

## **Abstract**

The use of various information technologies in education is becoming more prevalent due to the fact that they are thought to have several advantages over traditional pen and paper as well as the fact that they are seen as a means to decrease the digital divide and ensure equal access to educational resources. In South Africa, initiatives such as the Smart Schools program aim to make schools paperless in the near future through the use of smartboards and tablets. With such emphasis on the success of the integration of educational technology it is imperative that we understand the factors which influence this process.

Current research points to the idea that the mere provision of educational technology is not sufficient to garner success and that there are also intrinsic factors which need to be considered when integrating educational technology. This study follows on from this premise of intrinsic factors in that it investigates learner attitudes towards tablet usage in a blended learning environment. An extended version of the Technology Acceptance Model which posits that perceived usefulness, perceived ease of use and perceived enjoyability are the factors which need to be taken into account when exploring learner attitudes is used as the theoretical basis for this study. Other factors which are thought to influence attitudes as well as the success of tablet integration (as measured by learner achievement) are learning style preferences, motivation as well as access to various form of technology and thus familiarity with such technology. These factors were also explored through this research. Access to technology, learning style preference and motivation as predictors of overall attitudes and the three components of attitudes were thus explored. This study further investigated whether attitudes (and the three components of attitudes), learning style preferences or learner motivation best predicted academic achievement.

The sample consisted of 276 learners from one independent and one public school in Johannesburg where tablets had already been introduced into the learning environment. A questionnaire consisting of an Attitudes Towards Tablet Usage Scale, a Learning Styles Scale, a Motivation Scale and an Access Scale was used. The results of this study indicated that overall attitudes towards tablet usage were relatively positive. The most positive component was perceived ease of use followed by perceived usefulness and then perceived enjoyability. Attitudes towards ECT (and the three components) were influenced by learning style preferences, motivation and access to technology while learner achievement was influenced by learner attitudes as well as learning style preferences. This provides valuable insights into the tablet integration process in that we conclude that tablet provision, while necessary, is not sufficient for the successful integration of tablets and subsequent reduction in the digital divide.

*Keywords: digital divide, educational technology, ICT access, learner motivation, learning styles*

## **Chapter 1: Literature Review**

### **1.1 Introduction**

The use of technology in education is becoming increasingly popular. Educational institutions are taking advantage of the developments in educational technology such as interactive smartboards, mobile phones, tablets and the internet to engage learners in different modes of learning. The current direction in the education field has been to introduce tablets into the learning environment. Tablets are perceived to have many advantages over traditional pen and paper learning as well as other forms of educational technology. As a result of the way in which tablets are used, they are able to create a learning environment that is more interactive and collaborative (Enriquez, 2010; Lee, Yoon, & Lee, 2009; Ludwig & Mayrberger, 2012). According to Enriquez (2010) this type of learning environment may prove to be a more effective pedagogy, especially in classes such as Mathematics, Science and Biology which require more problem solving skills.

In a study by Enriquez (2010), tablets were perceived to have many advantages including being helpful in improving performance, increased attentiveness, as well as an improved ability to organise class material. Completion and submission rates for homework assignments were higher in the tablet group when compared to the traditional learning group and the tablet group also had higher attendance rates.

The provision of e-textbooks or digital textbooks is one of the most prominent uses of tablets in education. A tablet can hold hundreds of e-books which eliminates the need to carry heavy text books. There are many other advantages associated with tablets such as cost effectiveness (Liaw & Huang, 2014) as well as speed and convenience which Ludwig and Mayrberger (2012) found

to be the tablet's greatest advantage. Additional benefits include improved organisation of learning materials and access to information (Baki, 2010; Enriquez, 2010; Liaw & Huang, 2014; Ludwig, & Mayrberger, 2012).

As mentioned previously, tablets are thought to be an improvement on the previous use of computers and other educational technology for a number of reasons including the fact that they can simulate the use of pen and paper and the benefits which their wireless technology provide (Enriquez, 2010).

However, it would be remiss not to mention that there are also disadvantages associated with the tablets which include the lack of a USB port making printing difficult and the fact that without internet access the tablets cannot perform the necessary functions which make it beneficial (Ludwig & Mayrberger, 2012). Liaw and Huang (2014) and Baki (2010) also raise the security issues which surround internet access as a disadvantage to technology usage. They also mention headaches and eyestrain from uninterrupted use and the fact that learners need to be proficient in operating the devices before they can be effective.

One way of measuring the success of technology integration is through assessing learner achievement. Hassler, Major and Hennessy (2015) conducted a critical review on current literature regarding tablets and learning outcomes. They found that the majority of studies reported positive learning outcomes (n= 16) while a smaller number of studies reported neutral (n=5) or negative (n=2) learning outcomes. The nature of tablets, such as those mentioned above, appeared to be a relevant factor in this.

From the discussion it is evident that tablet use has the potential to influence learner education but over and above the physical benefits and limitations of using tablets, there are a number of factors, intrinsic to the learners which can influence the success of educational technology integration. There are a large number of studies in current literature which consider external factors such as those mentioned above. Not many however explored the internal factors which have been shown to play a pivotal role. Hence this study considers intrinsic factors which may influence learners' perceptions of tablet usage in a sample of 276 learners in a blended learning environment.

In the literature review to follow, several aspects of technology integration are discussed. First and foremost, the South African context will be discussed and the importance of technology integration and a blended learning environment. Thereafter the importance of learner attitudes towards technology in the integration process will be explored as well as several theoretical frameworks regarding both attitudes and technology. Lastly, various other intrinsic factors which have been linked to attitudes towards technology and/or the success of technology integration (as measured by learner achievement) are discussed. These factors include learning style preferences, and learner motivation.

### **1.1.2 Blended Learning and the South African Education system.**

The digital divide is a concept which has received much attention in recent years. The digital divide is frequently conceptualised as the difference between the 'have's' and the 'have not's' with respect to access to technology (Partridge, 2007). It is thought that initiatives in South Africa such as the smart school project will provide access to educational technology, thus

reducing the digital divide. In addition to this and from the discussion it is evident that tablet use has the potential to influence learner education both by providing access to educational resources as well as improving the learning environment. There are a number of factors however that influence this process over and above simply providing access to the resources and tools.

Partridge (2007) notes that ideas about the digital divide have shifted away from socio-economic factors were the cause of unequal technology use to the individual person and the psychological factors that influence the use of technology.

According to a statement by the Education MEC, Penny Lesufi (Lesufi, 2015) the introduction of increasingly “paperless classrooms” and the resulting combination of technologies will address gaps in teaching quality, learner engagement and school administration. The current Smart School program is the largest project to be undertaken by the Gauteng Department of Education to date and is the cornerstone of transforming the current education system. Blended learning has been on the Department of Education’s (DoE) agenda for some time now in an effort to improve the South African Education system. Provincial projects were developed in 2001 with the purpose of providing schools with access to computers namely; Khanya in the Western Cape and Gauteng On-Line in Gauteng (DoE, 2004). These projects had varying levels of success. In 2004, the DoE released the White Paper on the e-education policy followed by ‘Guidelines for teacher training and professional development in ICT and training’ in 2007 (Vandeyar, 2014). Despite the wealth of policies concerning e-education, the reality at the school level has previously fallen short of policy expectations, and many of the e-education goals were not reached by 2013 (Vandeyar, 2014). There are currently seven schools taking part in the Smart School project with the aim of having 5-10% (100-200) of schools with fully blended learning practices in place by the end of 2019. The GDE has already invested 800 million on the project in the 2015/16 financial year with a projected 2 billion being spent on the project each year. With such emphasis on the integration educational technology it is imperative that we fully understand the factors which influence this process.

The Smart School Project (Mawson, 2015) is one of many initiatives in South Africa which aim to integrate technology into the classroom. Technology can be integrated into the classroom in many different modes. One way of introducing technology into classroom is through the concept of blended learning (De George-Walker & Keeffe, 2010). While the term blended learning has been used frequently in the last twenty years this has resulted in a variety of different meanings emerging and as such it is not a well-defined concept (Alammary, Sheard, & Carbone, 2014). The three most common definitions according to Graham (2014) are ‘combining instructional modalities’, ‘combining instructional methods’ and ‘combining online and face to face instruction’ (p.3). These three definitions broadly refer to the use of technology in conjunction with face-to-face teaching. Technology can refer to a wide range of equipment such as laptops, computers, tablets, interactive whiteboards and tablets. For the purposes of this study, the term blended learning will be used to refer to the use of tablets as e-readers in conjunction with the use of the internet and other online resources in the learning environment.

Torrissi-Steele and Drew (2013) refer to two types of blended learning environments. The first type is a transformative blend while the second type is a minimally impacting blend. The goal of blended learning is to achieve a transformative blend however, in a recent review of the literature, Torissi-Steele and Drew (2013) noted that blended learning is more often used for efficiency and supplementation rather than to enhance the learning experience, thus resulting in a minimally impacting blend. In line with this, many studies have been conducted which assess the effectiveness of blended learning through measuring learner achievement.

According to Lopez-Perez, Perez-Lopez and Rodriguez-Ariza (2011), the internet is used to compliment traditional face-to-face instruction with the hope that the incorporation of this technology leads to more effective and efficient education. They investigated the voluntary use

of online learning activities in Spanish undergraduate learners and found that a higher degree of voluntary learner participation resulted in higher learner achievement.

There is a general perception that the use of e-textbooks as opposed to traditional textbooks is beneficial to learning. The use of tablets as e-textbooks within a blended learning environment allows learners to engage with material at their own pace and also provides a variety of interactive functions that traditional textbooks do not have (Byun, Choi & Song, 2006). The easy availability of mobile devices such as tablets and the convenience of their mobility, coupled with web-based learning portals, and e-textbooks has further fuelled blended learning implementation (Lopez-Perez et al., 2011).

Establishing the links between the use of tablets in blended learning and learner achievement is imperative so that we can make better use of educational technology. Blended learning has been on the Department of Education's (DoE, 2004) agenda for some time now in an effort to improve the South African Education system. The latest technological development within the South African education system is the launch of the Smart Schools program in 2015. The pilot project is currently underway with the aim of replacing chalkboards and textbooks with smartboards and tablets in an effort to go paperless in the next five years (Mawson, 2015). This study will be investigating the use of e-textbooks together with the incorporation of internet to determine whether the use of tablets in a blended learning environment is achieving the success which the South African Department of Education hopes it will. There is evidence to suggest that the success of technology in education relies on more than the mere provision of the technology. Attitudes towards the technology have been shown to have a significant role in the successful integration of various forms of educational technology. The theoretical frameworks which

underpin this claim are examined in the following section as well as studies which have investigated these attitudes.

## **1.2. The Importance of Attitudes with Regards to the Use of Technology in Education**

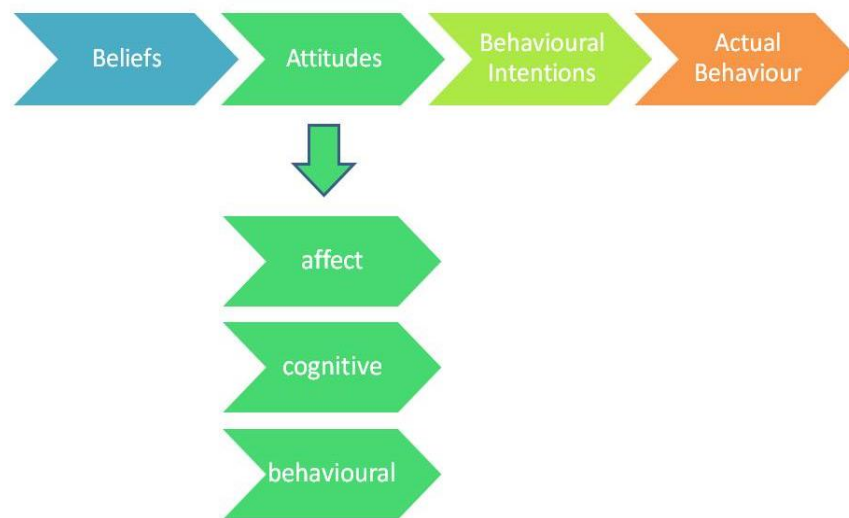
There are numerous models within social psychology which attempt to explain and predict human behaviour. Several of these models have been used with regards to the implementation and integration of technology in an educational setting. These models include the Theory of Planned Behaviour (TPB) the Diffusion of Innovations Theory (DIT) and the Technology Acceptance Model (TAM). All of these theories are based on the intrinsic factors which can affect the integration of technology. These theories are discussed below as well as an extended version of the TAM (eTAM) which incorporates enjoyment as an additional factor which needs to be considered when determining attitudes towards educational technology, or in the case of this study, attitudes towards tablet usage.

### **1.2.1 Theory of planned behaviour**

The Theory of Planned Behaviour (TPB) is a well established theory within social psychology (Ajzen & Fishbein, 2010) which looks at how attitudes are related to behavioural intentions, and it has been used as a theoretical basis in various studies regarding technology integration in schools (Albirini, 2006; Edmunds, Thorpe & Conole, 2012; Teo, 2008).

The Theory of Planned Behaviour operates on the assumption that human behavior is guided by behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs include beliefs

about the consequences of performing an action, as well as other attributes associated with the behaviour. Normative beliefs refer to the expectations of others while control beliefs refer to factors that promote or hinder performance of the action such as ease of use (Ajzen, 1991). In essence, this theory posits that behaviour is influenced by an affective, cognitive and behavioural dimension as illustrated in Figure 1.1.



**Figure 1.1: Ajzen's Theory of Planned Behaviour and the three attitude domains**

According to Ajzen (1991), Attitudes towards a behaviour refers to the degree to which an individual is favourable or unfavourable towards the object or behaviour. Beliefs are the antecedents of attitudes, which are formed by associating an object or behaviour with certain attributes and each belief links the behaviour to a certain outcome. He also states that because these attributes and thus beliefs are already valued positively or negatively, we automatically

have an attitude towards that behaviour. Therefore, it is possible to investigate attitudes by eliciting salient beliefs about the attitude object.

