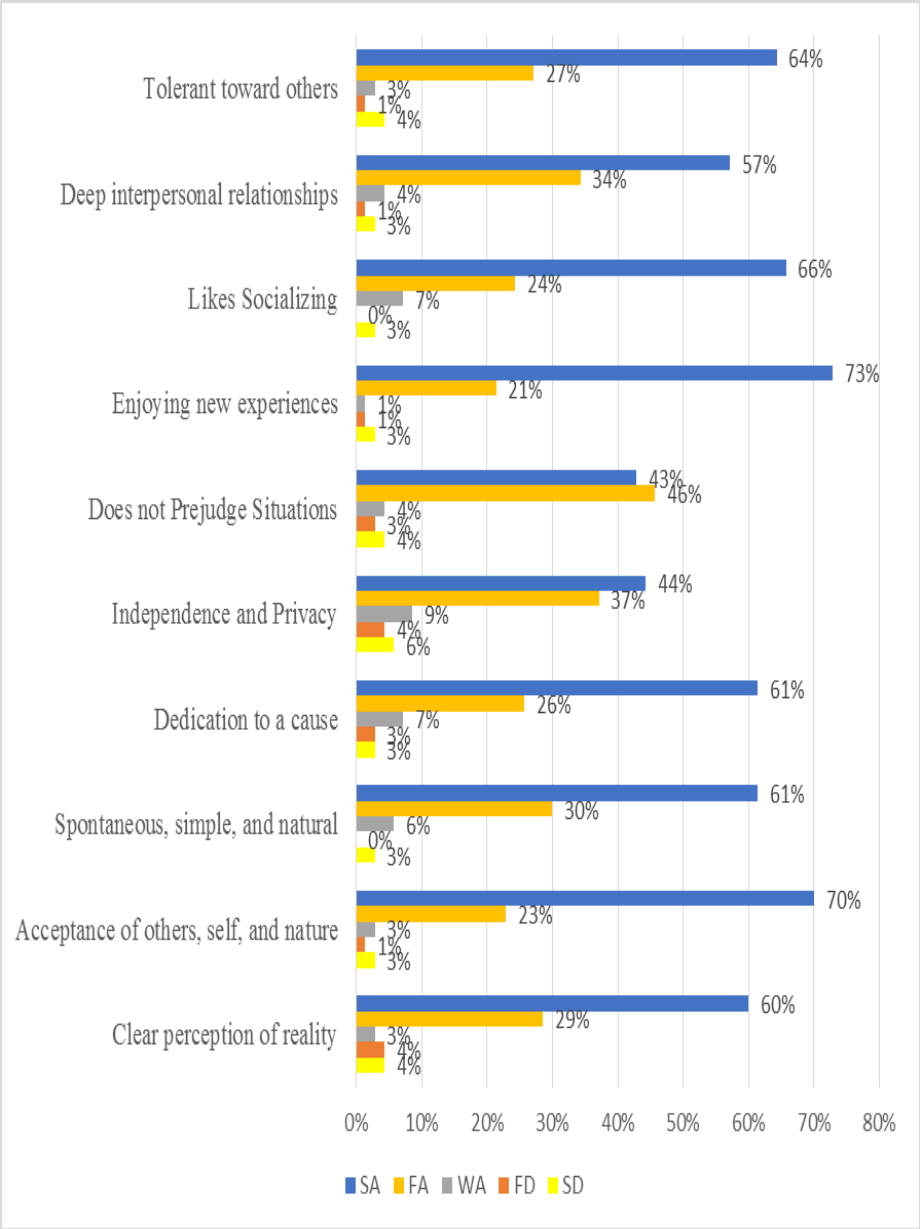

Figure 4.2: Proportion distribution histogram for items on educators perceived self-actualized personality items

4.2.3 Fully Functioning Personality

Results from Figure 4.3 indicate that almost all the educators who participated in this study perceive themselves as having a fully-functional personality; and this is confirmed for all the items used to measure fully functioning personality as evidenced by Table 4.4 and by Figure 4.4. In fact, findings from Table 4.3 indicate that educators' perceive themselves as having a very strong fully functioning personality when they share positive feelings with others as well as striving towards

to grow towards his/her full potential. However, results from Table 4.4 indicate that educators' perceive themselves to have a low fully functioning personality when they share negative feelings with others. Also, educators' perceptions are almost evenly spread from strongly disagree to strongly agree as to whether they are willing to share negative feelings with others.

Table 4.4: Proportion distribution table for items on educators perceived fully functioning personality

C	S1	S2	S3	S4	S5	Mean	SD
C1	4	0	4	37	54	4.37	0.92
C2	1	1	3	20	74	4.64	0.743
C3	17	19	17	24	23	3.17	1.424
C4	4	7	19	34	36	3.90	1.105
C5	4	3	6	44	43	4.19	0.982
C6	4	0	10	27	59	4.36	0.979
C7	4	0	4	41	50	4.33	0.912
C8	3	3	10	26	59	4.33	0.912
C9	6	1	6	39	49	4.23	1.038
C10	3	1	1	20	74	4.61	0.839
TOTAL	**5**	**4**	**8**	**31**	**52**	**4.20**	

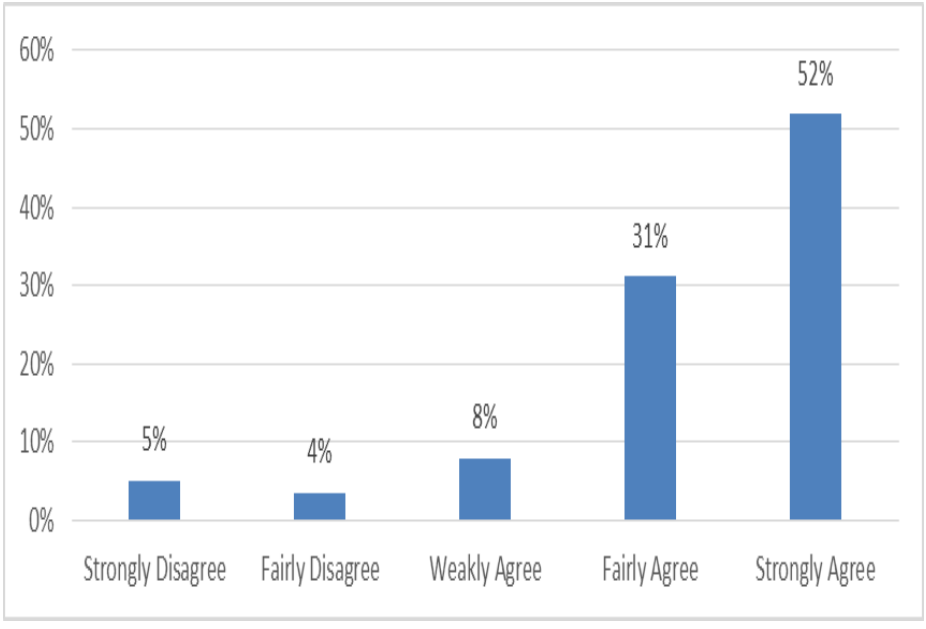

Figure 4.3: Proportion distribution histogram on educators overall perceived fully functioning personality

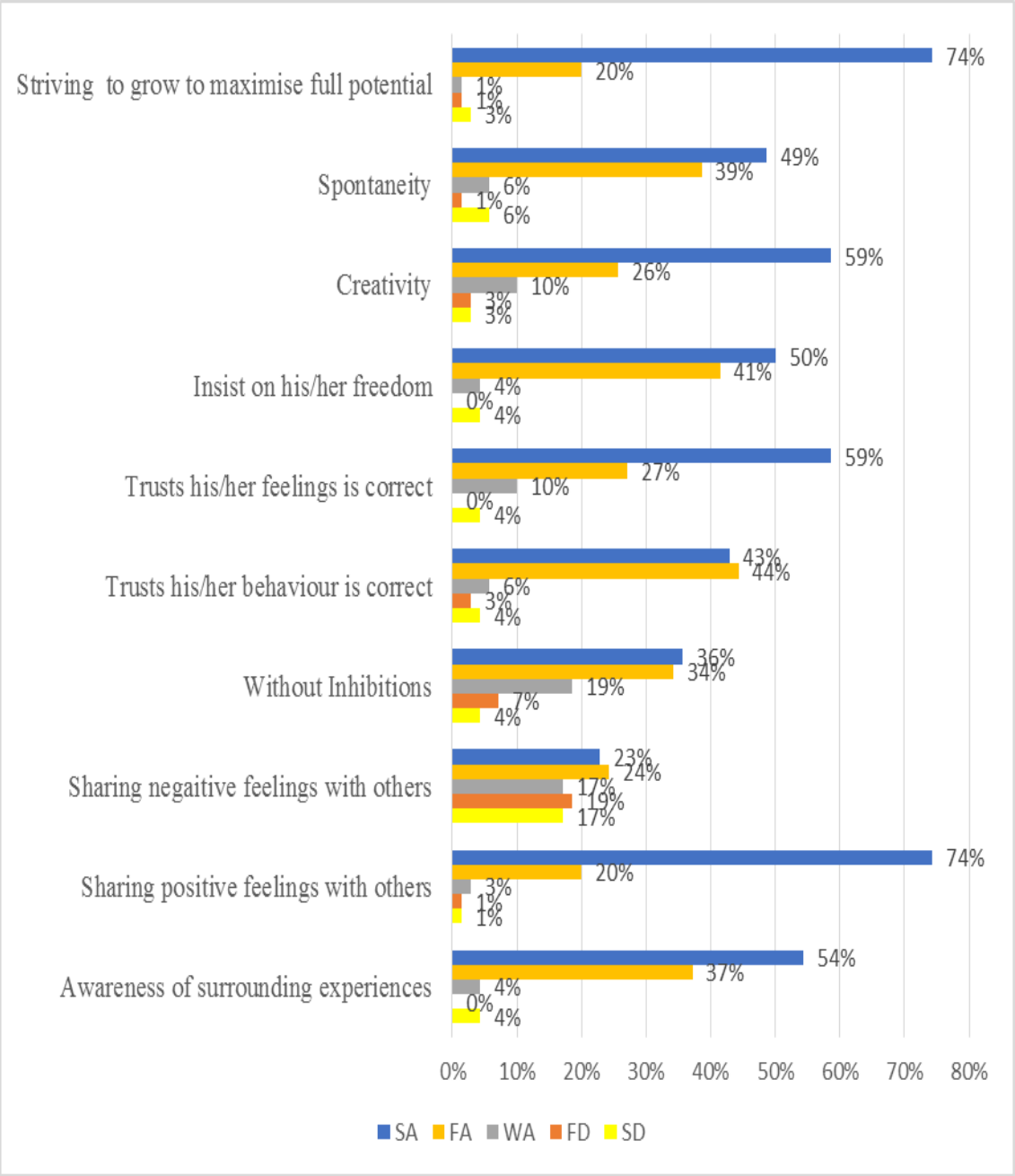

Figure 4.4: Proportion distribution histogram for items on educators' perceived individual fully functioning items

4.2.4 Healthy Personality

Results from Figure 4.5 indicate that almost all the educators who participated in this survey perceive themselves as having a healthy personality. This result of the educators perceived healthy personality is confirmed for all the items used to measure healthy personality as evidenced by Table 4.5 and by Figure 4.6. In fact, findings from Table 4.5 indicate that educators' perceive themselves as having a very

strong healthy personality when they share sense of humour and have a clear understanding of him/herself. However, results from Table 4.5 indicate that educators' share a strong healthy personality when they are compassionate and tolerant with others; accept his/her self as it is; consider themselves as realistic; and fully committed to his/her self-development.