The TPB is included in this literature review as it forms the foundation of many other theories.

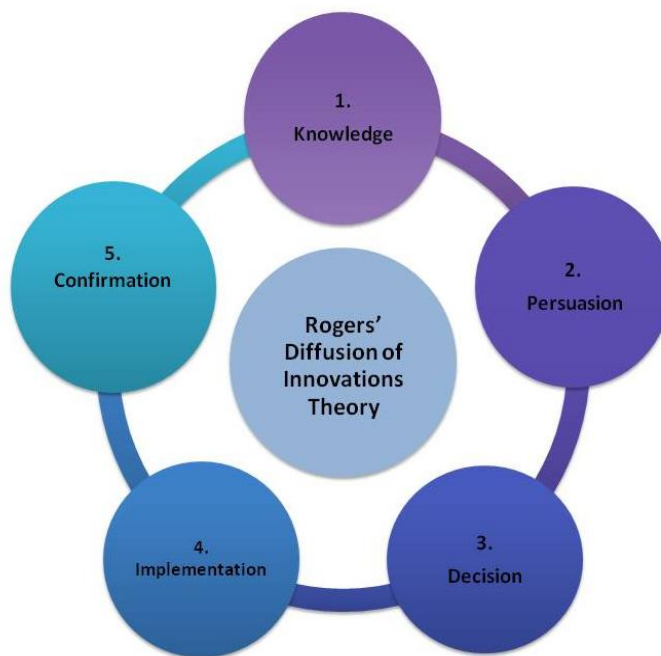
The core aspect of this theory is the idea that attitudes affect behaviour. Various studies have confirmed this theory such as Selwyn (1997) who concluded that computer attitudes were important for initial acceptance and computer behaviour. Hyman, Moser & Segala (2014) reported that learners enjoy using e-textbooks providing they are easy to use, useful and achieve specific learning objectives and that this predicts behavioural intentions to use the technology.

Their study was conducted with 140 Education Master's students at a US university and demonstrates the theoretical foundations of the TPB. Rogers corroborates this belief in the theory which follows, in which the knowledge about an object or behaviour leads to attitude formation and then the rejection or adoption of that behaviour. The Diffusion of Innovations Theory (DIT) (Rogers, 2003) is explored in more detail in the proceeding section. The DIT specifies where attitude formation occurs and which beliefs will influence attitude formation when looking specifically at technology integration.

### **1.2.2 Diffusion of Innovations Theory**

The Diffusion of Innovations Theory is a popular model developed by Rogers (2003) which investigates the factors associated with the adoption of technology. There are several components within Rogers Theory however; the component of the DIT which applies to this area of research is the innovation-decision process. This refers to what happens between the acquisition of first knowledge through to attitude formation and finally decision making. There

are 5 stages in this process which occur over time; Knowledge, Persuasion, Decision, Implementation and Confirmation (Rogers, 2003). These 5 stages are illustrated in Figure 1.2 below.

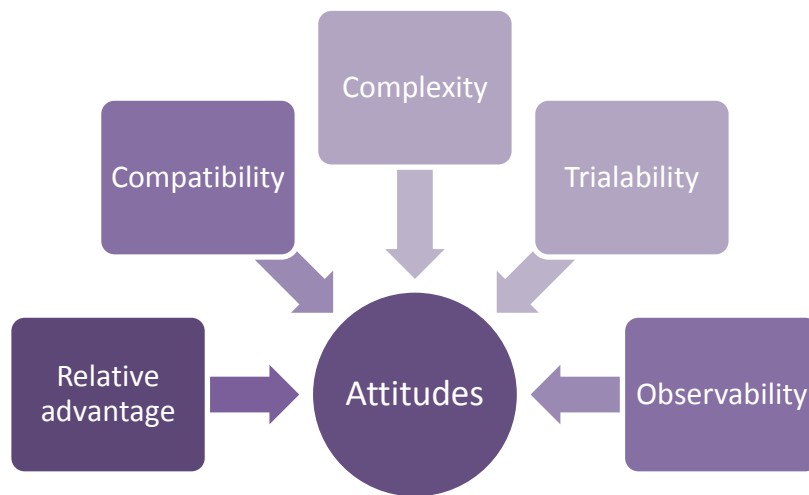


**Figure 1.2:** Roger's Diffusion of Innovations Theory: Stages of the Innovation-Decision Process

The knowledge stage is when an individual gains an understanding of the innovation. There are three components to this: Awareness-knowledge which is the knowledge of an innovations existence. How-to-knowledge, which involves knowing how to use an innovation correctly and finally principals-knowledge. This refers to how and why an innovation works and although an innovation can be adopted without principals-knowledge, misuse of an innovation may lead to discontinuance.

The persuasion stage as seen in Figure 1.3 is when attitude formation occurs based on the expected consequences associated with the innovation. Individuals form their attitudes about an innovation after gaining knowledge about it, thus the persuasion phase follows the knowledge stage in the innovation-decision process. During the persuasion stage, Rogers (2003) argues that it is the perceptions of the characteristics of an innovation which determines people's attitudes namely; relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003).

Relative advantage refers to whether or not the innovation is perceived as superior to what came before it. Compatibility refers to whether or not the innovation is perceived as consistent with the needs of the potential adopter. Another important factor in the diffusion process is Complexity which is defined as the degree to which the innovation is perceived as easy to use or understand. The remaining two attributes to consider are Trialability and Observability. Trialability refers to the degree to which the innovation can be experimented with and Observability which is the degree to which the results of using the innovation are visible to others (Rogers, 2003). It could be argued that learner achievement is thus an indication of Observability. In summary, Rogers (2003) argues that the presence of these attributes and thus the formation of favourable attitudes will affect the rate of adoption of an innovation. According to Rogers (2003), the most important factors to consider when looking at attitude formation are relative advantage and compatibility followed by complexity.



**Figure 1.3: Factors Involved in Attitude Formation during the Persuasion Stage**

The decision stage is the third stage in Rogers' (2003) innovation-decision process. This is where an individual makes a decision about whether to reject or adopt the innovation. Next, the implementation stage occurs when the innovation is used. Uncertainty regarding the outcomes of an innovation can still be problematic at this stage and thus it may be necessary to receive technical assistance. It is also in this stage where reinvention of an innovation occurs where adopters change or modify the innovation in the process of decision and implementation. Lastly, the confirmation stage is when an individual looks to reinforce the decision that has been made with regards to the innovation. If reinforcement is not apparent, the decision can be reversed (Rogers, 2003).

### **1.2.3 Technology acceptance model**

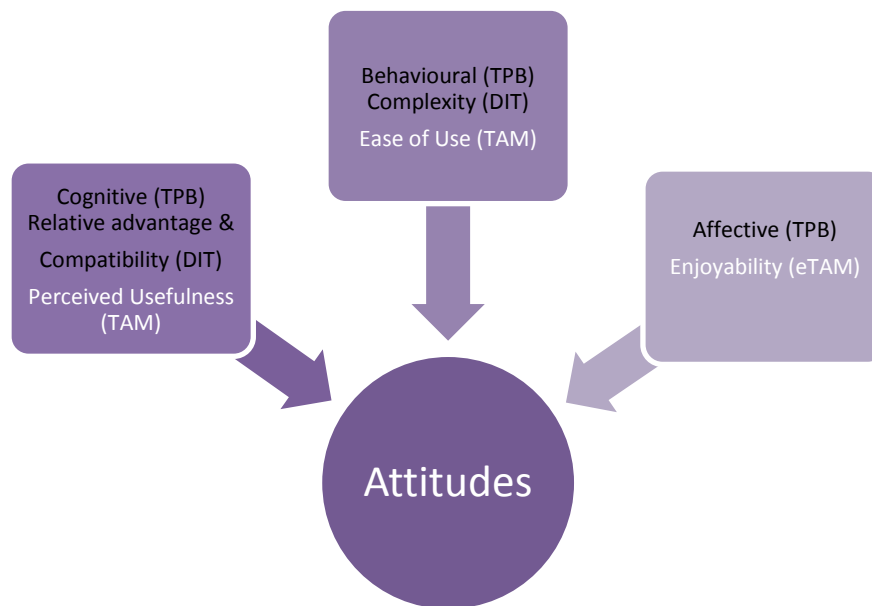
Davis (1989) developed the Technology Acceptance Model, like many others, drawing on the TPB. In fact, the TAM uses TPB as a theoretical framework to explain the antecedents of

behavioural intentions which in turn determines actual use. The initial TAM consisted of two factors, Perceived Usefulness (PU) and Perceived Ease of Use (PEU). PU is defined as the degree to which the technology will improve performance while PEU refers to how much effort is required for the use of such technology. According to this theory, as with the TPB, attitudes are formed from beliefs. So beliefs about PU and PEU are factors which influence attitude formation.

The TAM also compliments the above mentioned DIT. As mentioned previously, the aspects which should be considered in terms of attitude formation in the DIT are relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). The most salient factors to consider when looking at attitude formation are relative advantage and compatibility followed by complexity (Rogers, 2003). These concepts map well onto the TAM in the following way: relative advantage and compatibility can be regarded as components of Perceived Usefulness while complexity can be used interchangeably with Perceived Ease of Use.

According to Ajzen and Fishbein (2010), attitudes consist of an affective, cognitive and behavioural dimension. The TAM considers only the cognitive (perceived usefulness) and behavioural (perceived ease of use) dimensions. While these factors explain some of the variance in people's attitudes, they do not explain all the variance and thus other factors should also be investigated (Thatcher & Ndabeni, 2014). Thus it is not surprising that many researchers have subsequently added another dimension to the TAM.

Venkatesh, Thong and Xu (2012), are among the researchers who propose the addition of various other variables to the TAM. Among them is hedonic motivation – the fun or pleasure derived from using technology and this then encompasses the affective component in Ajzen’s theory (Ajzen and Fishbein, 2010). Other studies which incorporate hedonic motivation otherwise referred to as enjoyability or perceived enjoyment include Sledgianowski and Kulviwat (2008), Hu, Poston and Kettinger (2011) and Ernst, Pfeiffer and Rothlauf (2013). This model, as seen in Figure 1.4, is referred to as the Extended Technology Acceptance Model or eTAM.



**Figure 1.4: Extended Technology Acceptance Model and the overlap with Rogers' DIT and Ajzen's TPB**

The TPB and DIT were discussed in order to explain the causal links between attitudes and behaviour and to investigate the theories that have influenced the development of the TAM and

the extension of this theory. This study will follow on from previous research in incorporating perceived enjoyability (PEN) into the theoretical framework alongside PU, and PEU.

The majority of the research in this field has been conducted on learners in a university setting, and again, a large portion of these studies have been conducted internationally rather than in a South African context. This highlights the need for more research to be conducted in a sample of school learners as this is the area where the Department of Education is focusing their integration projects at this time. General trends in a global university sample indicate that attitudes towards educational technology in these settings are positive and there is substantial support for the TAM. Several of these studies are discussed below.

Cheung and Vogel (2013) conducted research on the use of Google applications in a blended learning environment. The sample consisted of 136 learners at a Hong Kong University. The results of their study indicate that the determinants of the TAM – perceived ease of use and perceived usefulness, are the most important factors influencing the adoption of technology.

The findings from this study suggest that perceived usefulness and perceived ease of use predict learner attitudes, and that perceived ease of use predicts perceived usefulness. They also note that compatibility (a component of perceived usefulness) has a significant effect on learner attitudes.

In another study, as per the TAM, ease of use and perceived usefulness were found to be important measures for learner attitudes toward educational technology implementation (Edmunds et al., 2012).

Lee et al. (2009) conducted a study on college students in South Korea focusing on learner attitudes towards e-learning and found that intentions to use e-learning were predicted by

perceived usefulness and playfulness (the entertainment value of lessons), while ease of use was found to predict perceived usefulness.

Liaw and Huang (2014; 2015) provide further evidence that supports the TAM. They found that learner characteristics such as self-efficacy and self-regulation were predictors of perceived usefulness of e-textbooks. Furthermore they found that perceived usefulness also predicted behavioural intentions to use e-textbooks among 554 university students (Liaw & Huang, 2014). A further study conducted by Liaw and Huang (2015) conducted with 159 learners at a Taiwan University who had been exposed to a blended learning environment for one month confirmed these findings. Again, personal factors were found to predict perceived usefulness and ease of use which in turn predicted attitudes towards blended learning.

Another study which was conducted much more recently, and also in South Africa, explored learner attitudes towards using WhatsApp for academic purposes (Bere, 2013). The study took place at a University in the Free State where 157 learners participated. The results suggest that convenience, ease of use and perceived usefulness are the important factors to consider when examining learner attitudes. Perceived ease of use was found to predict perceived convenience which in turn influenced attitudes. Perceived usefulness also influenced attitudes and they found that behavioural intentions lead to the use of Watsapp for academic purposes, offering support for the TAM in a South African context.

The above mentioned studies have based their research on the traditional TAM (Davis 1989). The following studies have explored the addition of various elements to the TAM. Manochehri and Sharif (2010) conducted research at a university in Qatar which had recently introduced ICT in the learning environment. They used the TAM as a theoretical framework and found that ease

of use positively affects learner attitudes towards ICT as does the perceived usefulness of ICT's, furthermore; the ability to control and manage their own learning had a positive effect on learner attitudes. They also found that previous experience or access to ICT does not influence attitudes towards ICT or the uptake of this technology and that interest and motivation were a fundamental condition for learning rather than experience in a blended learning environment.

Some of the above mentioned studies highlight the need to address personal factors which may influence learner attitudes towards tablets in a blended learning environment. One of the additional personal factors which will be addressed in this study is motivation; this is discussed in more detail in the proceeding section.

### **1.3 Motivation and Educational Technology**

There are numerous theories which aim to explain motivation, one of the most well know is a theory proposed by Ryan and Deci (2000) – the Self-Determination theory (SDT). The SDT first proposed two distinct types of motivation. Firstly intrinsic motivation is seen as something which is inherently interesting or enjoyable, while extrinsic motivation is seen as something which is influenced by external outcomes. In a review of the SDT, Ryan and Deci (2000) proposed that extrinsic motivation consists of two separate types of motivation. The first type is what is traditionally referred to as extrinsic motivation – an external motivating force while the second type of extrinsic motivation occurs when external outcomes become self-endorsed. According to Ryan and Deci (2000) this second type of extrinsic motivation is of vital importance in education more so than intrinsic motivation as previously thought. This is because educational material is seldom inherently interesting or enjoyable i.e. intrinsically motivating. Self-endorsed extrinsic motivation on the other hand such as being motivated to achieve good results in order to get a

good job one day (as opposed to achieving good results for purely external reward such as passing). Thus, if students value and self-regulate activities they are more likely to be motivated – that is, have self-endorsed extrinsic motivation. Eales, Hall and Bannon (2002) distinguish between two forms of motivation, much like the SDT. The two forms in this theory are referred to as authentic (self-endorsed) and inauthentic (external motivation). They also note the importance of learners being in control of learning and motivation, thus they claim that the use of tablets and the resulting perceived control learners have when learning with tablets is a motivational factor. Jones et al. (2006), also claim that mobile devices provide a strong sense of control which is an important motivational factor.

Passey and Rogers (2003) investigated the effects of ET use on motivation and they found that the use of ET results in more motivation related to a commitment to learning than to complete tasks get good marks. One could thus argue that ET use increases the second type of extrinsic motivation (self-endorsed) more so than the first type (external). They also found that ET increased intrinsic motivation and thus ET use is motivating in its own right as something which is inherently interesting and enjoyable. Crook (2000) mentions that collaborative learning, as a result of the use of ET in the classroom is motivating because working with others can be motivational. Tuzun et al. (2009) reported higher intrinsic motivation and lowered extrinsic motivation in learners who learned geography in a game based learning environment which they attributed to the game enabling learners to explore, interact and collaborate thus increasing their autonomy. Sucaromana (2013) compared learners who were in a blended learning environment and those who received face-to-face instruction among university students taking English as a foreign language. The results showed increased intrinsic motivation, and greater satisfaction with the learning environment when taught in a blended learning environment.

Numerous other studies have also identified autonomy and the transfer of control from teacher to learner as factors increasing intrinsic motivation in learners (Blatchford et al., 2003; Lawlor, Marshall & Tangney, 2015). Lockton (2012) also found that there was a statistically significant relationship between iPad use and motivation. While Rockman & Walker (1997) found that learner motivation and learner attitudes became more positive after the introduction of a laptop integration program.

Interestingly, Lim, Morris and Kupritz (2014) also mention the fact that learners who lack self motivation have a limited ability to benefit from blended learning environments. One of the aims of this study was to investigate whether motivation (that could theoretically be increased due to the use of tablets) also had the ability to influence learner attitudes towards tablet use. Thus, this study postulates that if relationships between tablets and attitudes are found, the use of tablets in a way which fosters motivation through above mentioned modes, could improve learner attitudes towards tablet usage and thereby tablet integration would be more successful. Following on from this, motivation, has been found to predict academic achievement and control for the effects of intelligence (Chamorro-Premuzic & Arteche, 2008) thus, the influence that motivation has on learner achievement will also be explored alongside the relationship between attitudes towards tablet usage and learner achievement.

Another personal factor which has been identified in the literature regarding the integration of educational technology is that of learning style preferences. In the following section, learning styles are explored in more detail.

## **1.4 Learning Styles and Educational Technology**

Fishbein and Ajzen (1975) refer to a category called ‘external variables’. This category potentially includes variables such as personality type, cognitive styles, and cultural/political factors to name a few. Thus it can be argued that learning styles fits into this category of ‘external variables’ and thus is a factor worthy of investigation when considering technology integration, especially in an educational environment where learning styles have been shown to play a role.

Learning styles and the definition of such is a matter of considerable debate due to the large number of theories and methods of classification (Grasha, 1996). According to Keefe and Monks (1986) a learning style is a relatively stable indicator of the way learners perceive and interact with information and Grasha (1996, p.41) defines learning styles as “personal qualities that influence a student’s ability to acquire information, to interact with peers and the teacher, and otherwise participate in the learning experience”.

The two learning style scales which are drawn from in this study are the Grasha-Riechmann scale and the VARK (Visual, Auditory, Read/Write, and Kinaesthetic) learning style scale, each of which will be discussed below. The Grasha-Riechmann learning style scale (GRLSS) is based on a model that describes learning styles in terms of how learners respond in the classroom rather than the measurement of cognitive or personality traits. Learning styles are divided into six categories according to this model, Independent, Dependent, Avoidant, Participant, Collaborative and Competitive (Grasha & Riechmann, 1974). This study makes use of two of these categories; collaborative and competitive which are thought to be the most important aspects to consider in a blended learning environment. The second scale used in this study is the VARK learning styles

scale which aims to provide information about the method in which learners prefer to receive information. The four dimensions of the VARK are Visual, Auditory, Read/Write and Kinaesthetic, as proposed by Fleming and Mills (1992). Visual learners prefer learning with the aid of pictures, videos, colour and diagrams etc. Auditory learners prefer discussions, verbal explanations and stories and jokes. Read/Write learners prefer using lists, headings, notes and textbooks to learn and kinaesthetic learners like concrete examples, case studies, experiments, active movement and field trips (Fleming, 2006).

All learners according to Felder and Spurlin (2005) have a preference and strength towards a certain method of learning. Pruet, Ang and Farzin (2014) conducted a study in the rural areas of Thailand. Their findings suggest that learners with auditory and competitive learning style preferences had more positive attitudes toward tablets as they appreciated time for tablet use while auditory, visual and competitive learners reported high levels of computer anxiety. They also found that collaborative learning styles predicted higher learner achievement. Hassan (2009) on the other hand found that learning style preferences (using the VARK) were not related to attitudes towards learning with technology as was predicted.

Grasha and Hicks (2000) also found that learning style preferences were associated with student performance in a blended learning environment. In South Africa, Koorsse, Cilliers and Calitz (2010) assessed both learning styles (using the VARK questionnaire) and motivation of learners taking IT (information technology) as a subject. A preference for auditory learning was associated with higher marks, followed by a preference for visual learning.

Research on learning styles in blended learning environments is increasing and it can provide valuable insight into the design of such courses and how they would best suit individuals with

different learning styles (Graf, Viola, Kinshuk & Leo, 2007). Effectively matching learning style preferences to methods of instruction has been linked to achievement by numerous researchers (Felder & Spurlin, 2005; Peacock, 2001). While Cobcroft Towers and Smith (2006), also note that blended learning offers a unique opportunity to increase learner engagement due to the fact that different types of learning styles intersect. This study aims to investigate the relationship between learning styles and learner attitudes towards tablet usage as well as the relationship between learning styles and learner achievement. A more detailed discussion of learner achievement follows below.

### **1.5 Academic Achievement and Educational Technology**

Academic achievement is defined as the extent to which a person has accomplished certain goals (Steinmeyer, Miessner, Weidinger & Wirthwein, 2014) In South Africa, academic achievement has been attributed to many external factors such as socio-economic status, attendance and English proficiency, as well as internal factors such as locus of control, and self discipline (Fraser & Killen, 2003; Howie, 2003). According to Grolund (1998), the main goal of assessing learner achievement (also referred to as academic achievement in this study) is to improve learning. It is the aim of this study to assess achievement, and some of the internal factors which are thought to influence it in blended learning environments, in order to gain insight into how to improve learner achievement. In this study, learner achievement will be assessed by looking at the learners' average midyear marks.

Previous studies which have looked at learner achievement in conjunction with the use of educational technology include Hsu and Hsieh (2011) who examined the factors associated with learning outcomes in a blended learning environment among nursing students in Taiwan. They

found that the frequency of online dialogue, time spent on the internet and most importantly, attitudes towards blended learning were predictors of learner achievement.

Lopez-Perez et al. (2011) conducted a study in Granada, looking at blended learning and academic achievement. 1431 students took part in the study and the results indicated that the use of blended learning reduced dropout rates and increased exam marks. They also found that perceptions of blended learning, i.e. their attitudes towards it were related to their achievement. In another study, Mahmoudi, Samad, Zainab and Razak (2012) also found that attitudes and performance were positively related.

In a review of the literature Torissi-Steele and Drew (2011) found many articles pertaining to the effectiveness of blended learning. They note that learner performance/ achievement is most commonly measured by means of assessing test scores. The results of their literature search indicate that while some studies reported no difference between blended learning at traditional learning the majority of studies reported increased performance and motivation. However, they also draw attention to the fact that the reasons for the effectiveness of blended learning were seldom explored.

## **1.6 Conclusion**

It is evident that blended learning is an important aspect in education today. It is therefore necessary to investigate which factors influence the integration of technology such as learner attitudes and which factors in turn influence attitudes towards tablet usage. An extended version of the TAM which incorporates PU, PEU and PEN as the factors which influence learners' attitudes is used as the theoretical basis of this study. This study hypothesises that attitudes

result from beliefs about PU and PEU as well as PEN. This study also investigates learner motivation and learning style preference which are thought to have a relationship with learner attitudes towards tablet. Furthermore, these factors (learning styles, motivation and attitudes) are explored in relation to learner achievement.

This research adds to a growing body of research internationally which considers psychological factors associated with the use of tablets, as well as contributing to research regarding tablet integration in schools in South Africa. As mentioned in the literature review, studies pertaining to attitudes towards tablets that have been conducted in a school sample rather than a university sample are hard to come by, highlighting a need for more research in to be conducted in this area.

## **Chapter 2: Methods**

### **2.1 Introduction**

The general aims of this study were to investigate learner attitudes, furthermore, accesses to technology, learning style preference and motivation as predictors were also explored as well as which of these factors best predicted academic achievement. In the chapter that follows, the methodological aspects of the study are addressed. What was hoped to be achieved in this study and the rationale behind it are discussed. Thereafter the specific research questions and hypotheses are stated. A breakdown of the sample is provided and the research design is outlined and a rationale for a correlational design is provided. A large portion of this chapter focuses on the subscales used - the demographics, attitude, learning style and motivation scales respectively. Lastly the procedure, ethical considerations and data analysis are described.

### **2.2 Aims**

The aim of this study was to investigate whether learner's attitudes towards tablets were positive or negative. The three components of learner attitudes, as indicated in the expanded Technology Acceptance Model were also explored. These components are: perceived enjoyability, perceived ease of use and perceived usefulness. Furthermore, access to technology, learning style preference and motivation as predictors of overall attitudes and the three components of attitudes were also explored. This study further investigated whether attitudes (and the three components of attitudes), learning style preferences or learner motivation best predicted academic achievement.

## 2.3 Rationale

There is currently very little research on attitudes towards educational technology as well as motivation and learning styles in a South African context. To date the one study has been conducted which looked at how different teaching and learning styles may negatively affect the relationship between teachers and their learners (Dreyer, 1998) and another which addressed learning styles and motivation in South African learners (Koorse, Cilliers & Calitz, 2010). Bovee, Voogt and Meelisen (2007) studied attitudes towards technology in a South African School however no studies pertaining to learning styles in relation to technology implementation in schools in South Africa have yet been found. This research will be beneficial to curriculum designers who are attempting to integrate technology into everyday teaching by ensuring that the curriculum is suited to individuals with different learning style preferences as well as ensuring that issues relating to attitudes are addressed before implementing the technology. This study also adds to a growing body of research internationally that is now considering the personal factors associated with educational technology (ET) use as well as contributing significantly to research regarding ET implementation in South Africa, particularly within South African schools where there is a marked increase in ET use for teaching and learning.

Technology is becoming a valuable tool in the classroom; however, in order to fully benefit from the use of this technology, it needs to be used correctly and with a proper understanding of the teaching-learning process. In order for this to happen a number of factors need to be considered, especially intrinsic factors. One of the primary factors is learner attitudes. Hence this study primarily explored learner attitudes towards using tablets in a blended learning environment as well as learning styles and motivation as well as learner achievement in relation to these constructs. The specific research questions are outlined below.

## **2.4 Research Questions**

1. What is the level of access to tablets and other forms of technology for the sample?
2. What are learner attitudes towards the use of- tablets?
3. What are the factors which influence overall attitudes towards tablet usage?
  - 3.1. What are the factors which influence perceived enjoyability, perceived ease of use and perceived importance of using tablets?
4. To what extent do overall attitudes towards tablet usage, learning style preferences, motivation and access predict academic achievement?
  - 4.1. To what extent do perceived enjoyability, perceived ease of use, perceived importance, learning style preferences, access and motivation predict academic achievement?
5. To what extent do overall attitudes, learning style preferences, access and motivation predict learners' desire to continue using tablets in a blended learning environment?
6. What are learners' reasons for wanting to continue/discontinue using tablets in a blended learning environment?

## **2.5 Hypotheses**

*H1*: Learners in the sample will have high levels of access to tablets and other technology.

*H2*: learner attitudes towards the use of tablets will be positive.

*H3:* Overall attitudes towards tablet use will be influenced by motivation and learning style preference. Access will not have as great of an influence.

*H3.1:* The perceived enjoyability, ease of use and importance associated with tablet use will be influenced most by learning style and motivation. Access will not have as great of an influence.

*H4:* Academic achievement will be influenced by overall attitudes towards tablet use, motivation, learning style preferences and access to tablets and other technology.

*H5:* Overall attitudes will be the strongest determiner of learners' desire to continue using tablets.

## **2.6 Sample**

The sample in this study consisted of learners from two schools in the Johannesburg area. Learners from one independent high school and one public high school were sampled. Schools and learners were asked to participate voluntarily. Thus non-probability convenience sampling was used. The sample, as evidenced in Table 2.1, consisted of 276 learners from grade 8 to 12 who were currently using tablets in the classroom. The majority of the sample were from the independent school (n=179, insert 64.9%). In the independent school, 62% of learners in the sample were female. Most of the learners were from grade 8 (25.3% and grade 9 (25.3%) followed by grade 12 (17.2%) and then grades 9 and 10 (16.1% respectively). Ages ranged from 12 to 20 years of age.