Table 4.5: Proportion distribution table for items on educators perceived healthy personality

D	S1	S2	S3	S4	S5	Mean	SD
D1	3	6	1	40	50	4.29	0.965
D2	3	0	3	26	69	4.57	0.809
D3	3	0	3	26	69	4.57	0.809
D4	1	0	6	36	57	4.47	0.737
D5	3	3	3	27	64	4.47	0.912
D6	3	1	1	19	76	4.63	0.837
D7	3	1	1	23	71	4.59	0.843
D8	4	0	4	41	50	4.33	0.912
D9	3	1	4	41	50	4.34	0.866
D10	6	3	7	34	50	4.20	1.085
TOTAL	**3**	**2**	**3**	**31**	**61**	**4.5**	

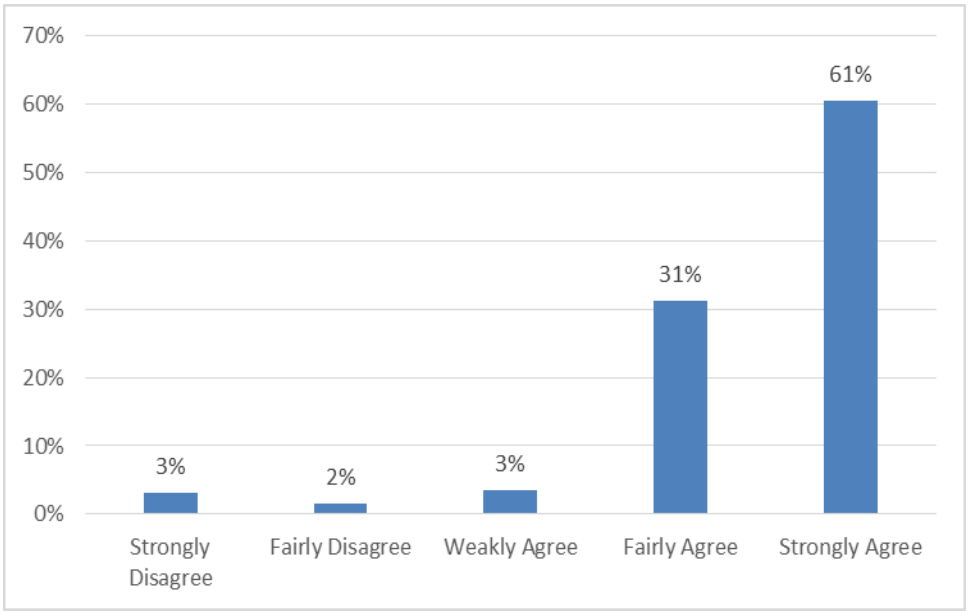

Figure 4.5: Proportion distribution histogram on educators overall perceived healthy personality

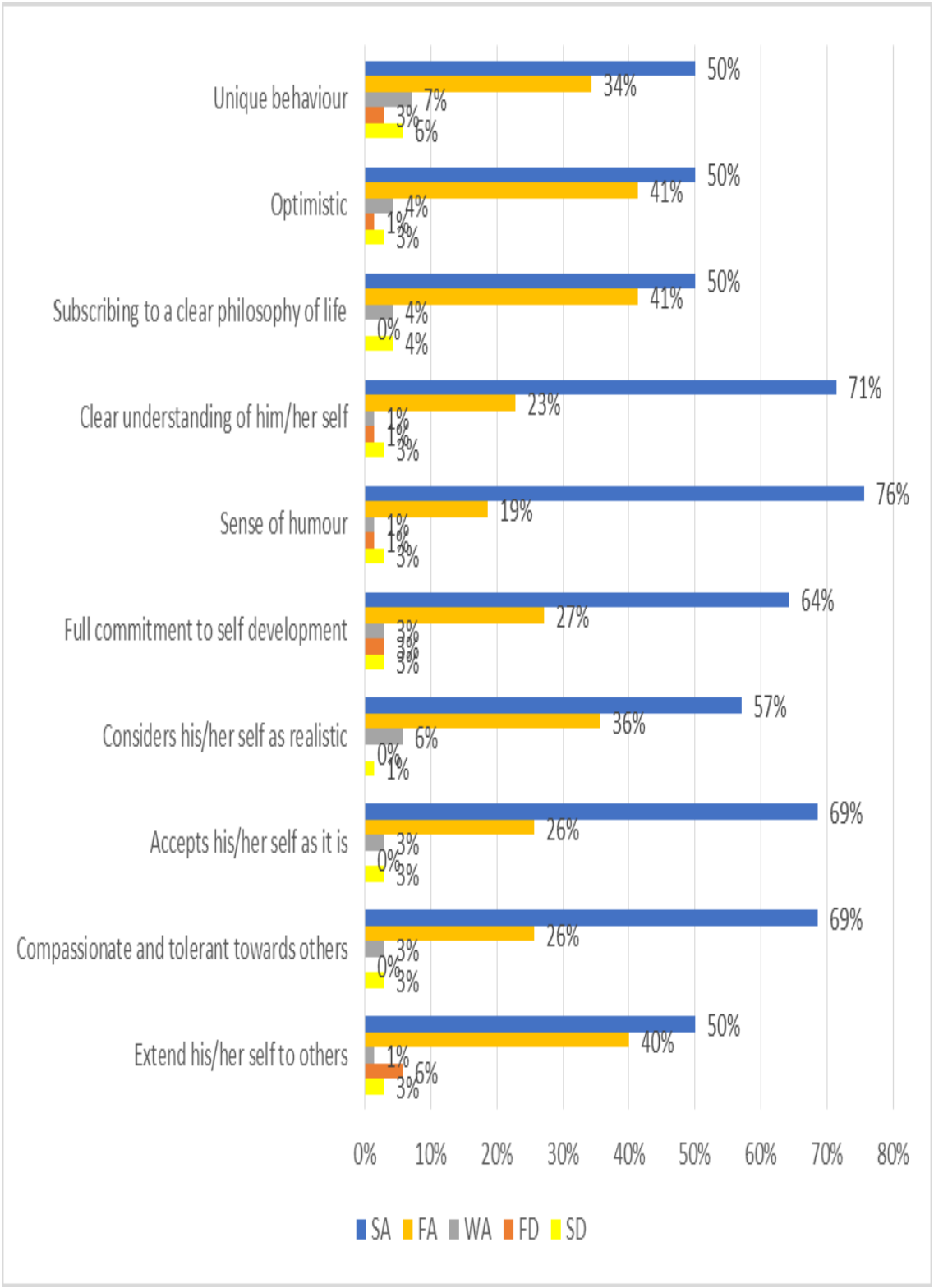

Figure 4.6: Proportion distribution histogram for items on educators perceived healthy personality items

4.2.5 Educators' Perceptions on the age from which Learners should be Allowed to use ICTs at school

Results from Figure 4.7 indicate that there is almost an absolute majority of educators from this study who believe that ICTs should be introduced in schools between Grade R and Grade 6, evidenced by Table 4.6 and by Figure 4.8. In fact, findings from Table 4.6 indicate that educators' have a strong perceptions on the age from which learners should be allowed to use ICTs at school when introduced between grade R-6 to assist learners in analyzing hypothesis using abstract thinking and deductive reasoning. Findings from this study also indicate that educators' perceptions on the age from which learners should be allowed to use ICTs at school are almost evenly spread across all grades for the item on analyzing hypotheses using abstract thinking and deductive reasoning where there seems to be no unanimity on the right age from which learners should be allowed to use ICTs at school. However, results from Table 4.5 indicate that educators' perceptions seems to be normal and evenly spread on the age from which learners should be allowed to use ICTs at school when introduced between grade R-6 to assist learners apply logic to classify objects and ideas; receive, process, remember, and present information; handling many concepts at a time; and differentiating themselves as individuals. Moreover, educators' perceptions seems to be very low on the age when ICTs should be introduced at school between grade R-6 when dealing with information on moral issues such as sex, abortion, etc.