Eighty-six learners from the public school participated in the study, 55.8% of the learners in the sample were female and 41.9% were male. All of the learners from the public school were in grade 11 and their ages ranged from 16 to 18 years of age.

Table 2.1: *Gender, Grade and Age Distribution of the Sample*

| Variable | Level  | Independent |      | Public    |      |
|----------|--------|-------------|------|-----------|------|
|          |        | Frequency   | %    | Frequency | %    |
| Gender   | Male   | 71          | 37.6 | 36        | 41.9 |
|          | Female | 118         | 62.4 | 48        | 55.8 |
| Grade    | 8      | 47          | 25.3 | 0         | 0    |
|          | 9      | 30          | 16.1 | 0         | 0    |
|          | 10     | 30          | 16.1 | 0         | 0    |
|          | 11     | 47          | 25.3 | 86        | 100  |
|          | 12     | 32          | 17.2 | 0         | 0    |
|          | 12     | 1           | .5   | 0         | 0    |
|          | 13     | 19          | 10.3 | 0         | 0    |
| Age      | 14     | 28          | 15.2 | 0         | 0    |
|          | 15     | 38          | 20.7 | 0         | 0    |
|          | 16     | 33          | 17.9 | 22        | 25.6 |
|          | 17     | 36          | 19.6 | 43        | 50.0 |
|          | 18     | 24          | 13.0 | 19        | 22.1 |
|          | 19     | 4           | 2.2  | 0         | 0    |
|          | 20     | 1           | 0.5  | 0         | 0    |

## **2.7 Research Design**

This study was quantitative in nature. The questionnaires were completed at one point in time; hence the study was cross-sectional (Stangor, 2011). There was no manipulation of variables or the presence of a control group; as such the study adopted a non-experimental design (Stangor, 2011). The study considered questions regarding the relationships between learner's attitudes towards using tablets, learning styles, motivation, access to technology and academic achievement; therefore it is a correlational design (Stangor, 2011). This design was suited to the study as it is usually used in contexts where little research has been conducted on the topic. Correlational designs are also used when it is necessary to determine trends in the field and thus aid intervention (Babbie & Mouton, 2012). Furthermore, correlational designs are often used to predict values on an outcome variable where clear causal paths are not present (Gravetter & Forzano, 2015).

## **2.8 Instruments**

One questionnaire consisting of four sections was used for the purpose of this study. The four sections were: demographics, learning styles, attitudes and motivation. The questionnaire concluded with a single open ended question asking learners whether they would like to continue using tablets at school and their reasons for this. The questionnaire took approximately 40-45 minutes to complete. Each section of the questionnaire is described below.

### ***Demographics***

The demographics section requested information on age, gender, grade and access and usage of tablets and other technology. Access to tablets and internet at home and school were measured by 12 closed-ended questions in a Yes/No format. An open ended question, “How do you use the tablet/iPad?” was also asked to explore how learners were using the tablets at their school. This section was adapted from Pruet et al. (2014), however no information regarding the reliability of the scale was provided by Pruet et al (2014). Cronbach’s alpha was calculated to determine internal consistency reliability for the access scale in this study and was found to be 0.6.

### ***Learning styles***

As no reliability and validity results were available for either of the learning style scales, a pilot study was deemed necessary. The pilot study was conducted on approximately 30 learners in grades 6 to 12. Given that the questionnaire differed from the final questionnaire used in this study; results from the pilot study were not included in the dataset. Two learning style instruments were piloted. The VARK Learning Style Scale (Fleming, 2014) and the learning style scale used in a study by Pruet et.al. (2014) were used in the pilot study.

The VARK Learning Styles Scale aims to provide information about the method in which learners prefer to receive information. The four dimensions of the VARK are visual, aural, read/write and kinaesthetic, as proposed by Fleming (2014). The scale consisted of 16 hypothetical situations whereby one had to choose the preferred option for dealing with the situation. Each of the four options represents one of the dimensions; answers are summed to produce a total score for each of the dimensions. The scale used by Pruet et al. (2014) is a

composite scale consisting of some items from the VARK learning styles test and the collaborative and competitive items from the Grasha-Riechmann learning style scale (Grasha & Reichmann, 1974). The scale was also adapted for use with young learners. Individuals received a score for each of the following dimensions Visual, Kinaesthetic, Auditory, Collaborative and Competitive learning style preferences. Following the outcome of this pilot study the learning style scale developed by Pruet et al. (2014) was found to be the more appropriate learning style scale as it was easier for the learners to understand. Items were scored on a 5 point likert scale ranging from 1(Strongly Disagree) to 5 (Strongly Agree).

Based on reliability analyses and a principal components analysis with a varimax rotation, several items from the scale were removed. Items 4 (I like note taking while I'm studying) from the Kinesthetic subscale and 25 (When I get home from school I practice what I learned that day) from the Competitive subscale were removed due to poor reliability. Items 8 (I like listening to music or songs) and 9 (I can remember my friends from their voices) from the Auditory subscale, 14 (I can remember people's faces) and 15 (I can do it if my teacher shows me how to do it) from the Visual subscale were removed because they did not load on any factor. Lastly item 21 (If I practice more, I will get a good mark) was removed from the competitive subscale because it was cross-loading. The final learning style scale appears in Table 2.2 along with the factor loadings.

**Table 2.2: Items from the Learning Styles Scale and the Factor Loadings of Each Item**

| Item                                                       | Component   |             |             |             |             |
|------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|
|                                                            | 1           | 2           | 3           | 4           | 5           |
| <b>Kinesthetic</b>                                         |             |             |             |             |             |
| I like sitting still in the classroom (R)                  | .082        | -.168       | -.147       | <b>.673</b> | -.202       |
| I like to use my hands to describe things                  | -.080       | .037        | .188        | <b>.600</b> | .112        |
| I like to walk around when I'm working                     | .248        | -.056       | -.092       | <b>.596</b> | .108        |
| I like to act and do drama                                 | .032        | .453        | .193        | <b>.511</b> | -.116       |
| <b>Auditory</b>                                            |             |             |             |             |             |
| I remember when listening to the teacher                   | .098        | <b>.788</b> | -.098       | -.212       | .038        |
| I remember better when listening                           | .088        | <b>.777</b> | -.009       | .050        | .059        |
| <b>Visual</b>                                              |             |             |             |             |             |
| I like looking at maps and pictures                        | .091        | .007        | <b>.621</b> | .095        | -.004       |
| I remember something better if I write it down             | .001        | -.242       | <b>.741</b> | -.119       | -.075       |
| I like to doodle and make notes when I learn something new | -.003       | .145        | <b>.729</b> | .034        | .149        |
| <b>Collaborative</b>                                       |             |             |             |             |             |
| I like group study                                         | <b>.630</b> | .376        | .031        | -.008       | .157        |
| I like to share my ideas with my friends                   | <b>.662</b> | .256        | .118        | .017        | .236        |
| I like to work alone (R)                                   | <b>.662</b> | .178        | -.115       | .010        | -.145       |
| I know more when I talk to my friends                      | <b>.608</b> | -.122       | .035        | .330        | -.099       |
| My friends ideas are useful                                | <b>.723</b> | -.158       | .103        | .036        | -.004       |
| <b>Competitive</b>                                         |             |             |             |             |             |
| I want to win when I compete with my friends               | -.089       | -.037       | .016        | -.009       | <b>.808</b> |
| I like competitive class activity                          | .133        | .118        | .043        | .011        | <b>.833</b> |
| <b>% of Variance Explained</b>                             | 17.3%       | 11.8%       | 10.6%       | 8.1%        | 8.0%        |

The Cronbach's internal consistency reliability values for the resulting scales were as follows: the Kinesthetic subscale had a Cronbach's alpha of 0.434, the Auditory subscale had a Cronbach's alpha of 0.691, the Visual subscale had a Cronbach's alpha of 0.500, the Collaborative subscale had a Cronbach's alpha of 0.689 and the competitive subscale had a Cronbach's alpha of 0.620.

The learning style scales were all normally distributed. The kinaesthetic subscale was normally distributed with a skewness co-efficient of 0.024 and a kurtosis value of -0.281. The auditory subscale was normally distributed with a skewness co-efficient of -0.130 and a kurtosis value of -0.006. The visual subscale was also normally distributed with a skewness co-efficient of -0.424 and kurtosis value of 0.215. The collaborative subscale was normally distributed with a skewness co-efficient of -0.136 and a kurtosis value of -0.725. Lastly the competitive subscale was also normally distributed with a skewness co-efficient of -0.486 and a kurtosis value of -0.339.

### ***Attitudes Towards Tablet Usage Scale***

The Attitudes Towards Tablet Usage Scale was adapted from two scales, namely the Computer Attitude Questionnaire (Kenezek & Christensen, 1996) and the Computer Attitude Measure for Young Students (Teo & Noyes, 2008). This was done due to the fact that there were many different attitude scales which had many overlapping items however, no one scale covered all the theoretical components corresponding to the TPB, DIF, TAM and eTAM. Upon examination of the scales, the appropriate items were selected based on the theoretical underpinnings of this study and the eTAM. Thus, items pertaining to perceived enjoyability, perceived usefulness and perceived ease of use were selected.

The attitude scale which was developed consisted of 23 likert-type questions ranging from 1(Strongly Disagree) to 5 (Strongly Agree). This scale was then tested in a pilot study as previously mentioned. Based on comments from the learners, some of the items in the attitude scale were re-worded or deleted. “I am tired of using the tablet/iPad was changed to Using the tablet/iPad is exciting”. “I enjoy lessons on the table/iPad” was changed to “I enjoy lessons/studying on the tablet/iPad”. The word hinder in “Using tablets/iPads will hinder future generations from learning their traditions’ was changed to stop. The word diminish in ‘Working with tablets/iPads will diminish peoples relationships with one another’ was changed to decrease. Reliability of the scale was measured using Cronbach’s alpha and was found to be 0.817 for the overall attitude scale.

In the current study, a principal component analysis with a promax rotation was conducted to assess the construct validity of the scale as evidenced in Table 2.3. The final Attitudes Towards Tablet Usage Scale consisted of the three original subscales; Perceived Enjoyability, Perceived Ease of Use and Perceived Usefulness. However, some items were removed or re-arranged based on the various loadings, the reliability of the scales as well as an actual examination of items and the possible subscales they could represent. Internal consistency reliability coefficients were calculated for each of the resulting subscales using Cronbach’s alpha and the results are as follows; the Perceived Enjoyability subscale consisted of 5 items and had a Cronbach’s reliability co-efficient of 0.814. The Perceived Ease of Use subscale consisted of 6 items and had a Cronbach’s reliability co-efficient of 0.829. Perceived Usefulness consisted of 3 items and had a Cronbach’s reliability co-efficient of 0.689.

**Table 2.3: Items from the Attitudes Towards Tablet Usage Scale and the Factor Loadings of Each Item**

| Item                                                                          | Component    |              |              |
|-------------------------------------------------------------------------------|--------------|--------------|--------------|
|                                                                               | 1            | 2            | 3            |
| <b>Perceived Enjoyability</b>                                                 |              |              |              |
| I enjoy doing things on a tablet/iPad                                         | -.143        | <b>.921</b>  | .008         |
| Using the tablet/iPads is exciting.                                           | -.067        | <b>.882</b>  | -.035        |
| Lessons/studying on the tablet/iPad is fun.                                   | .406         | <b>.480</b>  | .002         |
| I concentrate well when I use a tablet/iPad.                                  | .261         | <b>.515</b>  | .104         |
| I feel that I am in control when I use a tablet/iPad.                         | -.035        | <b>.673</b>  | .062         |
| <b>Perceived Ease of Use</b>                                                  |              |              |              |
| The tablet/iPad is easy to use for schoolwork.                                | <b>.737</b>  | .127         | -.100        |
| I use the tablet/iPad to help me to do my schoolwork.                         | <b>.765</b>  | .024         | -.048        |
| It does not take up much time for me to find things on the tablet/iPad.       | <b>.790</b>  | -.305        | .080         |
| I like to do assignments that allow me to use the tablet/iPad.                | <b>.698</b>  | .206         | -.096        |
| The tablet/iPad allows me to do my work faster.                               | <b>.844</b>  | -.034        | -.040        |
| I know that tablet/iPads give me opportunities to learn many things.          | <b>.501</b>  | -.045        | .334         |
| <b>Perceived Usefulness</b>                                                   |              |              |              |
| I believe that it is very important for me to learn how to use a tablet/iPad. | .258         | -.014        | <b>.591</b>  |
| I will be able to get a good job if I learn how to use a tablet/iPad.         | -.135        | .113         | <b>.843</b>  |
| Knowing how to use a tablet/iPad is important for university.                 | -.071        | -.026        | <b>.837</b>  |
| <b>% of Variance Explained</b>                                                | <b>38.7%</b> | <b>10.8%</b> | <b>10.0%</b> |

## ***Motivation***

The Motivation Scale was adapted from a subscale of the Computer Attitude Questionnaire by Knezek and Christensen (1996). It consists of 8 likert-type questions ranging from 1(Strongly Disagree)-5 (Strongly Agree). Items 24-31 in the questionnaire measured learner motivation i.e. “I study by myself without anyone forcing me to study” and “I enjoy working on a difficult problem”. The Motivation Subscale in the Computer Attitude Questionnaire was found to have good validity as well as good internal consistency reliability with a Cronbach’s alpha of 0.8( $\alpha=0.8$ ) (Knezek & Christiansen, 1996). In this study, the Motivation Scale which appears in Table 2.4 below remained unchanged and was also found to have a Cronbach’s alpha of 0.8. The motivation scale was normally distributed with a skewness co-efficient of -0.261 and a kurtosis value of 0.238.

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**Table 2.4: Items Included in the Motivation Scale**

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Item

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I study by myself without anyone forcing me to study.  
If I do not understand something, I will not stop thinking about it.  
When I don’t understand a problem, I keep working until I find the answer.  
I try to finish whatever I begin.  
I enjoy working on a difficult problem.  
I think about many ways to solve a difficult problem.  
I always remember to do my homework.

---

## ***Academic Achievement***

Academic achievement was measured using learners’ midyear marks which were obtained from the school with the permission of the learner, the learners’ parent/guardian and the school. An average mark for all subjects was used to represent overall academic achievement.

## **2.9 Procedure**

Permission to conduct this study was first obtained from the Gauteng Department of Education. In order to gain access to the learners, consent was then obtained from the Principals of the two schools. The principal assisted the researcher by informing the learners and their parents of the study. Consent forms were then sent to the learners' parents/ legal guardians. Once parental consent was received, questionnaires were given to the learners in class at a time which was convenient to test the learners. Learners had an opportunity to provide assent to participating in the study (see ethical procedures section). Data from the questionnaires was entered on MS Excel and analysed using SPSS (Version 23, 2015).

## **2.10 Ethical Considerations**

The ethical standards of research in psychology were maintained when developing this study. Participation in this study was strictly voluntary and, confidentiality was guaranteed. Anonymity could not be provided as the researcher needed to match participants with their marks. Permission to access the learners' marks was also requested from the principal and the learners' parents/ legal guardians. The Participant Information Sheet briefly outlined the aims and rationale of the study. It was stated that assent would be given by means of completion and return of the questionnaire and that there were no negative consequences should they choose not to participate. The assent form also stated that completion of the questionnaire was taken as consent to use their marks in the study. The fact that there are no risks or benefits for the learners associated with participation in this study was explained.

The Participant Information sheet also stated that because the questionnaire provided confidentiality, no individual feedback could be given. General feedback in the form of a summary sheet was provided to parents or learners upon request. Parents/ legal guardians or learners were informed that they could email the researcher should they require additional information or feedback. Contact details were provided on the Participant information sheet. The summary sheet was also emailed to the schools for distribution.

The Participant Information Sheet stated that data would be used to determine learners' attitudes towards tablet usage as well as their motivation and learning style preference and information regarding technology use. The participants were informed that the data would be reported in the research report in an aggregated form and that it could also be used in conference presentations and journal articles and would be securely stored for future research purposes. Participants were asked to keep the participant information sheet for future reference.

## **2.11 Data Analysis**

Cronbach's alpha was used to determine the internal consistency reliability of the scales used in this study. An exploratory factor analysis was also used for the Attitudes Towards Tablet Usage Scale and the Learning Style Scale due to the fact that these scales were adapted for this study and the fact that there was also no evidence of the scales having been being used in South Africa.

Thereafter, descriptive statistics were conducted. Frequencies were determined for the nominal data such as gender age and grade. The mean, standard deviation minimum and maximum values and skewness coefficients were determined for attitudes towards tablet usage and each of

the 3 subscales; Perceived Enjoyability, Perceived Ease of Use, Perceived Usefulness, and also learner motivation learning style preference and academic achievement.

To determine whether there were significant differences between the schools, independent samples t-tests were conducted. Independent sampling was achieved and the data had an interval scale. Additionally, normality was determined by examining skewness co-efficients and kurtosis values and the similarity of variances was explored by looking at Levene's test of homogeneity. Thus, the assumptions for an independent samples t-test were satisfied.

A multiple regression analysis was performed to determine what best predicted learner attitudes as well as learners' performance in blended learning environment. The assumptions for a regression analysis were checked in the following way; normally distributed residuals were tested using studentised residuals, a histogram of residuals and normal probability plots (Field, 2009). Multicollinearity was addressed by means of examining correlations and the VIF values (Tabachnick & Fidell, 2007). Homoscedasticity was tested using a regression standardized residual versus regression standardized predicted value scatterplot (Field, 2009). Independence of errors was investigated using the Durbin-Watson test and linearity was tested using partial regression plots. Finally, influential cases were investigated by means of Cook's D values (Field, 2009).

The open ended question "Would you like to continue using the tablet/iPad at school? Please provide reasons for your answer", was analysed in two ways. The learners' desire to continue/discontinue the use of tablets in a blended learning environment was coded into two categories, yes (1) and no (2). In order to determine whether attitudes predicted behavioural intentions and to offer support for the extended technology acceptance model, a binary logistic

regression analysis was conducted. Furthermore, the reasons for wanting to continue/discontinue using the tablets in the classroom were coded using thematic content analysis methods as outlined by Braun and Clarke (2006) and the frequency of various reasons was explored.

## **2.12 Conclusion**

The aim of this study was to investigate learners' attitudes towards tablet use and the three components which make up attitudes – perceived enjoyability, perceived ease of use and perceived usefulness. This study also aimed to explore learning style preferences, motivation and levels of access to tablets and other technology in relation to these attitudes. Furthermore, this study aimed to examine the role that learner attitudes towards tablet usage, learning style preferences, motivation and access to technology played in learner achievement. The final sample consisted of 276 students from one independent high school and one public high school in the Johannesburg area where students were currently using tablets in the classroom in a blended learning environment. The current study was a quantitative, correlational study which made use of an Attitudes Towards tablet Usage Scale, a Learning Styles Scale, a Motivation Scale and a demographics scale which assessed levels of access to tablets and other technology among other things. Data was entered and analysed using SPSS (Version 23, 2014). The results are presented in Chapter 3.

## **Chapter 3: Results**

### **3.1 Introduction**

This chapter reports on the results which were obtained in answer to the various research questions. Firstly, levels of access to tablets and other forms of technology within the sample are addressed. Thereafter, learners' attitudes towards tablet usage are explored as well as the three components which constitute overall attitudes. Namely, the perceived enjoyability, perceived ease of use and perceived usefulness associated with the use of tablets in a blended learning environment.

Leading on from this, the factors which influence overall attitudes towards tablet usage and the three components of these attitudes were explored through means of two backwards stepwise regression analyses. Another two backwards stepwise regression analyses looked at the extent to which attitudes towards tablet usage (and the three components of attitudes), learning style preferences, motivation and access to tablets and other forms of technology influenced learner achievement.

The extent to which attitudes towards tablet usage, learning style preferences, motivation and access predict learners' desires to continue/not continue using tablets was explored through mean of a binary logistic regression analysis. And lastly, the reasons given for wanting to continue/not continue using the tablets were examined by coding learners' responses using thematic content analysis.

### **3.2 Research Question 1: What are the Levels of Access to Tablets and Other Forms of Technology for the Sample?**

As evidenced in table 3.1, learners had high levels of access to the internet, computers and tablets. 90.5% of the learners at the independent school had access to internet at home while fewer learners at the public school had access to the internet at home at 72.1%. Access to computers at home was similar for both schools with 79.9% of students at the independent school and 79.1% at the public school having access. 90% of the learners at the independent school and 86% of learners from the public school had mobile phones. 94.2% of the learners from the independent school and 95.3% of learners from the public school had access to tablets at home and all students at both schools had access to and used tablets during class. 90% of learners from the independent school and 86% of learners from the public school reported using their tablets for assignments at school, 90%% of learners from the independent school and 89.5% of learners from the public school reported using their tablets for homework and then 98.4% of learners from the independent school and 95.3% of learners from the public school reported using their tablets to study.

In terms of using tablets for communication purposes, roughly half of the learners used their tablets to contact classmates about schoolwork, 50% at the independent school and 59.3% at the public school. While 62.1% of learners from the independent school and 55.8% of learners at the public school used their tablets to contact their classmates socially..Just less than half of the learners (independent 42.1%, pubic 47.7%) reported using their tablets for social media. Only 16.8% of learners from the independent school and 9.3% from the public school reported using their tablets to contact their teachers about schoolwork.

Learners were also specifically asked how the tablets were used in their school. The majority of responses indicated that they were used as e-textbooks while learners also mentioned the fact that they used tablets to take pictures of the board if teachers were explaining difficult concepts or look for educational videos on you-tube if they didn't understand something. They also referred to the use of portals where they could access additional educational resources as well as assignments.

**Table3.1: *Frequency of Learners Who Have/ Don't Have Access to Various Forms of Technology and How They Use It***

| Variable | Level                                 | Independent |      | Public    |      |
|----------|---------------------------------------|-------------|------|-----------|------|
|          |                                       | Frequency   | %    | Frequency | %    |
| Access   | Internet access at home               | 172         | 90.5 | 62        | 72.1 |
|          | No internet access at home            | 18          | 9.5  | 22        | 25.6 |
|          | Computer at home                      | 151         | 79.9 | 68        | 79.1 |
|          | No computer at home                   | 37          | 19.6 | 17        | 19.8 |
|          | Tablet at home                        | 179         | 94.2 | 82        | 95.3 |
|          | No tablet at home                     | 11          | 5.8  | 3         | 3.5  |
|          | Mobile phone                          | 171         | 90   | 74        | 86.0 |
|          | No mobile Phone                       | 8           | 9.5  | 10        | 11.6 |
|          | Tablet used during class              | 190         | 100  | 86        | 100  |
|          | Tablet not used during class          | 0           | 0    | 0         | 0    |
|          | Tablet used for assignments at school | 171         | 90   | 77        | 89.5 |

|                                                        |     |      |    |      |
|--------------------------------------------------------|-----|------|----|------|
| Tablets not used for assignments at school             | 19  | 10   | 8  | 9.3  |
| Tablet used for homework                               | 187 | 98.4 | 82 | 95.3 |
| Tablet not used for homework                           | 3   | 1.6  | 3  | 3.5  |
| Tablet used to study                                   | 183 | 96.3 | 79 | 91.9 |
| Tablet not used to study                               | 6   | 3.2  | 6  | 7    |
| Tablet used to contact classmates about schoolwork     | 95  | 50   | 51 | 59.3 |
| Tablet not used to contact classmates about schoolwork | 95  | 50   | 34 | 39.5 |
| Tablet used to contact classmates socially             | 118 | 62.1 | 48 | 55.8 |
| Tablet not used to contact classmates socially         | 72  | 37.9 | 36 | 41.9 |
| Tablet used to contact teachers for schoolwork         | 32  | 16.8 | 8  | 9.3  |
| Tablet not used to contact teachers for schoolwork     | 157 | 82.6 | 77 | 89.5 |
| Tablet used for social media                           | 80  | 42.1 | 41 | 47.7 |
| Tablet not used for social media                       | 110 | 57.9 | 45 | 52.3 |

As evidenced in table 3.2, levels of access were significantly different for levels of access to the internet at home,  $t(115.637) = 2.805$ ,  $p < 0.01$ ,  $d = 0.42$ , with learners at the independent school having significantly lower levels of access to the internet at home. All other items were not significantly different,  $p > 0.05$ . Overall levels of access were also not significantly different,  $t(247) = 1.313$ ,  $p > 0.05$ . Thus access appears to be similar across both schools.

**Table 3.2: Independent Samples T-test Showing The Difference In Access Between The Two Schools**

|                                     | Levene's Test for Equality of Variances |      | T-test for Equality of Means |         |                 |
|-------------------------------------|-----------------------------------------|------|------------------------------|---------|-----------------|
|                                     | F                                       | Sig. | t                            | df      | Sig. (2-tailed) |
| Internet at home                    | 48.934                                  | .000 | 2.805                        | 115.637 | .006**          |
| Computer at home                    | .009                                    | .926 | .180                         | 272     | .857            |
| Tablet at home                      | 2.541                                   | .112 | -.786                        | 273     | .433            |
| Mobile phone                        | 1.398                                   | .238 | .597                         | 271     | .551            |
| Tablet used for assignments         | .092                                    | .762 | -.151                        | 273     | .880            |
| Tablet used for homework            | 4.169                                   | .042 | .883                         | 119.353 | .379            |
| Tablet used to study                | 8.422                                   | .004 | 1.264                        | 120.492 | .209            |
| Contact classmates about schoolwork | 7.859                                   | .005 | 1.547                        | 164.145 | .124            |
| Contact classmates socially         | 1.901                                   | .169 | -.773                        | 272     | .440            |
| Contact teachers for schoolwork     | 11.930                                  | .001 | 1.791                        | 203.954 | .075            |
| Tablet used for social media        | 1.750                                   | .187 | -.862                        | 274     | .390            |
| Overall Access                      | .404                                    | .984 | 1.313                        | 274     | .190            |

*Note: \* significant at 0.05 level \*\* significant at 0.01 level*

### 3.3 Research Question 2: What are Learners' Attitudes Towards the Use of Tablets?

The Attitudes Towards Tablet Usage Scale was normally distributed with a skewness coefficient of -0.388 and a kurtosis value of -0.026. Learners' attitudes towards tablet usage at the independent school were relatively positive with an overall mean score for learners' attitudes of 3.84 (SD =0.65) as evidenced in Table 3.3. Learners at the public school demonstrated less positive attitudes towards tablets with a mean score of 3.59 (SD=0.61). Factor analysis revealed that the scale items adequately reflected the subscales of attitudes; the affect (Perceived Enjoyability), behavioural (Perceived Ease of use) and cognitive (Perceived Usefulness) domains. As such the domains will each be considered separately.

**Table 3.3 Minimum and Maximum Values, Means and Standard Deviations and Skewness Measures for the Attitudes Towards Tablet Usage Scale**

|              | Independent |         |      |     | Public   |     | Skewness  |       | Kurtosis  |            |
|--------------|-------------|---------|------|-----|----------|-----|-----------|-------|-----------|------------|
|              | Std.        |         |      |     | Std.     |     | Std.      |       |           |            |
|              | Deviatio    |         |      |     | Deviatio |     | Std.      |       |           |            |
|              | Minimum     | Maximum | Mean | n   | Mean     | n   | Statistic | Error | Statistic | Std. Error |
| Overall      |             |         |      |     | 3.59     | .61 |           |       |           |            |
| Attitudes    | 1.00        | 5.00    | 3.84 | .65 |          |     | -.388     | .147  | -.026     | .292       |
| Enjoyability | 1.00        | 5.00    | 3.66 | .86 | 3.37     | .72 | -.321     | .147  | -.055     | .292       |
| Ease of Use  | 1.00        | 5.00    | 3.97 | .72 | 3.75     | .80 | -.499     | .147  | -.049     | .292       |
| Usefulness   | 1.00        | 5.00    | 3.89 | .80 | 3.65     | .81 | -.301     | .147  | -.436     | .292       |

Perceptions of enjoyability associated with the use of tablets was relatively neutral at both schools with a mean score of 3.66 (SD=.86) in the independent school and a mean score of 3.37 (SD=.72) in the public school, as evidenced in table 3.3. The Enjoyability subscale was normally distributed with a skewness co-efficient of -0.321 and a kurtosis value of -0.055.