Table 4.6: Proportion table for items on educators' perceptions on the age from which learners should be allowed to use ICTs at school

E	S1	S2	S3	S4	S5	Mean	SD
E1	4	0	4	37	54	3.59	1.45
E2	1	1	3	20	74	3.74	1.315
E3	17	19	17	24	23	4.21	6.297
E4	4	7	19	34	36	3.67	1.224
E5	4	3	6	44	43	3.84	1.085
E6	4	0	10	27	59	3.53	1.327
E7	4	0	4	41	50	3.44	1.379
E8	3	3	10	26	59	3.14	1.311
E9	6	1	6	39	49	3.57	1.325
E10	3	1	1	20	74	3.47	1.411
TOTAL	**5**	**4**	**8**	**31**	**52**	**3.60**	

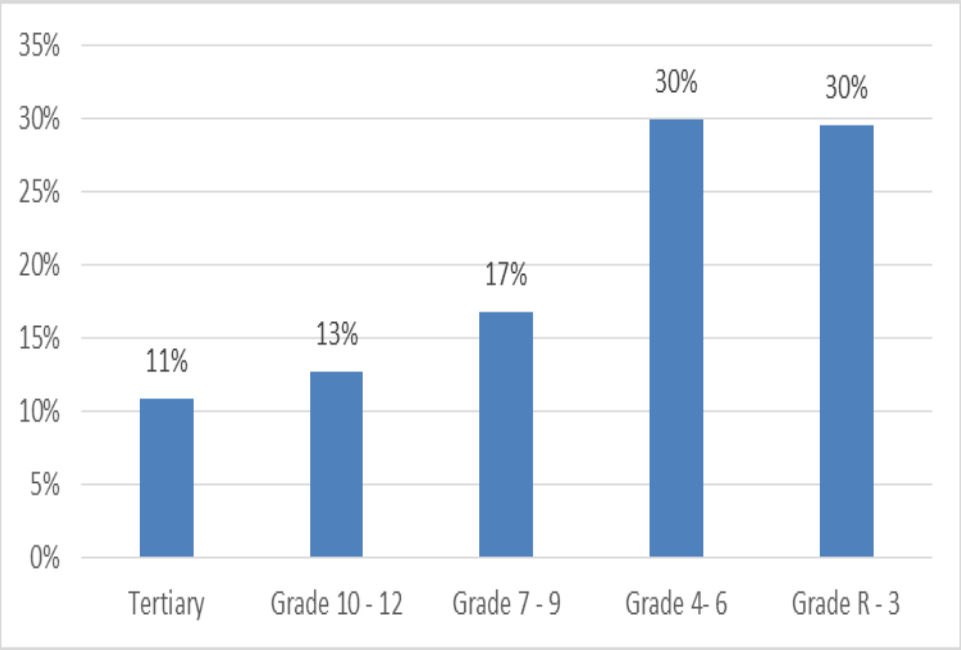

Figure 4.7: Proportion distribution histogram on educators overall perceptions on how early ICTs can be introduced in schools

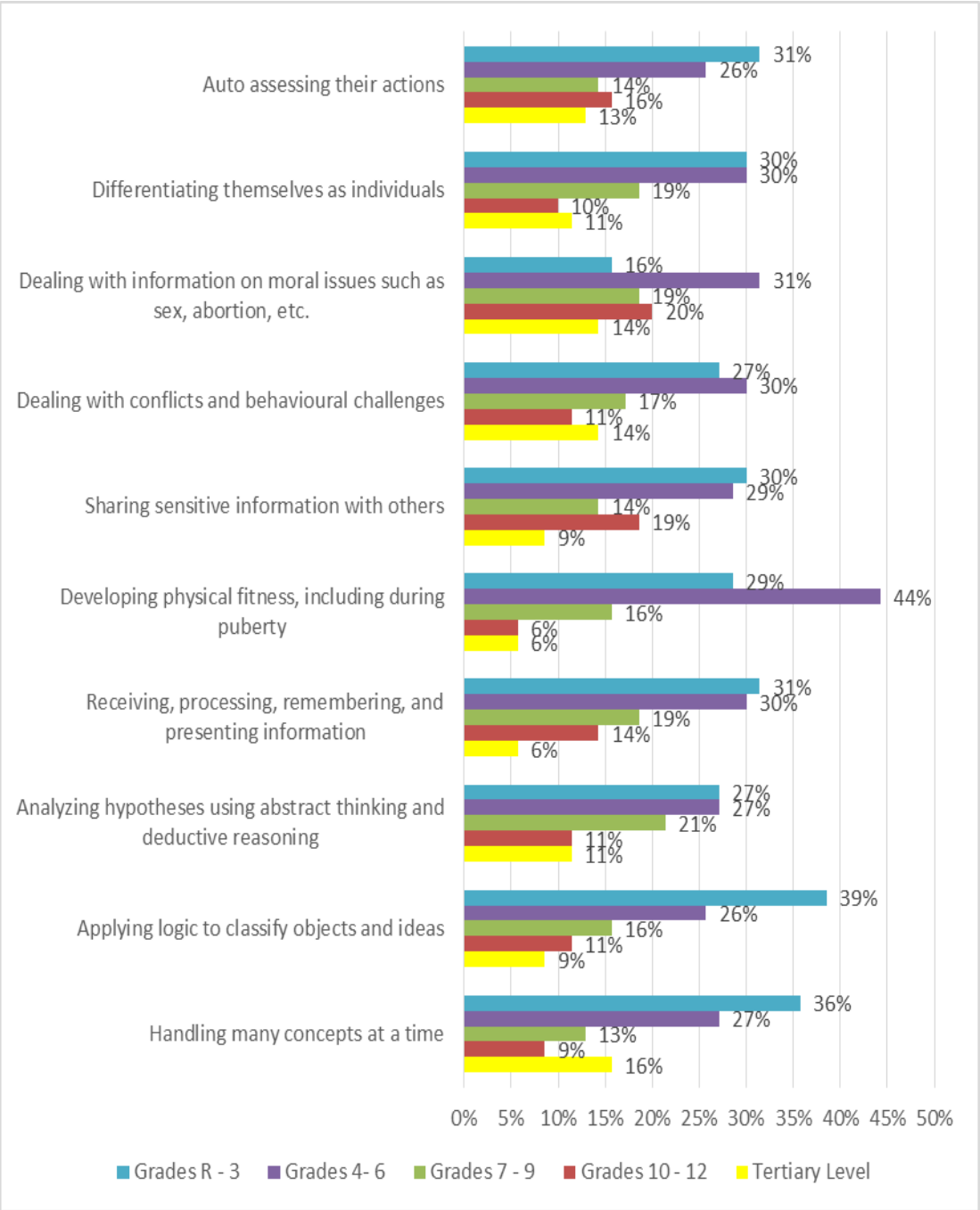

Figure 4.8: Proportion distribution histogram for items on educators' perceptions on the age from which learners should be allowed to use ICTs at school

4.3 Inferential Statistics

The results of the correlation tests performed by this study are presented in this section starting with the outcomes of the ANOVA test, followed by those of the Pearson's correlation tests.

4.3.1 ANOVA Test Results

The results of the ANOVA tests performed by this study are found on Table 4.10 and Table 4.13 and are summarised as follows in terms of their confirmation or disconfirmation of the hypothesis of this study.

- Fa: Grade or class taught by an educator is the only demographic variable that has a direct relationship with his or her perceptions on his or her self-actualised personality, on his or her fully functioning personality, and on his or her healthy personality.
- Fb: The subject specialisation of educators is the only demographic variable that has a direct relationship with their perceptions on the age from which learners should be allowed to use ICTs at school.

Table 4.7: ANOVA test results for gender

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Self-Actualised Personality	Between Groups	92.575	1	92.575	1.706	.196
	Within Groups	3689.196	68	54.253		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	109.375	1	109.375	2.235	.140
	Within Groups	3327.196	68	48.929		
	Total	3436.571	69			
Healthy Personality	Between Groups	34.300	1	34.300	.719	.400
	Within Groups	3245.071	68	47.722		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	3.214	1	3.214	.019	.892
	Within Groups	11810.571	68	173.685		
	Total	11813.786	69			

Table 4.8: ANOVA test results for school location

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	12.602	1	12.602	.227	.635
	Within Groups	3769.170	68	55.429		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	29.562	1	29.562	.590	.445
	Within Groups	3407.009	68	50.103		
	Total	3436.571	69			
Healthy Personality	Between Groups	5.623	1	5.623	.117	.734
	Within Groups	3273.748	68	48.143		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	74.766	1	74.766	.433	.513
	Within Groups	11739.020	68	172.633		
	Total	11813.786	69			

Table 4.9: ANOVA test results for age group

		Sum of	df	Mean	F	Sig.
Self-Actualised Personality	Between Groups	41.843	3	13.948	.246	.864
	Within Groups	3739.929	66	56.666		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	59.750	3	19.917	.389	.761
	Within Groups	3376.822	66	51.164		
	Total	3436.571	69			
Healthy Personality	Between Groups	68.538	3	22.846	.470	.704
	Within Groups	3210.834	66	48.649		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	1213.834	3	404.611	2.519	.066
	Within Groups	10599.952	66	160.605		
	Total	11813.786	69			

Table 4.10: ANOVA test results for grade (class taught)

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between	606.454	5	121.291	2.445	.043
	Within Groups	3175.318	64	49.614		
	Total	3781.771	69			
Fully Functioning Personality	Between	589.798	5	117.960	2.652	.031
	Within Groups	2846.774	64	44.481		
	Total	3436.571	69			
Healthy Personality	Between	564.384	5	112.877	2.661	.030
	Within Groups	2714.987	64	42.422		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between	851.434	5	170.287	.994	.428
	Within Groups	10962.352	64	171.287		
	Total	11813.786	69			

Table 4.11: ANOVA test results for current class size

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	376.049	4	94.012	1.794	.141
	Within Groups	3405.722	65	52.396		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	219.514	4	54.878	1.109	.360
	Within Groups	3217.058	65	49.493		
	Total	3436.571	69			
Healthy Personality	Between Groups	348.824	4	87.206	1.934	.115
	Within Groups	2930.547	65	45.085		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	299.696	4	74.924	.423	.792
	Within Groups	11514.089	65	177.140		
	Total	11813.786	69			

Table 4.12: ANOVA test results for highest level of education

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	384.815	3	128.272	2.492	.068
	Within Groups	3396.956	66	51.469		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	205.581	3	68.527	1.400	.251
	Within Groups	3230.991	66	48.954		
	Total	3436.571	69			
Healthy Personality	Between Groups	101.244	3	33.748	.701	.555
	Within Groups	3178.127	66	48.153		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	457.872	3	152.624	.887	.453
	Within Groups	11355.914	66	172.059		
	Total	11813.786	69			

Table 4.13: ANOVA test results for subject specialization

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	582.581	12	48.548	.865	.586
	Within Groups	3199.191	57	56.126		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	286.098	12	23.841	.431	.944
	Within Groups	3150.474	57	55.271		
	Total	3436.571	69			
Healthy Personality	Between Groups	386.759	12	32.230	.635	.803
	Within Groups	2892.612	57	50.748		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	3472.600	12	289.383	1.978	.044
	Within Groups	8341.186	57	146.337		
	Total	11813.786	69			

Table 4.14: ANOVA tests results for computer usage

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	258.500	3	86.167	1.614	.194
	Within Groups	3523.271	66	53.383		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	200.420	3	66.807	1.362	.262
	Within Groups	3236.151	66	49.033		
	Total	3436.571	69			
Healthy Personality	Between Groups	155.207	3	51.736	1.093	.358
	Within Groups	3124.165	66	47.336		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	153.109	3	51.036	.289	.833
	Within Groups	11660.676	66	176.677		
	Total	11813.786	69			

Table 4.15: ANOVA test results for ethnicity

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	25.650	2	12.825	.229	.796
	Within Groups	3756.121	67	56.062		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	84.450	2	42.225	.844	.435
	Within Groups	3352.121	67	50.032		
	Total	3436.571	69			
Healthy Personality	Between Groups	37.174	2	18.587	.384	.683
	Within Groups	3242.197	67	48.391		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	268.452	2	134.226	.779	.463
	Within Groups	11545.333	67	172.318		
	Total	11813.786	69			

Table 4.16: ANOVA test results for teaching experience

		Sum of Squares	df	Mean Square	F	Sig.
Self-Actualised Personality	Between Groups	28.685	4	7.171	.124	.973
	Within Groups	3753.086	65	57.740		
	Total	3781.771	69			
Fully Functioning Personality	Between Groups	101.127	4	25.282	.493	.741
	Within Groups	3335.444	65	51.315		
	Total	3436.571	69			
Healthy Personality	Between Groups	66.233	4	16.558	.335	.853
	Within Groups	3213.138	65	49.433		
	Total	3279.371	69			
Educators' perceptions on the age from which learners should be allowed to use ICTs at school	Between Groups	1134.428	4	283.607	1.726	.155
	Within Groups	10679.357	65	164.298		
	Total	11813.786	69			

4.3.2 Differences Between Groups

A further interpretation of the output of the ANOVA test between the grades or class taught by an educator and his or her perceived self-actualised personality indicates that there is a significant difference between the perceived self-actualisation of educators from grade 7 – 12, on the one hand, and, on the other hand on teachers from grade R – 3, from grade 7 – 9, and grades 4-9, who are in disfavour of grades 7 – 12 educators (Table 4. 17 and Table 4.18)

Table 4.17: Descriptive for self-actualisation

	N	Mean	Std. Deviation	Std. Error	95% Confidence		Minimum	Maximum
					Lower Bound	Upper Bound		
1	25	44.6400	4.75114	.95023	42.6788	46.6012	30.00	50.00
2	22	43.6364	8.65500	1.84525	39.7989	47.4738	10.00	50.00
3	12	45.5000	5.43557	1.56911	42.0464	48.9536	30.00	50.00
4	5	44.8000	4.14729	1.85472	39.6505	49.9495	40.00	50.00
23	3	48.3333	.57735	.33333	46.8991	49.7676	48.00	49.00
34	3	31.0000	18.24829	10.53565	-14.3313	76.3313	10.00	43.00
Total	70	44.0571	7.40326	.88486	42.2919	45.8224	10.00	50.00

Table 4.18: Multiple Comparisons Dependent Variable: Self-actualising personality (Tukey HSD)

(I) A4_Grade (Class)		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	1.00364	2.05907	.996	-5.0455	7.0528
	3	-.86000	2.47368	.999	-8.1272	6.4072
	4	-.16000	3.45072	1.000	-10.2976	9.9776
	23	-3.69333	4.30380	.955	-16.3371	8.9504
	34	13.64000*	4.30380	.027	.9962	26.2838
2	1	-1.00364	2.05907	.996	-7.0528	5.0455
	3	-1.86364	2.52779	.976	-9.2898	5.5625
	4	-1.16364	3.48971	.999	-11.4157	9.0885
	23	-4.69697	4.33513	.886	-17.4328	8.0388
	34	12.63636	4.33513	.053	-.0994	25.3721
3	1	.86000	2.47368	.999	-6.4072	8.1272
	2	1.86364	2.52779	.976	-5.5625	9.2898
	4	.70000	3.74932	1.000	-10.3148	11.7148
	23	-2.83333	4.54672	.989	-16.1907	10.5241
	34	14.50000*	4.54672	.026	1.1426	27.8574
4	1	.16000	3.45072	1.000	-9.9776	10.2976
	2	1.16364	3.48971	.999	-9.0885	11.4157
	3	-.70000	3.74932	1.000	-11.7148	10.3148
	23	-3.53333	5.14402	.983	-18.6455	11.5788
	34	13.80000	5.14402	.093	-1.3122	28.9122
23	1	3.69333	4.30380	.955	-8.9504	16.3371
	2	4.69697	4.33513	.886	-8.0388	17.4328
	3	2.83333	4.54672	.989	-10.5241	16.1907
	4	3.53333	5.14402	.983	-11.5788	18.6455
	34	17.33333*	5.75119	.041	.4374	34.2293
34	1	-13.64000*	4.30380	.027	-26.2838	-.9962
	2	-12.63636	4.33513	.053	-25.3721	.0994
	3	-14.50000*	4.54672	.026	-27.8574	-1.1426
	4	-13.80000	5.14402	.093	-28.9122	1.3122
	23	-17.33333*	5.75119	.041	-34.2293	-.4374

***. The mean difference is significant at the 0.05 level.**

Another further interpretation of the output of the ANOVA test between the grades or class taught by an educator and his or her perceived fully functioning personality indicates that there is a significant difference between the perceived fully functioning personality of educators from grade 7 – 12 on the one hand, and, on the other hand on teachers from grade R – 3, from grade 7 – 9, and grades 4 -9, who are in disfavour of grades 7 – 12 educators (Table 4.19 and Table 4.20)

Table 4.19: Descriptive for fully functioning personality

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	25	42.9600	4.28641	.85728	41.1907	44.7293	32.00	50.00
2	22	41.2727	8.34484	1.77913	37.5728	44.9726	12.00	50.00
3	12	42.7500	4.95663	1.43086	39.6007	45.8993	36.00	50.00
4	5	46.6000	5.27257	2.35797	40.0532	53.1468	38.00	50.00
23	3	44.0000	2.00000	1.15470	39.0317	48.9683	42.00	46.00
34	3	30.0000	16.64332	9.60902	-11.3443	71.3443	11.00	42.00
Total	70	42.1429	7.05729	.84351	40.4601	43.8256	11.00	50.00

Table 4.20: Multiple Comparisons Dependent Variable: Fully Functioning Personality (Tukey HSD)

(I) A4_Grade(Class)		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	1.68727	1.94964	.953	-4.0404	7.4149
	3	.21000	2.34221	1.000	-6.6710	7.0910
	4	-3.64000	3.26732	.874	-13.2388	5.9588
	23	-1.04000	4.07507	1.000	-13.0118	10.9318
	34	12.96000*	4.07507	.026	.9882	24.9318
2	1	-1.68727	1.94964	.953	-7.4149	4.0404
	3	-1.47727	2.39345	.989	-8.5088	5.5542
	4	-5.32727	3.30424	.594	-15.0345	4.3800
	23	-2.72727	4.10473	.985	-14.7862	9.3316

	34	11.27273	4.10473	.080	-.7862	23.3316
3	1	-.21000	2.34221	1.000	-7.0910	6.6710
	2	1.47727	2.39345	.989	-5.5542	8.5088
	4	-3.85000	3.55006	.886	-14.2794	6.5794
	23	-1.25000	4.30508	1.000	-13.8975	11.3975
	34	12.75000*	4.30508	.047	.1025	25.3975
4	1	3.64000	3.26732	.874	-5.9588	13.2388
	2	5.32727	3.30424	.594	-4.3800	15.0345
	3	3.85000	3.55006	.886	-6.5794	14.2794
	23	2.60000	4.87064	.995	-11.7090	16.9090
	34	16.60000*	4.87064	.014	2.2910	30.9090
23	1	1.04000	4.07507	1.000	-10.9318	13.0118
	2	2.72727	4.10473	.985	-9.3316	14.7862
	3	1.25000	4.30508	1.000	-11.3975	13.8975
	4	-2.60000	4.87064	.995	-16.9090	11.7090
	34	14.00000	5.44554	.120	-1.9980	29.9980
34	1	-12.96000*	4.07507	.026	-24.9318	-.9882
	2	-11.27273	4.10473	.080	-23.3316	.7862
	3	-12.75000*	4.30508	.047	-25.3975	-.1025
	4	-16.60000*	4.87064	.014	-30.9090	-2.2910
	23	-14.00000	5.44554	.120	-29.9980	1.9980
***. The mean difference is significant at the 0.05 level.**						

A further interpretation of the output of the ANOVA test between the grades or class taught by an educator and his or her perceived healthy personality indicates that there is a significant difference between the perceived healthy personality of educators from grade 7 – 12 on the one hand, and, on the other hand on educators from grade R – 3, from grade 4 – 6, and grades 4 -9, who are in disfavour of grades 7 – 12 educators (Table 4.21 and Table 4.22).