Perceived ease of use associated with tablets was generally positive with a mean score of 3.97 (SD=0.72) in the independent school and 3.75 (SD=.80) in the public school. The Perceived Ease of Use subscale was normally distributed with a skewness co-efficient of -0.499 and a kurtosis value of -0.049.

Perceived usefulness was also in the more positive range especially in the independent school with a mean score of 3.89 (SD=0.80). The public school has a mean score for perceived usefulness of 3.65 (SD=.81). The Perceived Usefulness subscale was normally distributed with a skewness co-efficient of -0.301 and a kurtosis value of -0.436.

The independent school had only been only been using tablets for a few months at the time of the study. The public school on the other hand was the first pilot school in Gauteng to begin using tablets and had thus been using tablets a lot longer than the independent school. An independent samples t-test was conducted to determine whether there was a significant difference between learners' attitudes towards using tablets at the two schools. The results as evidenced in table 3.4 indicate that the independent school, scored on average higher in all of the attitude subscales as well as overall attitudes. Overall attitudes towards tablet usage were significantly higher in the independent school ( $M=3.84$ ) than the public school ( $M=3.59$ ),  $t(274)= 3.021$ ,  $p<0.01$ ,  $d=0.40$ . Perceived enjoyability was also higher in the independent school ( $M=3.66$ ) than the public school ( $M=3.37$ ),  $t(193.792)=2.844$ ,  $p<0.01$ ,  $d=0.20$ . Ease of use was again higher for the

independent school (M=3.98) than the public school (M=3.75),  $t(274)=2.316$ ,  $p<0.05$ ,  $d=0.31$ .

Finally, importance was also higher in the independent school (M=3.89) than the public school (M=3.65),  $t(274)=2.327$ ,  $p<0.05$ ,  $d=0.30$ . Thus learners at the independent school had generally more positive attitudes overall and on each dimension than the public school.

**Table 3.4: Independent Samples T-test Showing The Difference in Attitudes Between The Two Schools**

|                   | Levene's Test for |      | t-test for Equality of Means |         |                 |                  |             |
|-------------------|-------------------|------|------------------------------|---------|-----------------|------------------|-------------|
|                   | Equality of       |      |                              |         |                 |                  |             |
|                   | Variances         |      |                              |         |                 |                  |             |
|                   | F                 | Sig. | t                            | df      | Sig. (2-tailed) | Independent Mean | Public Mean |
| Overall Attitudes | 1.623             | .204 | 3.021                        | 274     | .003**          | 3.84             | 3.59        |
| Enjoyability      | 6.574             | .011 | 2.844                        | 193.792 | .005**          | 3.72             | 3.38        |
| Ease of Use       | 1.052             | .306 | 2.316                        | 274     | .021*           | 3.98             | 3.75        |
| Usefulness        | .486              | .486 | 2.327                        | 274     | .021*           | 3.89             | 3.65        |

Note: \* significant at 0.05 level

\*\* significant at 0.01 level

### 3.4. Research Question 3: What are the Factors which Influence Overall Attitudes Towards Tablet Usage?

A backwards stepwise regression analysis was performed to examine the predictors of learners' attitudes. This technique begins with all of the independent variables in the equation. At each

step the largest p-value of F is removed and then the deletion of each variable is tested to see if the model improves should the variable be deleted. This process is repeated until the model cannot be improved further (Huck, 2014). The assumptions for a regression analysis were checked using the following tests; normally distributed residuals were tested using studentised residuals, a histogram of residuals and normal probability plots (Field, 2009). The histogram of residuals showed a normal distribution as did the probability plot. The studentised values also indicated normality with no absolute values greater than 3 and less than 1% of the values greater than 2.5 (Field, 2009). The next assumption that none of the independent variables had zero variance was also met. The next assumption that there should be no multi-collinearity between the variables was also met as no correlations were above 0.8 and the VIF values were all less than 10 (Tabachnick & Fidell, 2007). Homoscedasticity was tested using a regression standardized residual versus regression standardized predicted value scatterplot (Field, 2009). The data points formed a rectangular shape and so the assumption was met. Independence of errors was investigated using the Durbin-Watson test, the values fell in the acceptable range between 1 and 3 (Field, 2009) and so this assumption was also met. The final assumption is linearity, this was tested using partial regression plots. The Loess lines were generally linear for all variables and so this assumption was also met. Next influential cases were investigated by means of Cook's D values (Field, 2009). None of the Cook's D values were greater than 1 and thus no influential cases were identified.

Significant differences were found between the two schools for learners' overall attitudes towards using tablets. As a result, it was deemed necessary to conduct separate regression analyses for each of the schools. For each of the regression analyses presented in this section, the

results from the independent school will be presented first, followed by the results of the public school.

### ***Independent School (overall attitudes)***

The results from the regression analyses which explored the predictors of overall attitudes at the independent school appear in table 3.5. Model 1 of the backwards stepwise regression for the independent school indicated that 11.7% of the variance was explained by the model which included learning style preferences (kinesthetic, visual, auditory, collaborative and competitive) as well as motivation and access . The model was significant at the 0.1 level of significance  $F(7,160) = 4.163, p < 0.01$ . Collaborative learning style preference had the greatest predictive power followed by competitive learning style preferences. The following are the absolute values of the standardized estimate (b) of the significant predictors in model 1. Collaborative learning style preference ( $b = 0.274, t = 3.539, p = .001$ ) and competitive learning style preference ( $b = 0.189, t = 2.492, p = 0.014$ ). The remaining variables were not statistically significant predictors of overall attitudes towards tablet usage in a blended learning environment at the independent school.

The final Model (Model 6) of the backwards stepwise regression as reported in table 3.5 indicated that 11.1% of the variance was explained by the model which only included collaborative and competitive learning style preferences. The model was significant at the 0.1 level of significance  $F(2, 165) = 11.395, p < 0.01$ . As in model 1, collaborative learning style preference had the greatest predictive power followed by competitive learning style preferences. The absolute values of the standardized estimate (b) of these factors are as follows; collaborative

learning style preference ( $b=0.258$ ,  $t=3.519$ ,  $p=.001$ ) and competitive learning style preference ( $b=0.215$ ,  $t=2.936$ ,  $p=0.004$ ).

**Table 3.5: Regression Summary: Predictors of Overall Attitudes Towards Tablet Usage At the Independent School**

|       |               | Unstandardized |            | Standardized |        |      |       |      | Adjusted       |
|-------|---------------|----------------|------------|--------------|--------|------|-------|------|----------------|
|       |               | Coefficients   |            | Coefficients |        |      |       |      | R <sup>2</sup> |
| Model |               | B              | Std. Error | Beta         | t      | Sig. | F     | Sig  |                |
| 1     | (Constant)    | 2.272          | .484       |              | 4.694  | .000 | 4.163 | .000 | .117           |
|       | Kinesthetic   | -.106          | .072       | -.113        | -1.466 | .145 |       |      |                |
|       | Auditory      | .032           | .057       | .044         | .562   | .575 |       |      |                |
|       | Visual        | -.016          | .063       | -.020        | -.250  | .803 |       |      |                |
|       | Competitive   | .131           | .053       | .189         | 2.492  | .014 |       |      |                |
|       | Collaborative | .235           | .066       | .274         | 3.539  | .001 |       |      |                |
|       | Motivation    | .052           | .077       | .054         | .679   | .498 |       |      |                |
|       | Access        | .508           | .332       | .114         | 1.531  | .128 |       |      |                |
| 2     | (Constant)    | 2.238          | .464       |              | 4.827  | .000 | 4.875 | .000 | .122           |
|       | Kinesthetic   | -.108          | .072       | -.115        | -1.512 | .132 |       |      |                |
|       | Auditory      | .036           | .056       | .048         | .640   | .523 |       |      |                |
|       | Competitive   | .132           | .052       | .191         | 2.535  | .012 |       |      |                |
|       | Collaborative | .233           | .066       | .273         | 3.541  | .001 |       |      |                |
|       | Motivation    | .046           | .073       | .048         | .634   | .527 |       |      |                |
|       | Access        | .498           | .329       | .112         | 1.517  | .131 |       |      |                |

|   |               |       |      |       |        |      |        |      |      |
|---|---------------|-------|------|-------|--------|------|--------|------|------|
| 3 | (Constant)    | 2.360 | .421 |       | 5.609  | .000 | 5.791  | .000 | .125 |
|   | Kinesthetic   | -.111 | .071 | -.118 | -1.552 | .123 |        |      |      |
|   | Auditory      | .040  | .055 | .054  | .723   | .471 |        |      |      |
|   | Competitive   | .140  | .051 | .201  | 2.751  | .007 |        |      |      |
|   | Collaborative | .234  | .066 | .273  | 3.554  | .000 |        |      |      |
|   | Access        | .507  | .328 | .114  | 1.546  | .124 |        |      |      |
| 4 | (Constant)    | 2.453 | .400 |       | 6.131  | .000 | 7.129  | .000 | .128 |
|   | Kinesthetic   | -.115 | .071 | -.123 | -1.627 | .106 |        |      |      |
|   | Competitive   | .143  | .051 | .206  | 2.831  | .005 |        |      |      |
|   | Collaborative | .242  | .065 | .282  | 3.735  | .000 |        |      |      |
|   | Access        | .543  | .323 | .122  | 1.678  | .095 |        |      |      |
| 5 | (Constant)    | 2.174 | .363 |       | 5.984  | .000 | 8.538  | .000 | .119 |
|   | Competitive   | .151  | .051 | .217  | 2.980  | .003 |        |      |      |
|   | Collaborative | .213  | .063 | .249  | 3.403  | .001 |        |      |      |
|   | Access        | .524  | .325 | .117  | 1.613  | .109 |        |      |      |
| 6 | (Constant)    | 2.541 | .285 |       | 8.913  | .000 | 11.395 | .000 | .111 |
|   | Competitive   | .149  | .051 | .215  | 2.936  | .004 |        |      |      |
|   | Collaborative | .221  | .063 | .258  | 3.519  | .001 |        |      |      |

### ***Public School (overall attitudes)***

The results from the regression analyses which explored the predictors of overall attitudes at the public school appear in table 3.6. Model 1 which included learning style preferences (kinesthetic,

visual, auditory, collaborative and competitive) as well as motivation and access as predictors of learner attitudes indicated that 25% of the variance was explained by the model. The model was significant at the 0.01 level of significance ( $F(7,78)=5.040$ ,  $p<0.01$ ). The strongest predictor was access ( $b=.258$ ,  $t=2.693$ ,  $p=.009$ ) followed by collaborative learning style preference ( $b=.219$ ,  $t=2.159$ ,  $p=.034$ ), all other variables in the equation were not significant predictors of learner attitudes towards tablet usage in a blended learning environment.

In the final regression model (model 5), 24.7% of the variance was explained by the variables in the model which included access motivation and collaborative learning style preference. The model was significant ( $F(3,82)=10.317$ ,  $p<0.01$ ). All three variables in the equation were significant with motivation having the greatest predictive power over learner attitudes towards tablet usage ( $b=.320$ ,  $t=3.375$ ,  $p=.001$ ) followed by access ( $b=.280$ ,  $t=2.960$ ,  $p=.004$ ), and then collaborative learning style preference ( $b=.248$ ,  $t=2.626$ ,  $p=.010$ ).