Table 4.21: Descriptive for healthy personality

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	25	45.4800	5.20513	1.04103	43.3314	47.6286	26.00	50.00
2	22	44.2727	6.95689	1.48321	41.1882	47.3572	19.00	50.00
3	12	44.7500	4.78872	1.38238	41.7074	47.7926	37.00	50.00
4	5	44.8000	4.54973	2.03470	39.1508	50.4492	40.00	49.00
23	3	48.3333	2.08167	1.20185	43.1622	53.5045	46.00	50.00
34	3	31.6667	18.77054	10.83718	-14.9620	78.2953	10.00	43.00
Total	70	44.4571	6.89399	.82399	42.8133	46.1010	10.00	50.00

Table 4.22: Multiple Comparisons Dependent Variable: Healthy Personality (Tukey HSD)

(I) A4_Grade(Class)		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	1.20727	1.90398	.988	-4.3863	6.8008
	3	.73000	2.28736	1.000	-5.9898	7.4498
	4	.68000	3.19080	1.000	-8.6940	10.0540
	23	-2.85333	3.97963	.979	-14.5447	8.8381
	34	13.81333*	3.97963	.012	2.1219	25.5047
2	1	-1.20727	1.90398	.988	-6.8008	4.3863
	3	-.47727	2.33739	1.000	-7.3441	6.3895
	4	-.52727	3.22685	1.000	-10.0072	8.9526
	23	-4.06061	4.00859	.912	-15.8371	7.7159
	34	12.60606*	4.00859	.029	.8296	24.3826
3	1	-.73000	2.28736	1.000	-7.4498	5.9898
	2	.47727	2.33739	1.000	-6.3895	7.3441
	4	-.05000	3.46691	1.000	-10.2351	10.1351
	23	-3.58333	4.20425	.956	-15.9346	8.7680
	34	13.08333*	4.20425	.032	.7320	25.4346
4	1	-.68000	3.19080	1.000	-10.0540	8.6940
	2	.52727	3.22685	1.000	-8.9526	10.0072
	3	.05000	3.46691	1.000	-10.1351	10.2351
	23	-3.53333	4.75656	.976	-17.5072	10.4406
	34	13.13333	4.75656	.077	-.8406	27.1072
23	1	2.85333	3.97963	.979	-8.8381	14.5447
	2	4.06061	4.00859	.912	-7.7159	15.8371
	3	3.58333	4.20425	.956	-8.7680	15.9346
	4	3.53333	4.75656	.976	-10.4406	17.5072

	34	16.66667*	5.31800	.030	1.0434	32.2899
34	1	-13.81333*	3.97963	.012	-25.5047	-2.1219
	2	-12.60606*	4.00859	.029	-24.3826	-.8296
	3	-13.08333*	4.20425	.032	-25.4346	-.7320
	4	-13.13333	4.75656	.077	-27.1072	.8406
	23	-16.66667*	5.31800	.030	-32.2899	-1.0434
***. The mean difference is significant at the 0.05 level.**						

A further interpretation of the output of the ANOVA test between the educators subject specialization and their perceptions on the age from which learners should be allowed to use ICTs at school indicates that there is a significant difference between the following two types of educators: those teaching social sciences only, and those teaching Languages, and Science and Technology; with the latter group favouring an earlier introduction of ICT in schools compared to the former group (See Table 4.23 and Table 4.24).

Table 4.23: Descriptive for educators' perceptions on the age from which learners should be allowed to use ICTs at school

	N	**Mean**	**Std. Deviation**	**Std. Error**	**95% Confidence Interval for Mean**		**Minimum**	**Maximum**
					Lower Bound	Upper Bound		
1	18	35.2222	10.33302	2.43552	30.0837	40.360	14.00	50.00
2	3	26.0000	2.00000	1.15470	21.0317	30.968	24.00	28.00
3	3	32.3333	8.08290	4.66667	12.2543	52.412	23.00	37.00
4	5	26.2000	8.25833	3.69324	15.9459	36.454	18.00	36.00
12	17	37.9412	12.54228	3.04195	31.4925	44.389	12.00	50.00
13	4	56.7500	27.24427	13.62213	13.3983	100.10	40.00	97.00
14	6	31.1667	11.39152	4.65057	19.2120	43.121	17.00	48.00
23	4	37.7500	5.31507	2.65754	29.2925	46.207	31.00	44.00
24	1	29.0000					29.00	29.00
34	3	29.3333	15.01111	8.66667	-7.9563	66.623	14.00	44.00
123	1	46.0000					46.00	46.00
134	3	41.3333	9.60902	5.54777	17.4632	65.203	31.00	50.00
1234	2	49.0000	1.41421	1.00000	36.2938	61.706	48.00	50.00
Total	70	36.2143	13.08489	1.56394	33.0943	39.334	12.00	97.00

Table 4.24: Multiple Comparisons Dependent Variable: Perceptions on the age from which learners should be allowed to use ICTs at school (Tukey HSD)

(I) A7_SubjectSpecialisation		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower	Upper
1	2	9.22222	7.54378	.977	-16.0690	34.5134
	3	2.88889	7.54378	1.000	-22.4023	28.1801
	4	9.02222	6.11532	.922	-11.4799	29.5244
	12	-2.71895	4.09119	1.000	-16.4350	10.9971
	13	-21.52778	6.68685	.070	-43.9461	.8905
	14	4.05556	5.70256	1.000	-15.0628	23.1739
	23	-2.52778	6.68685	1.000	-24.9461	19.8905
	34	5.88889	7.54378	.999	-19.4023	31.1801
	134	-6.11111	7.54378	.999	-31.4023	19.1801
	1234	-13.77778	9.01655	.904	-44.0066	16.4510
2	1	-9.22222	7.54378	.977	-34.5134	16.0690
	3	-6.33333	9.87713	1.000	-39.4473	26.7807
	4	-.20000	8.83437	1.000	-29.8180	29.4180
	12	-11.94118	7.57541	.886	-37.3384	13.4561
	13	-30.75000	9.23921	.053	-61.7253	.2253
	14	-5.16667	8.55385	1.000	-33.8442	23.5109
	23	-11.75000	9.23921	.970	-42.7253	19.2253
	34	-3.33333	9.87713	1.000	-36.4473	29.7807
	134	-15.33333	9.87713	.895	-48.4473	17.7807
	1234	-23.00000	11.04297	.594	-60.0226	14.0226
3	1	-2.88889	7.54378	1.000	-28.1801	22.4023
	2	6.33333	9.87713	1.000	-26.7807	39.4473
	4	6.13333	8.83437	1.000	-23.4847	35.7514
	12	-5.60784	7.57541	1.000	-31.0051	19.7894
	13	-24.41667	9.23921	.252	-55.3920	6.5586
	14	1.16667	8.55385	1.000	-27.5109	29.8442
	23	-5.41667	9.23921	1.000	-36.3920	25.5586
	34	3.00000	9.87713	1.000	-30.1140	36.1140
	134	-9.00000	9.87713	.998	-42.1140	24.1140
	1234	-16.66667	11.04297	.911	-53.6892	20.3559
4	1	-9.02222	6.11532	.922	-29.5244	11.4799
	2	.20000	8.83437	1.000	-29.4180	29.8180
	3	-6.13333	8.83437	1.000	-35.7514	23.4847
	12	-11.74118	6.15430	.710	-32.3740	8.8917
	13	-30.55000*	8.11489	.016	-57.7559	-3.3441
	14	-4.96667	7.32508	1.000	-29.5247	19.5913
	23	-11.55000	8.11489	.937	-38.7559	15.6559

	34	-3.13333	8.83437	1.000	-32.7514	26.4847
	134	-15.13333	8.83437	.823	-44.7514	14.4847
	1234	-22.80000	10.12105	.479	-56.7317	11.1317
12	1	2.71895	4.09119	1.000	-10.9971	16.4350
	2	11.94118	7.57541	.886	-13.4561	37.3384
	3	5.60784	7.57541	1.000	-19.7894	31.0051
	4	11.74118	6.15430	.710	-8.8917	32.3740
	13	-18.80882	6.72251	.185	-41.3467	3.7290
	14	6.77451	5.74434	.982	-12.4839	26.0329
	23	.19118	6.72251	1.000	-22.3467	22.7290
	34	8.60784	7.57541	.987	-16.7894	34.0051
	134	-3.39216	7.57541	1.000	-28.7894	22.0051
	1234	-11.05882	9.04303	.977	-41.3764	19.2587
13	1	21.52778	6.68685	.070	-.8905	43.9461
	2	30.75000	9.23921	.053	-.2253	61.7253
	3	24.41667	9.23921	.252	-6.5586	55.3920
	4	30.55000*	8.11489	.016	3.3441	57.7559
	12	18.80882	6.72251	.185	-3.7290	41.3467
	14	25.58333	7.80856	.061	-.5956	51.7622
	23	19.00000	8.55385	.500	-9.6776	47.6776
	34	27.41667	9.23921	.128	-3.5586	58.3920
	134	15.41667	9.23921	.845	-15.5586	46.3920
	1234	7.75000	10.47628	1.000	-27.3727	42.8727
14	1	-4.05556	5.70256	1.000	-23.1739	15.0628
	2	5.16667	8.55385	1.000	-23.5109	33.8442
	3	-1.16667	8.55385	1.000	-29.8442	27.5109
	4	4.96667	7.32508	1.000	-19.5913	29.5247
	12	-6.77451	5.74434	.982	-26.0329	12.4839
	13	-25.58333	7.80856	.061	-51.7622	.5956
	23	-6.58333	7.80856	.999	-32.7622	19.5956
	34	1.83333	8.55385	1.000	-26.8442	30.5109
	134	-10.16667	8.55385	.981	-38.8442	18.5109
	1234	-17.83333	9.87713	.772	-50.9473	15.2807
23	1	2.52778	6.68685	1.000	-19.8905	24.9461
	2	11.75000	9.23921	.970	-19.2253	42.7253
	3	5.41667	9.23921	1.000	-25.5586	36.3920
	4	11.55000	8.11489	.937	-15.6559	38.7559
	12	-.19118	6.72251	1.000	-22.7290	22.3467
	13	-19.00000	8.55385	.500	-47.6776	9.6776
	14	6.58333	7.80856	.999	-19.5956	32.7622
	34	8.41667	9.23921	.998	-22.5586	39.3920
	134	-3.58333	9.23921	1.000	-34.5586	27.3920

	1234	-11.25000	10.47628	.991	-46.3727	23.8727
34	1	-5.88889	7.54378	.999	-31.1801	19.4023
	2	3.33333	9.87713	1.000	-29.7807	36.4473
	3	-3.00000	9.87713	1.000	-36.1140	30.1140
	4	3.13333	8.83437	1.000	-26.4847	32.7514
	1s2	-8.60784	7.57541	.987	-34.0051	16.7894
	13	-27.41667	9.23921	.128	-58.3920	3.5586
	14	-1.83333	8.55385	1.000	-30.5109	26.8442
	23	-8.41667	9.23921	.998	-39.3920	22.5586
	134	-12.00000	9.87713	.978	-45.1140	21.1140
	1234	-19.66667	11.04297	.786	-56.6892	17.3559
134	1	6.11111	7.54378	.999	-19.1801	31.4023
	2	15.33333	9.87713	.895	-17.7807	48.4473
	3	9.00000	9.87713	.998	-24.1140	42.1140
	4	15.13333	8.83437	.823	-14.4847	44.7514
	12	3.39216	7.57541	1.000	-22.0051	28.7894
	13	-15.41667	9.23921	.845	-46.3920	15.5586
	14	10.16667	8.55385	.981	-18.5109	38.8442
	23	3.58333	9.23921	1.000	-27.3920	34.5586
	34	12.00000	9.87713	.978	-21.1140	45.1140
	1234	-7.66667	11.04297	1.000	-44.6892	29.3559
1234	1	13.77778	9.01655	.904	-16.4510	44.0066
	2	23.00000	11.04297	.594	-14.0226	60.0226
	3	16.66667	11.04297	.911	-20.3559	53.6892
	4	22.80000	10.12105	.479	-11.1317	56.7317
	12	11.05882	9.04303	.977	-19.2587	41.3764
	13	-7.75000	10.47628	1.000	-42.8727	27.3727
	14	17.83333	9.87713	.772	-15.2807	50.9473
	23	11.25000	10.47628	.991	-23.8727	46.3727
	34	19.66667	11.04297	.786	-17.3559	56.6892
	134	7.66667	11.04297	1.000	-29.3559	44.6892

*. The mean difference is significant at the 0.05 level.

4.3.3 Pearson Correlation Tests Results

The results of Pearson's correlation tests performed by this study will be found on Table 4.25 and they can be summarized as follows in terms of their confirmation or disconfirmation of the hypothesis of this study.

Re: There is a direct relationship between the perceived self-actualized personality of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

Rf: There is a direct relationship between the perceived fully functioning personality of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

Rg: There is a direct relationship between the perceived healthy personality of an educator, and his or her perceptions on the age from which learners should be allowed to use ICTs at school.

These ANOVA and Pearson correlation tests results are fulfilling the third objective of this study which is to empirically test the conceptual model proposed in the second chapter of this dissertation. This empirically tested, validated model is presented in Figure 4.9.

Table 4. 25: Correlations not involving demographics

		B	C	D	E
B	Pearson Correlation	1	.783**	.557**	.185*
	Sig. (2-tailed)		0	0	0.126
	N	70	70	70	70
C	Pearson Correlation	.783**	1	.603**	0.163
	Sig. (2-tailed)	0		0	0.177
	N	70	70	70	70
D	Pearson Correlation	.557**	.630**	1	.263**
	Sig. (2-tailed)	0	0		0.028
	N	70	70	70	70
E	Pearson Correlation	.185*	0.163	.263**	1
	Sig. (2-tailed)	0.125	0.177	0.028	
	N	70	70	70	70

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

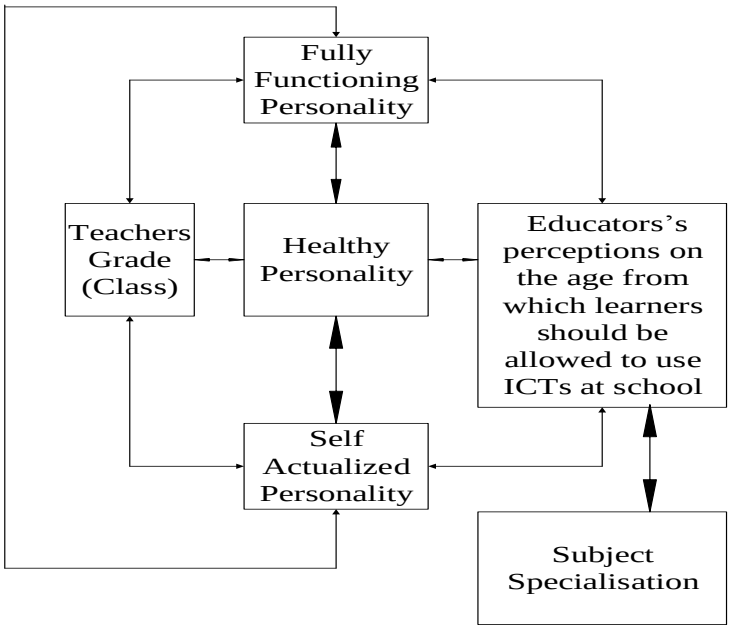

Figure 4.9: The validated model

4.3.4 Linear Regression Test Results

The results of the linear regression test performed by this study are represented by Table 4.26 and are translated by Equation (2) linking educators' personality to their perceptions on the age from which learners should be allowed to use ICTs at school.

$$E = 0.166B - 0.110C + 0.469D + 12.711 \quad \text{…….. (Equation 2)}$$

In Equation ii, E represents the perceptions of educators on the age from which learners should be allowed to use ICTs at school, B represents self-actualised personality, C represents fully functioning personality, and D represents healthy personality.

Table 4.26: Linear regression test result

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
1	(Constant)	12.711	11.134		1.142	.258
	Self-Actualised Personality	.166	.342	.094	.485	.629
	Fully Functioning Personality	-.110	.373	-.059	-.295	.769
	Healthy Personality	.469	.286	.247	1.637	.106

a. Dependent Variable: Educators' perceptions on the age from which learners should be allowed to use ICTs at school

4.4 Conclusion

The results of the descriptive statistics of this study indicate that almost the entire population of this survey is made up of Africans and the overwhelming majority are females whose age and teaching experience are almost evenly spread among the years. Almost half of the educators do not use computers at all. In the majority of cases, the class size is perceived as manageable for most of the educators that participated in this survey and two thirds of them are from primary schools, and they either teach languages or mathematics. All educators surveyed are suitably qualified with at least a Diploma. The results of the inferential tests performed by this study further reveal that the grade or class taught by an educator is the only demographic variable that has a direct relationship with his or her perceptions on his or her self-actualised personality, on his or her fully functioning personality, and on his or her healthy personality; and the subject specialisation of educators is the only demographic variable that has a direct relationship with their perceptions on the age from which learners should be allowed to use ICTs at school. Furthermore, it is interesting to note that the findings of this survey indicate that the Likert scale variables of this study (educators' perceived self–actualised personality, educators' perceived fully functioning personality, educators' perceived healthy personality, and educators' perceptions on the age from which learners should be allowed to use ICTs at school) are all correlated. The next chapter is dedicated to the discussion of these findings compared to existing empirical studies on the age learners use ICTs in schools.

CHAPTER 5
COMPARISON WITH RELATED LITERATURE, RECOMMENDATIONS, AND CONCLUSION

This chapter summarizes the content of this study on the age from which learners should be allowed to use ICTs at school and compares it against existing empirical studies on the age learners use ICTs in schools. The chapter ends with a set of recommendations on the introduction of ICTs in schools, in fulfilment of the fourth and last objective of this study.

5.1 Summary of Current Empirical Study

Africans and female educators approximately form the entire sample of this survey. All of the educators' are suitably qualified with at least a Diploma and they perceive their personality to be fully functional, healthy, and at the highest level of Maslow's personality scale. On average, educators' prefer ICTs to be introduced for use at school when learners are aged between 12 years and 13 years (grade 6 and grade 7). Inferential tests conducted in this study found a correlation between the grade or class taught by an educator and his or her personality; a correlation between the subject specialisation of an educator and his or her perceptions on the age from which learners should be allowed to use ICTs at school. It also found a correlation between educators' personality and their perceptions on the age from which learners should be allowed to use ICTs at school.

5.2 Summary of Existing Empirical Studies

This section presents findings of descriptive and inferential results of reviewed existing literature on research findings on the age from which ICTs should be introduced for use in schools.

5.2.1 Descriptive Results

This section summarises the descriptive results from existing literature on the age ICTs should be introduced at school. The majority (80%) of papers from the literature reviewed by this study argue for an introduction of ICTs in schools before

learners reach the age of 12 years (grade 6) (Papert 1980; Alexandra and Marion 1985; Genishi *et al.* 1985; McCollister *et al.* 1986; Bergin *et al.* 1993; Kromhout and Butzin 1993; Liu 1996; Hohmann 1998; Reitsma and Wesseling 1998; Wenglinsky 1998; Healy 1999; Graham and Banks 2000; Haugland 2000; Din *et al.* 2001; Kelly and Schorger 2001; Shahrimin and Butterworth 2001; Heft and Swaminathan 2002; Li and Atkins 2004; Nir-Gal and Klein 2004; Judge 2005; Izumi-Taylor *et al.* 2006; Kumtepe 2006; Voogt and McKenney 2007; McKenney and Voogt 2010; Serin 2011; Suleiman 2011; Abdollahpour and Maleki 2012; Beschorner and Hutchison 2013; Nikolopoulou 2014). Eleven percent (11%) of the papers reviewed argue for a first introduction of ICTs in schools not until learners are aged between 13 and 18 years (grade 7 to grade 12) (Kirsh 1998; Cordes and Miller 2000; Setzer and Monke 2001; Gentile *et al.* 2004; Bacigalupa 2005; Yang and Wu 2012). Nine percent (9%) of the papers reviewed argue for a first introduction of ICTs in schools not until learners are 19 years old (tertiary education level) (Anderson *et al.* 2004; Funk *et al.* 2004; Hopf *et al.* 2008; Gentile *et al.* 2009).

The results of the existing literature on the age ICTs should be introduced at school can be summarised in terms of the following four (4) items of the dependent variable proposed by this current study: i) Forty eight percent (48%) of the papers argue for the introduction of ICTs in schools before learners reach the age of 12 in order to assist them with the analysis of hypotheses that require the use of abstract thinking and deductive reasoning (Alexandra and Marion 1985; Dickinson 1986; McCollister *et al.* 1986; Kromhout and Butzin 1993; Wenglinsky 1998; Haugland 1999; Cordes and Miller 2000; Primavera *et al.* 2001; Setzer and Monke 2001; Li and Atkins 2004; Nir-Gal and Klein 2004; Bacigalupa 2005; Judge 2005; Izumi-Taylor *et al.* 2006; McMahon 2009; McKenney and Voogt 2010; Serin 2011; Yang and Wu 2012; Fessakis *et al.* 2013); ii) Fifty six percent (56%) of the papers also argue for the introduction of ICTs in schools before learners reach the age of 12 in order to assist them to improve their ability to receive, process, remember, and present information (Alexandra and Marion 1985; Genishi *et al.* 1985; Dickinson 1986; Bergin *et al.* 1993; Kromhout and Butzin 1993; Liu 1996; Hohmann 1998; Reitsma and Wesseling 1998; Haugland 1999; Din *et al.* 2001; Kelly and Schorger 2001;

Primavera *et al.* 2001; Shahrimin and Butterworth 2001; Heft and Swaminathan 2002; Segers and Verhoeven 2002; Bacigalupa 2005; Judge 2005; Izumi-Taylor *et al.* 2006; Voogt and McKenney 2007; Suleiman 2011; Abdollahpour and Maleki 2012; Beschorner and Hutchison 2013; Nikolopoulou 2014); iii) Twenty three percent (23%) of the papers argue for the introduction of ICTs in schools before learners reach the age of 12 in order to assist them in their physical development, including during puberty (Liu 1996; Haugland 1999; Cordes and Miller 2000; Graham and Banks 2000; Primavera *et al.* 2001; Judge 2005; Voogt and McKenney 2007; Beschorner and Hutchison 2013; Nikolopoulou 2014); iv) Twenty seven percent (27%) of the papers also argue for the introduction of ICTs in schools before learners reach the age of 12 in order to help them deal with conflicts and behavioural challenges (Kirsh 1998; Heft and Swaminathan 2002; Funk *et al.* 2004; Gentile *et al.* 2004; Kumtepe 2006; Hopf *et al.* 2008; Gentile *et al.* 2009; Hofferth 2010).