**Table 3.6: Regression Summary: Predictors of Overall Attitudes Towards Tablet Usage At The Public School**

|       |            | Unstandardized |            | Standardized |       |          |       |      |      |
|-------|------------|----------------|------------|--------------|-------|----------|-------|------|------|
|       |            | Coefficients   |            | Coefficients |       | Adjusted |       |      |      |
| Model |            | B              | Std. Error | Beta         | t     | Sig.     | F     | Sig  | R²   |
| 1     | (Constant) | .995           | .574       |              | 1.734 | .087     | 5.040 | .000 | .250 |
|       | Access     | 1.053          | .391       | .258         | 2.693 | .009     |       |      |      |
|       | Motivation | .178           | .101       | .204         | 1.756 | .083     |       |      |      |
|       | Auditory   | .029           | .086       | .036         | .340  | .735     |       |      |      |

|   |               |       |      |       |        |      |        |      |
|---|---------------|-------|------|-------|--------|------|--------|------|
|   | Visual        | .101  | .094 | .124  | 1.074  | .286 |        |      |
|   | Collaborative | .251  | .116 | .219  | 2.159  | .034 |        |      |
|   | Competitive   | .055  | .065 | .083  | .844   | .401 |        |      |
|   | Kinesthetic   | -.103 | .071 | -.144 | -1.461 | .148 |        |      |
| 2 | (Constant)    | 1.012 | .568 |       | 1.781  | .079 | 5.927  | .000 |
|   | Access        | 1.064 | .387 | .261  | 2.745  | .007 |        |      |
|   | Motivation    | .187  | .096 | .216  | 1.946  | .055 |        |      |
|   | Visual        | .104  | .094 | .127  | 1.106  | .272 |        |      |
|   | Collaborative | .256  | .114 | .223  | 2.236  | .028 |        |      |
|   | Competitive   | .058  | .064 | .087  | .899   | .371 |        |      |
|   | Kinesthetic   | -.099 | .069 | -.138 | -1.432 | .156 |        |      |
| 3 | (Constant)    | 1.110 | .557 |       | 1.993  | .050 | 6.967  | .000 |
|   | Access        | 1.083 | .386 | .265  | 2.803  | .006 |        |      |
|   | Motivation    | .199  | .095 | .229  | 2.086  | .040 |        |      |
|   | Visual        | .110  | .093 | .135  | 1.185  | .239 |        |      |
|   | Collaborative | .262  | .114 | .229  | 2.300  | .024 |        |      |
|   | Kinesthetic   | -.096 | .069 | -.133 | -1.385 | .170 |        |      |
| 4 | (Constant)    | 1.121 | .558 |       | 2.008  | .048 | 8.316  | .000 |
|   | Access        | 1.148 | .383 | .281  | 2.994  | .004 |        |      |
|   | Motivation    | .253  | .084 | .291  | 3.018  | .003 |        |      |
|   | Collaborative | .305  | .109 | .265  | 2.804  | .006 |        |      |
|   | Kinesthetic   | -.097 | .069 | -.135 | -1.398 | .166 |        |      |
| 5 | (Constant)    | .822  | .519 |       | 1.584  | .117 | 10.317 | .000 |

|               |       |      |      |       |      |
|---------------|-------|------|------|-------|------|
| Access        | 1.142 | .386 | .280 | 2.960 | .004 |
| Motivation    | .278  | .082 | .320 | 3.375 | .001 |
| Collaborative | .284  | .108 | .248 | 2.626 | .010 |

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### **3.4.1 Research Question 3.1: What are the Factors which Influence the Perceived Enjoyability, Perceived Ease of Use and Perceived Usefulness of Using Tablets?**

A series of backwards stepwise regression analyses were performed to examine the predictors of the three dimensions of learners' attitudes towards tablet usage i.e. perceived Enjoyability, perceived ease of use and perceived usefulness. The assumptions for a regression analysis were checked using the following tests; normally distributed residuals were tested using studentised residuals, a histogram of residuals and normal probability plots (Field, 2009). The histogram of residuals showed a normal distribution as did the probability plot. The studentised values also indicated normality with no absolute values greater than 3 and less than 1% of the values greater than 2.5 (Field, 2009). The next assumption that none of the independent variables had zero variance was also met. The next assumption that there should be no multi-collinearity between the variables was also met as no correlations were above 0.8 and the VIF values were all less than 10 (Tabachnick & Fidell, 2007). Homoscedasticity was tested using a regression standardized residual versus regression standardized predicted value scatterplot (Field, 2009). The data points formed a rectangular shape and so the assumption was met. Independence of errors was investigated using the Durbin-Watson test, the values fell in the acceptable range between 1 and 3 (Field, 2009) and so this assumption was also met. The final assumption is linearity; this was tested using partial regression plots. The Loess lines were generally linear for

all variables and so this assumption was also met. Next influential cases were investigated by means of Cook's D values (Field, 2009). None of the Cooks D values were greater than 1 and thus no influential cases were identified.

In order to gain a more in depth understanding of learner attitudes, the predictors of each of the subscales were also investigated. Significant differences were found between the two schools for each of the attitude subscales. As a result, it was deemed necessary to conduct separate regression analyses for each of the schools. For each of the regression analyses, the results from the independent school will be presented first, followed by the results of the public school.

### ***Independent School (Enjoyability)***

Variables entered into the model included learning style preferences (kinesthetic, auditory, visual, collaborative and competitive), motivation and access. As evidenced in table 3.7, model 1 of the backward stepwise regression explained 14.8% of the variance. The model was significant at the 0.01 level  $F(7,160) = 5.160, p < .01$ . Collaborative and competitive learning style preferences were the only significant predictors of perceived enjoyability at the independent school. The following are the absolute values of the standardized estimate (b) of these factors. Collaborative ( $b = 0.301, t = 3.964, p = .000$ ) and competitive ( $b = .158, t = 2.120, p = .036$ ). In the final model (model 4) for perceived enjoyability associated with tablet usage at the independent school, 15.4% of the variance was explained. The model was significant,  $F(4,163) = 8.620, p < .01$  and contained the variables kinesthetic, collaborative and competitive learning style preferences and access. The strongest predictor was collaborative learning style preference ( $b = .313, t = 4.207, p = 0.000$ ) followed by kinesthetic learning style preference which was a negative predictor ( $b = -$

.189,  $t=-2.548$ ,  $p=.012$ ), competitive learning style preference ( $b=.018$ ,  $t=2.521$ ,  $p=.013$ ) and then access ( $b=.152$ ,  $t=2.133$ ,  $p=.034$ ).

**Table 3.7: Regression Summary: Predictors of Perceived Enjoyability Associated With Tablet Usage At The Independent School**

|       |               | Unstandardized |            | Standardized |        |          |       |      |      |
|-------|---------------|----------------|------------|--------------|--------|----------|-------|------|------|
|       |               | Coefficients   |            | Coefficients |        | Adjusted |       |      |      |
| Model |               | B              | Std. Error | Beta         | t      | Sig.     | F     | Sig  | R    |
| 1     | (Constant)    | 1.617          | .622       |              | 2.602  | .010     | 5.160 | .000 | .148 |
|       | Kinesthetic   | -.216          | .093       | -.176        | -2.324 | .021     |       |      |      |
|       | Auditory      | .060           | .074       | .063         | .821   | .413     |       |      |      |
|       | Visual        | -.029          | .081       | -.028        | -.359  | .720     |       |      |      |
|       | Competitive   | .143           | .068       | .158         | 2.120  | .036     |       |      |      |
|       | Collaborative | .337           | .085       | .301         | 3.964  | .000     |       |      |      |
|       | Motivation    | .088           | .099       | .070         | .894   | .372     |       |      |      |
|       | Access        | .825           | .426       | .142         | 1.937  | .054     |       |      |      |
| 2     | (Constant)    | 1.555          | .596       |              | 2.612  | .010     | 6.032 | .000 | .153 |
|       | Kinesthetic   | -.220          | .092       | -.179        | -2.392 | .018     |       |      |      |
|       | Auditory      | .067           | .071       | .069         | .933   | .352     |       |      |      |
|       | Competitive   | .146           | .067       | .160         | 2.171  | .031     |       |      |      |
|       | Collaborative | .335           | .085       | .299         | 3.959  | .000     |       |      |      |
|       | Motivation    | .077           | .093       | .061         | .825   | .411     |       |      |      |
|       | Access        | .808           | .422       | .139         | 1.914  | .057     |       |      |      |
| 3     | (Constant)    | 1.760          | .541       |              | 3.253  | .001     | 7.116 | .000 | .155 |

|   |               |       |      |       |        |      |       |      |
|---|---------------|-------|------|-------|--------|------|-------|------|
|   | Kinesthetic   | -.224 | .092 | -.182 | -2.443 | .016 |       |      |
|   | Auditory      | .074  | .071 | .077  | 1.041  | .300 |       |      |
|   | Competitive   | .158  | .065 | .174  | 2.419  | .017 |       |      |
|   | Collaborative | .336  | .085 | .300  | 3.971  | .000 |       |      |
|   | Access        | .821  | .421 | .141  | 1.950  | .053 |       |      |
| 4 | (Constant)    | 1.932 | .515 |       | 3.748  | .000 | 8.620 | .000 |
|   | Kinesthetic   | -.233 | .091 | -.189 | -2.548 | .012 |       |      |
|   | Competitive   | .164  | .065 | .181  | 2.521  | .013 |       |      |
|   | Collaborative | .351  | .083 | .313  | 4.207  | .000 |       |      |
|   | Access        | .888  | .416 | .152  | 2.133  | .034 |       |      |

### ***Public School (Enjoyability)***

The predictors of learners' perceived enjoyability at the public school appear in table 3.8. Model 1 explained 15.1% of the variance and contained the learning styles, motivation and access variables. The model was significant  $F(7, 78) = 3.161$ ,  $p < 0.01$ , however the only significant predictor was collaborative learning style preference ( $b = .358$ ,  $t = 3.576$ ,  $p = .001$ ). The final model (model 7) contained only the collaborative learning style variable and explained 17.5% of the variance. The model was significant  $F(1, 84) = 19.007$ ,  $p < 0.01$ . Collaborative learning style preference ( $b = .430$ ,  $t = 4.360$ ,  $p = .000$ ) was found to be the only significant predictor of the perceived enjoyability associated with tablet usage at the public school.

**Table 3.8: Regression summary: Predictors of Perceived Enjoyability Associated With Tablet Usage At The Public School**

|       |               | Unstandardized |            | Standardized |       |      |       |      | Adjusted |
|-------|---------------|----------------|------------|--------------|-------|------|-------|------|----------|
|       |               | Coefficients   |            | Coefficients |       |      |       |      | R        |
| Model |               | B              | Std. Error | Beta         | t     | Sig. | F     | Sig  |          |
| 1     | (Constant)    | .417           | .819       |              | .510  | .612 | 3.161 | .005 | .151     |
|       | Access        | .733           | .558       | .134         | 1.314 | .193 |       |      |          |
|       | Motivation    | -.044          | .144       | -.038        | -.308 | .759 |       |      |          |
|       | Auditory      | .033           | .122       | .030         | .267  | .790 |       |      |          |
|       | Visual        | .096           | .135       | .088         | .714  | .477 |       |      |          |
|       | Collaborative | .592           | .166       | .385         | 3.576 | .001 |       |      |          |
|       | Competitive   | .048           | .093       | .054         | .515  | .608 |       |      |          |
|       | Kinesthetic   | .050           | .101       | .052         | .497  | .620 |       |      |          |
| 2     | (Constant)    | .437           | .810       |              | .539  | .591 | 3.720 | .003 | .161     |
|       | Access        | .745           | .553       | .136         | 1.348 | .181 |       |      |          |
|       | Motivation    | -.033          | .137       | -.029        | -.243 | .809 |       |      |          |
|       | Visual        | .099           | .133       | .090         | .739  | .462 |       |      |          |
|       | Collaborative | .598           | .163       | .389         | 3.665 | .000 |       |      |          |
|       | Competitive   | .051           | .091       | .057         | .557  | .579 |       |      |          |
|       | Kinesthetic   | .055           | .099       | .057         | .553  | .582 |       |      |          |
| 3     | (Constant)    | .361           | .743       |              | .486  | .628 | 4.505 | .001 | .171     |
|       | Access        | .744           | .549       | .136         | 1.355 | .179 |       |      |          |
|       | Visual        | .084           | .118       | .076         | .711  | .479 |       |      |          |

|   |               |       |      |      |       |      |        |      |
|---|---------------|-------|------|------|-------|------|--------|------|
|   | Collaborative | .601  | .162 | .391 | 3.714 | .000 |        |      |
|   | Competitive   | .048  | .090 | .054 | .532  | .596 |        |      |
|   | Kinesthetic   | .059  | .096 | .061 | .613  | .542 |        |      |
| 4 | (Constant)    | .466  | .713 |      | .653  | .515 | 5.610  | .000 |
|   | Access        | .761  | .546 | .139 | 1.393 | .167 |        |      |
|   | Visual        | .094  | .115 | .086 | .812  | .419 |        |      |
|   | Collaborative | .606  | .161 | .394 | 3.765 | .000 |        |      |
|   | Kinesthetic   | .061  | .096 | .063 | .633  | .528 |        |      |
| 5 | (Constant)    | .622  | .667 |      | .932  | .354 | 7.400  | .000 |
|   | Access        | .765  | .544 | .140 | 1.406 | .164 |        |      |
|   | Visual        | .085  | .114 | .078 | .746  | .458 |        |      |
|   | Collaborative | .620  | .159 | .403 | 3.912 | .000 |        |      |
| 6 | (Constant)    | .748  | .643 |      | 1.164 | .248 | 10.881 | .000 |
|   | Access        | .833  | .535 | .152 | 1.559 | .123 |        |      |
|   | Collaborative | .657  | .150 | .427 | 4.371 | .000 |        |      |
| 7 | (Constant)    | 1.331 | .528 |      | 2.524 | .013 | 19.007 | .000 |
|   | Collaborative | .661  | .152 | .430 | 4.360 | .000 |        |      |

### ***Independent School (perceived ease of use)***

As evidenced in table 3.9, model 1 of the backward stepwise regression explained 7.6% of the variance. Variables entered into the model included learning styles (kinesthetic, auditory, visual, collaborative and competitive), motivation and access. The model was significant at the 0.01 level  $F(6,161) = 3.467$ ,  $p < .01$ . Collaborative and competitive learning style preferences were the

only significant predictors of perceived ease of use at the independent school. The following were the absolute values of the standardized estimate (b) of these factors. Collaborative (b=.190 t=2.405, p=.017) and competitive (b=.169, t=2.173, p=.031). In the final model (model 5) for perceived ease of use, 8.2% of the variance was explained. The model was significant, F (3,164) =5.942, p<.01. The strongest predictor was collaborative learning style preference (b=.212, t=2.738, p=0.007) followed by competitive learning style preference (b=.188, t=2.511, p=.013) and then kinesthetic learning style preference which was again a negative predictor (b=-.161, t=-2.080, p=.039) at the independent school.