5.2.2 Inferential Results

This section summarises the existing reviewed studies on how the age ICTs should be introduced in schools is affected by demographic variables. It was reported that learners gender (Bergin *et al.* 1993; Heft and Swaminathan 2002; Funk *et al.* 2004; Gentile *et al.* 2004; Hopf *et al.* 2008), their age group (Kirsh 1998; Graham and Banks 2000; Funk *et al.* 2004; Li and Atkins 2004), their frequency of computer usage (Wenglinsky 1998; Li and Atkins 2004), and their ethnicity (Kumtepe 2006; McKenney and Voogt 2010) are the demographic factors that affect most research findings from existing literature on the age ICTs can be introduced for use at school.

5.2.3 Other Factors

Literature reviews on the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school reveals that some of these factors cannot be grouped according to the following four antecedent constructs of the theoretical framework of this study which examined perceptions on the age from which learners should be allowed to use ICTs at school from an adult (educator) perspective: demographics; self-actualised personality; fully functioning personality; and healthy personality. The following paragraph endeavours to present this literature review according to the early childhood learner outcomes framework

proposed by Moncada (1990). This framework classifies education outcomes for early childhood (between 0 and 9 years old) into the following categories: personal outcomes; social outcomes; physical outcomes; cognitive outcomes; aesthetic/creative outcomes; and communication outcomes.

5.2.3.1 Personal Outcome

A child is said to have reached a high level of personal education outcome if he or she is able to take care of himself or herself in terms of health, safety, and personal needs (Moncada 1990). According to Moncada (1990), characteristics of personal outcomes include: independence and self-reliance; the ability to describe feelings verbally; seeing one's self as a growing individual with self-confidence, with self-understanding, and with a range of potential roles, assuming increased responsibility for personal health and safety; making responsible choices affecting self and others; and becoming a self-motivated learner.

5.2.3.2 Social Outcome

A child is said to have reached a high level of social education outcome if he or she is able to interact with other people, including peers and adults (Kagan *et al.* 1998; Van Scoter *et al.* 2001). According to Moncada (1990), the main characteristics of social outcomes include: having concerns for others; having a sense of family and reliance on friendships and on the larger world; and having the ability to cooperate, to serve as a resource, to negotiate, and to lead and follow.

There are twenty three (23) papers in the literature review conducted in the current study that are interested in the study of learners' social education outcomes with regard to determining the age from which learners should be allowed to use ICTs. Among these 23 papers, five (5) papers focus on having concerns for others, ten (10) papers on having a sense of family and reliance on friendships and on the larger world, and fourteen (14) papers on having the ability to cooperate, to serve as a resource, to negotiate, and to lead and follow.

5.2.3.3 Physical Outcome

A child is said to have reached a high level of physical education outcome if he or she enjoys a sense of physical well-being and his or her motor skills are fully

functional (Kagan *et al.* 1998). The main characteristics of physical education outcomes include: exploring and manipulating the environment; mastering coordinated physical movements; purposely using tools and technology with one's hands, and deriving abstract understanding from physical actions (Moncada 1990).

There are seven (7) papers in the literature reviewed that are interested in the study of learners' physical education outcomes with regard to determining the age from which learners should be allowed to use ICTs. Among these 7 papers, four (4) papers are on mastering co-ordinated physical movements and three (3) papers are on purposely using tools and technology with one's hands.

5.2.3.4 Cognitive Outcome

A child is said to have reached a high level of cognitive education outcome if he or she is able to learn ways to solve problems (Kagan *et al.* 1998; Van Scoter *et al.* 2001). According to Moncada (1990), the main cognitive education outcomes include: attempting to understand phenomenon; accumulating knowledge by attaching meaning to perceived events and experiences; increasing one's abstract thinking abilities; improving complex thinking through observing, listening, and making inferences related to life experiences; solving problems through strategies and techniques to test out hypothetical possibilities; and acquiring, organizing, and using information in increasingly complex ways.

There are seventeen (17) papers in the literature review that are interested in the study of children's cognitive education outcomes with regard to determining the age from which learners should be allowed to use ICTs. Among these 17 papers, four (4) papers are on accumulating knowledge by attaching meaning to perceived events and experiences, one (1) paper on increasing one's abstract thinking abilities, three (3) papers on improving complex thinking through observing, listening, and making inferences related to life experiences, and nine (9) papers on solving problems through strategies and techniques to test out hypothetical possibilities, and acquiring, organizing, and using information in increasingly complex ways.

5.2.3.5 Aesthetic/Creative Outcome

A child is said to have reached a high level of aesthetic/creative education outcome if he or she is able to create, respond to, and evaluate aesthetic experiences (Moncada 1990). The main characteristics of aesthetic/creative outcomes include: crystalizing experiences through creative expressions; expressing, responding to, and interpreting artistic experiences and feelings; appreciating beauty; and developing personal judgments about what is aesthetically appealing (Moncada 1990).

5.2.3.6 Communication Outcome

A child is said to have reached a high level of communication education outcome if he or she has developed the ability to use language to communicate, express, and interpret meaning (Kagan *et al.* 1998). According to Moncada (1990), the main characteristics of communication education outcomes include: giving and receiving nonverbal and verbal messages; and communicating with self, others, and the environment through listening, speaking, writing, reading, and interpreting.

There are thirteen (13) papers in the literature review in this study that are interested in the study of children communication education outcomes with regard to determining the age from which learners should be allowed to use ICTs. Among these 13 papers, six (6) papers are on giving and receiving nonverbal and verbal messages, and eight (9) papers on communicating with self, others, and the environment through listening, speaking, writing, reading, and interpreting.

5.3 Comparing Current Empirical Studies to Existing Empirical Studies

This section compares the descriptive and inferential results of this study against the above reviewed existing literature.

5.3.1 Descriptive Results

The results of the current study indicate that, on average, educators prefer that ICTs be introduced in schools when learners are aged between 12 years and 13 years (grade 6 and grade 7) compared to the results from the above reviewed literature where majority argue for an introduction of ICTs in schools before learners reach the age of 12 years (grade 6). There is no unanimous agreement for any individual item of the dependent variable as to whether ICTs should be introduced in schools when

learners are still very young, when they are starting to reach puberty, or when they are starting to reach maturity. Therefore, it was difficult to compare the results of the current study against the results of the studies from the literature reviewed when taking into account each individual item of the dependent variable of the current study. This state of affairs might be linked to the diversity of methodologies used by the different reviewed studies. The results of some of the reviewed studies are based on the developmental aspects (cognitive, social/emotional, physical, language, self-care) of the child (Papert 1980; Hohmann 1998; Haugland 1999; Healy 1999; Cordes and Miller 2000; Godnig 2002). Other results are conclusions from observations or from experiments (Karen 1984; Genishi *et al.* 1985; Dickinson 1986; Bergin *et al.* 1993; Liu 1996; Graham and Banks 2000; Kelly and Schorger 2001; Shahrimin and Butterworth 2001; Bacigalupa 2005; Voogt and McKenney 2007; Beschorner and Hutchison 2013; Fessakis *et al.* 2013). Some studies used many types of research respondents which includes students, professionals, parents, and general users (Kirsh 1998; Din *et al.* 2001; Heft and Swaminathan 2002; Anderson *et al.* 2004; Gentile *et al.* 2004; Li and Atkins 2004; Nir-Gal and Klein 2004; Judge 2005; Kumtepe 2006; Hopf *et al.* 2008; McMahon 2009; Hofferth 2010; McKenney and Voogt 2010; Abdollahpour and Maleki 2012; Yang and Wu 2012; Chuang *et al.* 2013; Mei-Ling 2014).

5.3.2 Inferential Results

The results of the current study indicate that educators subject specialisation is the only demographic variable that has a direct relationship with their perceptions on the age from which learners should be allowed to use ICTs at school compared to existing reviewed studies which indicate that learners' gender, their age group, their frequency of computer usage, and their ethnicity affect the research findings from existing literature on the early introduction for the use of ICTs in schools.

5.3.3 Description of Existing Related Works

It is possible that the reasons why our results could not compare to existing literature was the various outcomes of experimental conditions used as well as the different research respondents employed for their sample. On the different experimental

methods used by different studies for example, Genishi *et al.* (1985) used child and child interaction, child and computer interaction, child and adult interaction as methodologies for their studies. They found that language development of kindergartners was enhanced while working on computer graphics when ICTs are introduced early in schools. Also, Graham and Banks (2000) used children's ergonomics, children's perception, children's approach to computers, time spent on computer as variable items for their studies. They established that most children began making the mouse and cursor connection while watching the screen at approximately effective age of 3 while Fessakis *et al.* (2013) in their studies reveals that students (5-6year olds) who participated in computer programming environments had opportunities to develop mathematical concepts, problem solving and social skills using the teachers attitude scale, roles and perception scale; Children's problem solving capabilities scales, challenges and interactions scales as methodologies for their experiment. On the other hand, Voogt and McKenney (2007) used an observation method to examine how ICTs can support reading and writing in 4 – 5 years old. He found from 16 early literacy skills test developed to observed children that regular and frequent use of technology can have a positive learning effect on literacy development of 4-5 year olds, or at least in cases where adult facilitation is present. On various research respondents used by different studies, Kirsh (1998) used 3rd and 4th grade students as his population and found that playing of violent video games leads to the development of a hostile attribution bias and subsequently seeing the world in a more negative way. Li and Atkins (2004) used 122 preschool children to explore early computer experience and cognitive and psychomotor development among young children while Kumtepe (2006) indicate that children who use computers more proficiently demonstrated less problem behaviours and better social skills using teachers as his research respondents.

5.4 Research Gaps

The analysis of the literature reviewed by this study points to the following gaps in the state of research on the factors affecting the perceptions on the age from which learners should be allowed to use ICTs at school. This research is an attempt to fill

these research gaps in an effort to contribute to better understanding of the use of ICTs by young learners.

- None of the reviewed studies examined how the perceptions on the age from which learners should be allowed to use ICTs at school is affected by educators' perceived personality.
- None of the reviewed studies examined the perceptions on the age from which learners should be allowed to use ICTs at school with regard to the following child development issues: learners' ability to share sensitive information with others; their ability to deal with information on moral issues such as sex and abortion; their ability to auto-assess their actions; their ability to take care of themselves; and their appreciation of beauty and creativity.
- None of the reviewed studies examined the following physical and cognitive aspects of child development in determining the age from which learners should be allowed to use ICTs at school: learners' ability to explore and manipulate the environment; their ability to analyse phenomena; and their ability to acquire, organize, and use information in increasingly complex ways.
- A limited number of studies examined the following cognitive aspect of child development in determining the age from which learners should be allowed to use ICTs at school: learners' ability to increase their abstract and complex thinking through observing, listening, and making inferences related to their life experiences.
- A limited number of studies is examined the following items on the educators' perceptions on the age from which learners should be allowed to use ICTs at school: learners' ability to handle many concepts at a time; and their ability to differentiate themselves as individuals.

5.5 Recommendations

The following recommendations can be made based on the results of the current study and based on the above identified research gaps.

- One of the interesting findings of the current study is that an overwhelming majority of the teachers, who participated in this survey, are fully qualified

female educators of African origin who are at the highest level of their personality needs. Therefore, this study proposes that these female educators be used as champions for introduction of ICTs in schools.

- Another finding of the current study is that the educators that were surveyed prefer ICTs to be introduced in schools when learners are aged between 12 years and 13 years (grade 6 and grade 7). Therefore, this study recommends that pilot projects on the introduction of ICTs in schools be implemented in priority for grade 6 and grade 7 learners.
- Another interesting finding of this study is that the subject specialisation of educators is the only demographic variable which has a direct relationship with educators' perceptions on the age from which learners should be allowed to use ICTs at school. Therefore, this study recommends that eLearning pilot projects be designed in ways that clearly considers differences between educators' from various subject specialisation.
- One of the research gaps identified by this study is that none of the reviewed studies is examining how the educators' perceptions on the age from which learners should be allowed to use ICTs at school is affected by educators' personality. Therefore, this study recommends the need for more research on the effect of personality on the perceptions of educators' on the age from which learners should be allowed to use ICTs at school, not only for teaching and learning as it is the case for this study, but also for other contexts.

5.6 Conclusion

This chapter used the early childhood education outcomes framework proposed by Moncada (1990) in addition to the conceptual framework of the current study for the analysis of existing literature related to the factors affecting educators' perceptions on the age from which learners should be allowed to use ICTs at school. These early childhood education outcomes are divided into six domains: i) personal outcomes which refer to the ability of a child to take care of himself/herself in terms of health, safety, and personal needs; ii) social outcomes which refer to a child's ability to interact with other people; iii) physical outcomes refer to the ability of a child to fully develop his or her motor skills; iv) cognitive outcomes refer to the ability of a child

to solve problems in various ways; v) aesthetic/creative outcomes refer to a child's ability to enjoy and appreciate aesthetic experiences, and vi) communication outcomes refer to a child's ability to communicate and interpret meanings.

The overwhelming majority of the literature reviewed by this study argue for an introduction of ICTs in schools before learners reach the age of 12 years old (grade 6), compared to the current study which indicates that educators prefer ICTs to be introduced in schools when learners are aged between 12 and 13 years old (grade 6 and grade 7). Moreover, this chapter found that learners' gender (38%), their age group (28%), their frequency of computer usage (11%), and their ethnicity (6%) are the demographic factors that affect most research findings from existing literature on how early ICTs can be introduced in schools, compared to the current study which indicates that educators' subject specialization is the only demographic factor that affects educators' perceptions on the age ICTs can be introduced in schools.

Some of the major research gaps identified from the analysis of the literature reviewed by this study are: none of the reviewed studies is examining how the perceptions of educators on the age from which learners should be allowed to use ICTs at school is affected by educators' perceived personality; and a limited number of studies is examining the perceptions of educators' on the age from which learners should be allowed to use ICTs at school with regards to the effect of such introduction of such ICTs on learners' ability to handle many concepts at a time and to differentiate themselves as individuals.

This chapter ends with some recommendations on the design of eLearning initiatives in schools in order to take advantage of the results of the current study: the implementation of pilot projects on the introduction of ICTs in schools in priority for learners in grade 6 and grade 7; and the need for more research on the effect of personality on the perceptions of educators on the age from which learners should be allowed to use ICTs at school, not only for teaching and learning, as it is the case for this study, but also for other contexts.

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APPENDIXES

LETTER OF INFORMATION AND CONSENT

Dear participant,

I am currently undertaking a research project as part of my studies towards a Master's degree in Technology: Information Technology at the Durban University of Technology. The aim of this study is to determine the factors affecting educators' perceptions on the age from which learners can be allowed to use ICTs at school as an attempt to contribute towards solving the identified problem of the non-definition or non-regulation of age ratings for new forms of ICT devices in schools.

The questionnaire will take approximately 10 – 15 minutes. Participation is voluntary and you are free to withdraw from the study at any time without giving reasons, and without prejudice or any adverse consequences. The information you give will only be used for research purposes and will be aggregated with other responses and only the overall or average information will be used. Your identity will be kept totally confidential. Should you wish to discuss this further to contact me or my supervisors Prof Obono, 031 373 5692 or eyonoobonoSD@dut.ac.za, or the IREC Administrator, Lavisha Deonarian: 032 373 2900 or LavishaD@dut.ac.za

Your assistance will be highly appreciated.

Yours Faithfully,

Oyetade Kayode
0846514453
kayoyetade@gmail.com

QUESTIONNAIRE ON EDUCATORS' PERCEPTIONS ON THE AGE FROM WHICH LEARNERS SHOULD BE ALLOWED TO USE ICTs AT SCHOOL

Dear participant,

This questionnaire will only be used for research purposes and information provided by you will always remain anonymous.

Please tick the box that best describes your answer for each item

A. Demographics

A1.	Gender	Male	☐	Female	☐				
A2.	School Location	Urban	☐	Rural	☐				
A3.	Age Group	Less than 30	30 – 40		41 - 50	Above 50			
		☐	☐		☐	☐			
A4.	Grade (Class)	R – 3	4 - 6		7 - 9	10 -12			
		☐	☐		☐	☐			
A5.	Current Class size	1 -20	21 -40		41 - 60	61 – Above			
		☐	☐		☐	☐			
A6.	Highest Level of Education	Diploma	Bachelors		Honors	Masters			
		☐	☐		☐	☐			
A7.	Subject Specialization	Languages	Mathematics		Science and Technology	Social Science			
		☐	☐		☐	☐			
A8.	Computer Usage	None	Daily		Weekly	Monthly			
		☐	☐		☐	☐			
A9.	Ethnicity	African	Indian		Colored	White	Others		
		☐	☐		☐	☐	☐		
A10.	Teaching Experience (Years)	0 – 5	6 - 10		11 - 15	16 - 20	Above 20		
		☐	☐		☐	☐	☐		

B. SELF ACTUALISED PERSONALITY In my personal and professional life, I am a person:		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
B1	With a clear perception of reality.					
B2	That accepts his/herself, others, and nature.					
B3	That is spontaneous, simple, and natural.					
B4	That dedicates his/her self to a cause.					
B5	That is independent and private.					
B6	That does not prejudge situations.					
B7	That enjoys new experiences.					
B8	That likes socializing.					
B9	With deep interpersonal relationships.					
B10	That is tolerant towards others					

C. FULLY FUNCTIONING PERSONALITY In my personal and professional life, I am a person:		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
C1	That is aware of surrounding experiences.					
C2	That shares positive feelings with others.					
C3	That shares negative feelings with others.					
C4	With no inhibitions					
C5	That trusts his/her behaviour is correct.					
C6	That trusts his/her feelings.					
C7	That insists on his/her freedom.					
C8	That is creative.					
C9	That is spontaneous.					
C10	That strives to grow towards his/her full potential.					

D. HEALTHY PERSONALITY In my personal and professional life, I am a person:		Strongly Disagree	Fairly Disagree	Weakly Agree	Fairly Agree	Strongly Agree
D1	That extends his/her life to the life of others.					
D2	That is compassionate and tolerant towards others.					
D3	That accepts his/her self as it is.					
D4	That considers his/her self as realistic.					
D5	That is fully committed to his/her self-development					
D6	With a sense of humor.					
D7	With a clear understanding of him/herself.					
D8	With a clear philosophy of life.					
D9	That is optimistic.					
D10	With a unique behaviour.					

E. EDUCATORS' PERCEPTIONS ON AGE FROM WHICH LEARNERS CAN BE ALLOWED TO USE ICTs AT SCHOOL The hereby chosen phase is the most suitable for the introduction of ICTs in schools in order to assist learners towards achieving the following child development objectives:		Tertiary Level	Grades 10 - 12	Grades 7 - 9	Grades 4 - 6	Grades R - 3
E1	Handling many concepts at a time.					
E2	Applying logic to classify objects and ideas.					
E3	Analyzing hypotheses using abstract thinking and deductive reasoning.					
E4	Receiving, processing, remembering, and presenting information.					
E5	Developing physical fitness, including during puberty.					
E6	Sharing sensitive information with others.					
E7	Dealing with conflicts and behavioral challenges.					
E8	Dealing with information on moral issues such as sex, abortion, *etc.*					
E9	Differentiating themselves as individuals.					
E10	Auto-assessing their actions.					