**Table 3.9: Regression summary: Predictors of Perceived Ease of Use Associated With Tablet Usage At The Independent School**

|       |               | Unstandardized |            | Standardized |        |          |       |      |      |
|-------|---------------|----------------|------------|--------------|--------|----------|-------|------|------|
|       |               | Coefficients   |            | Coefficients |        | Adjusted |       |      |      |
| Model |               | B              | Std. Error | Beta         | t      | Sig.     | F     | Sig  | R    |
| 1     | (Constant)    | 2.618          | .558       |              | 4.692  | .000     | 2.966 | .006 | .076 |
|       | Kinesthetic   | -.164          | .083       | -.155        | -1.970 | .051     |       |      |      |
|       | Auditory      | .066           | .066       | .080         | 1.000  | .319     |       |      |      |
|       | Visual        | .020           | .073       | .022         | .276   | .783     |       |      |      |
|       | Competitive   | .132           | .061       | .169         | 2.173  | .031     |       |      |      |
|       | Collaborative | .184           | .076       | .190         | 2.405  | .017     |       |      |      |
|       | Motivation    | .066           | .089       | .061         | .739   | .461     |       |      |      |
|       | Access        | .294           | .382       | .059         | .770   | .442     |       |      |      |
| 2     | (Constant)    | 2.660          | .534       |              | 4.978  | .000     | 3.467 | .003 | .081 |
|       | Kinesthetic   | -.162          | .083       | -.152        | -1.956 | .052     |       |      |      |

|   |               |       |      |       |        |      |       |           |
|---|---------------|-------|------|-------|--------|------|-------|-----------|
| 3 | Auditory      | .062  | .064 | .075  | .965   | .336 |       |           |
|   | Competitive   | .130  | .060 | .166  | 2.162  | .032 |       |           |
|   | Collaborative | .185  | .076 | .192  | 2.439  | .016 |       |           |
|   | Motivation    | .074  | .084 | .068  | .880   | .380 |       |           |
|   | Access        | .307  | .379 | .061  | .809   | .419 |       |           |
|   | (Constant)    | 2.838 | .487 |       | 5.831  | .000 | 4.038 | .002 .083 |
|   | Kinesthetic   | -.158 | .082 | -.149 | -1.919 | .057 |       |           |
|   | Auditory      | .069  | .063 | .084  | 1.097  | .274 |       |           |
|   | Competitive   | .128  | .060 | .164  | 2.136  | .034 |       |           |
|   | Collaborative | .187  | .076 | .194  | 2.471  | .014 |       |           |
| 4 | Motivation    | .076  | .083 | .070  | .913   | .363 |       |           |
|   | (Constant)    | 3.049 | .428 |       | 7.120  | .000 | 4.844 | .001 .084 |
|   | Kinesthetic   | -.162 | .082 | -.153 | -1.972 | .050 |       |           |
|   | Auditory      | .077  | .063 | .093  | 1.223  | .223 |       |           |
|   | Competitive   | .140  | .059 | .180  | 2.400  | .018 |       |           |
|   | Collaborative | .188  | .076 | .195  | 2.483  | .014 |       |           |
|   | (Constant)    | 3.276 | .387 |       | 8.469  | .000 | 5.942 | .001 .082 |
|   | Kinesthetic   | -.171 | .082 | -.161 | -2.080 | .039 |       |           |
|   | Competitive   | .147  | .058 | .188  | 2.511  | .013 |       |           |
|   | Collaborative | .205  | .075 | .212  | 2.738  | .007 |       |           |

### ***Public school (perceived ease of use)***

A backwards stepwise regression analysis was performed to examine the predictors of learners' perceived ease of use associated with tablet usage at the public school. Variables entered into the model included learning styles (kinesthetic, auditory, visual, collaborative and competitive), motivation and access. As evidenced in table 3.10 Model 1 of the backward stepwise regression explained 31.0% of the variance. The model was significant at the 0.01 level  $F(7,78)=6.448$ ,  $p<.01$ . Access and kinesthetic learning style preferences were the only significant predictors of perceived Ease of Use in the public school. The following are the absolute values of the standardized estimate (b) of these factors. Access ( $b=.300$   $t=3.259$ ,  $p=.002$ ) and kinesthetic ( $b=-.216$ ,  $t=-2.285$ ,  $p=.025$ ). In the final model (model 4) for perceived ease of use in the public school, 31.2% of the variance was explained by the access, motivation, visual and kinesthetic learning style preference variables. The model was significant,  $F(4, 81) = 10.632$ ,  $p<.01$ . The strongest predictor was access ( $b=.295$ ,  $t=3.232$ ,  $p=.002$ ) followed by visual learning style preference ( $b=.249$ ,  $t=2.377$ ,  $p=.020$ ) and then kinesthetic learning style preference which was again a negative predictor ( $b=-.210$ ,  $t=-2.287$ ,  $p=.025$ ) of perceived ease of use associated with tablet usage at the public school. Motivation was still included in the final model however; it was not found to be a significant predictor at the 0.05 level of significance and so was not included.

**Table 3.10: Regression summary: Predictors of Perceived Ease of Use Associated With Tablet Usage At The Public School**

| Model | Unstandardized |            | Standardized |  | t | Sig. | F | Sig | Adjusted R |
|-------|----------------|------------|--------------|--|---|------|---|-----|------------|
|       | Coefficients   |            | Coefficients |  |   |      |   |     |            |
|       | B              | Std. Error | Beta         |  |   |      |   |     |            |

|   |               |       |      |       |        |      |        |      |      |
|---|---------------|-------|------|-------|--------|------|--------|------|------|
| 1 | (Constant)    | .912  | .684 |       | 1.333  | .186 | 6.448  | .000 | .310 |
|   | Access        | 1.518 | .466 | .300  | 3.259  | .002 |        |      |      |
|   | Motivation    | .237  | .121 | .219  | 1.967  | .053 |        |      |      |
|   | Auditory      | -.082 | .102 | -.082 | -.802  | .425 |        |      |      |
|   | Visual        | .212  | .112 | .210  | 1.888  | .063 |        |      |      |
|   | Collaborative | .151  | .138 | .106  | 1.089  | .279 |        |      |      |
|   | Competitive   | .084  | .077 | .102  | 1.086  | .281 |        |      |      |
|   | Kinesthetic   | -.192 | .084 | -.216 | -2.285 | .025 |        |      |      |
| 2 | (Constant)    | .862  | .679 |       | 1.269  | .208 | 7.449  | .000 | .313 |
|   | Access        | 1.488 | .463 | .294  | 3.212  | .002 |        |      |      |
|   | Motivation    | .209  | .115 | .194  | 1.817  | .073 |        |      |      |
|   | Visual        | .206  | .112 | .203  | 1.841  | .069 |        |      |      |
|   | Collaborative | .136  | .137 | .095  | .994   | .323 |        |      |      |
|   | Competitive   | .076  | .077 | .092  | .994   | .323 |        |      |      |
|   | Kinesthetic   | -.204 | .083 | -.228 | -2.460 | .016 |        |      |      |
| 3 | (Constant)    | 1.204 | .586 |       | 2.053  | .043 | 8.742  | .000 | .313 |
|   | Access        | 1.469 | .463 | .290  | 3.174  | .002 |        |      |      |
|   | Motivation    | .201  | .115 | .186  | 1.750  | .084 |        |      |      |
|   | Visual        | .240  | .106 | .237  | 2.253  | .027 |        |      |      |
|   | Competitive   | .081  | .076 | .098  | 1.058  | .293 |        |      |      |
|   | Kinesthetic   | -.193 | .082 | -.217 | -2.353 | .021 |        |      |      |
| 4 | (Constant)    | 1.364 | .567 |       | 2.408  | .018 | 10.632 | .000 | .321 |
|   | Access        | 1.495 | .463 | .295  | 3.232  | .002 |        |      |      |

|             |       |      |       |        |      |
|-------------|-------|------|-------|--------|------|
| Motivation  | .217  | .114 | .201  | 1.900  | .061 |
| Visual      | .252  | .106 | .249  | 2.377  | .020 |
| Kinesthetic | -.187 | .082 | -.210 | -2.287 | .025 |

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### ***Independent school (perceived usefulness)***

Model 1 of the backward stepwise regression investigating the perceived usefulness associated with tablet usage at the independent school explained 4.6% of the variance. Variables entered into the model included learning styles (kinesthetic, auditory, visual, collaborative and competitive), motivation and access. The model was significant at the 0.01 level  $F(7,160) = 2.160, p < .05$ . Kinesthetic learning style preference was the only significant predictor of perceived usefulness ( $b = .164, t = 2.057, p = .041$ ). In the final model (model 6) for perceived usefulness, 4.8% of the variance was explained. The model containing kinesthetic and collaborative learning style preferences was significant,  $F(2,165) = 5.243, p < .01$ . However, the only significant predictor for perceived usefulness associated with the use of tablets at the independent school was kinaesthetic learning style preference ( $b = .158, t = 2.021, p = .045$ ). While a collaborative learning style preference was included in the final model, it was not found to be significant predictor at the 0.05 level of significance.

**Table 3.11: Regression summary: Predictors of Perceived Usefulness Associated With Tablet Usage At The Independent School**

|       |               | Unstandardized |            | Standardized |        |          |       |      |
|-------|---------------|----------------|------------|--------------|--------|----------|-------|------|
|       |               | Coefficients   |            | Coefficients |        | Adjusted |       |      |
| Model |               | B              | Std. Error | Beta         | t      | Sig.     | F     | R    |
| 1     | (Constant)    | 2.704          | .625       |              | 4.325  | .000     | 2.160 | .046 |
|       | Kinesthetic   | .192           | .094       | .164         | 2.057  | .041     |       |      |
|       | Auditory      | -.081          | .074       | -.088        | -1.093 | .276     |       |      |
|       | Visual        | -.061          | .081       | -.062        | -.749  | .455     |       |      |
|       | Competitive   | .109           | .068       | .126         | 1.599  | .112     |       |      |
|       | Collaborative | .162           | .086       | .152         | 1.892  | .060     |       |      |
|       | Motivation    | -.040          | .099       | -.033        | -.400  | .690     |       |      |
|       | Access        | .380           | .429       | .069         | .887   | .376     |       |      |
| 2     | (Constant)    | 2.632          | .597       |              | 4.406  | .000     | 2.506 | .051 |
|       | Kinesthetic   | .196           | .093       | .167         | 2.107  | .037     |       |      |
|       | Auditory      | -.086          | .072       | -.095        | -1.191 | .235     |       |      |
|       | Visual        | -.072          | .077       | -.073        | -.934  | .352     |       |      |
|       | Competitive   | .102           | .066       | .118         | 1.552  | .123     |       |      |
|       | Collaborative | .163           | .085       | .153         | 1.903  | .059     |       |      |
|       | Access        | .380           | .427       | .069         | .890   | .375     |       |      |
|       | (Constant)    | 2.832          | .553       |              | 5.119  | .000     | 2.853 | .053 |
| 3     | Kinesthetic   | .199           | .093       | .170         | 2.143  | .034     |       |      |
|       | Auditory      | -.075          | .071       | -.082        | -1.055 | .293     |       |      |

|   |               |       |      |       |       |      |       |      |
|---|---------------|-------|------|-------|-------|------|-------|------|
|   | Visual        | -.063 | .076 | -.064 | -.833 | .406 |       |      |
|   | Competitive   | .101  | .066 | .117  | 1.530 | .128 |       |      |
|   | Collaborative | .165  | .085 | .155  | 1.929 | .056 |       |      |
|   | (Constant)    | 2.604 | .480 |       | 5.423 | .000 | 3.399 | .011 |
|   | Kinesthetic   | .191  | .092 | .163  | 2.070 | .040 |       |      |
| 4 | Auditory      | -.065 | .070 | -.071 | -.928 | .355 |       |      |
|   | Competitive   | .102  | .066 | .118  | 1.551 | .123 |       |      |
|   | Collaborative | .159  | .085 | .149  | 1.872 | .063 |       |      |
| 5 | (Constant)    | 2.411 | .433 |       | 5.571 | .000 | 4.248 | .006 |
|   | Kinesthetic   | .198  | .092 | .169  | 2.157 | .032 |       |      |
|   | Competitive   | .097  | .065 | .112  | 1.478 | .141 |       |      |
|   | Collaborative | .145  | .084 | .136  | 1.736 | .084 |       |      |
| 6 | (Constant)    | 2.782 | .354 |       | 7.860 | .000 | 3.216 | .006 |
|   | Kinesthetic   | .185  | .092 | .158  | 2.021 | .045 |       |      |
|   | Collaborative | .158  | .083 | .148  | 1.890 | .061 |       |      |

### ***Public school (perceived usefulness)***

A backwards stepwise regression analysis was performed to examine the predictors of learners' perceived usefulness associated with tablet usage at the public school. Variables entered into the initial model included learning styles (kinesthetic, auditory, visual, collaborative and competitive), motivation and access. The results are evidenced in table 3.12. Model 1 of the backward stepwise regression explained 9.3% of the variance. The model was significant at the 0.05 level  $F(7, 78) = 2.244$ ,  $p < .05$ . However, none of the variables were significant at the 0.05

level of significance. In the final model for perceived usefulness (model 6), 11.0% of the variance was explained. The model was significant,  $F(2, 83) = 6.254, p < .01$ . The only significant predictor of perceived usefulness at the public school was motivation ( $b = .238, t = 2.170, p = .033$ ). Auditory learning style preference was also included in the final model however it was not found to be a significant predictor at the 0.05 level of significance.

**Table 3.12: Regression summary: Predictors of Perceived Usefulness Associated With Tablet Usage At The Public School**

|       |               | Unstandardized |            | Standardized |       |      |       |      | Adjusted |
|-------|---------------|----------------|------------|--------------|-------|------|-------|------|----------|
|       |               | Coefficients   |            | Coefficients |       |      |       |      | R        |
| Model |               | B              | Std. Error | Beta         | t     | Sig. | F     | Sig. |          |
| 1     | (Constant)    | 1.444          | .751       |              | 1.922 | .058 | 2.244 | .039 | .093     |
|       | Access        | .610           | .512       | .125         | 1.191 | .237 |       |      |          |
|       | Motivation    | .242           | .132       | .234         | 1.829 | .071 |       |      |          |
|       | Auditory      | .172           | .112       | .179         | 1.534 | .129 |       |      |          |
|       | Visual        | -.060          | .123       | -.061        | -.483 | .630 |       |      |          |
|       | Collaborative | .200           | .152       | .147         | 1.317 | .192 |       |      |          |
|       | Competitive   | .009           | .085       | .012         | .109  | .914 |       |      |          |
|       | Kinesthetic   | -.069          | .092       | -.081        | -.749 | .456 |       |      |          |
| 2     | (Constant)    | 1.458          | .735       |              | 1.985 | .051 | 2.649 | .022 | .104     |
|       | Access        | .612           | .508       | .126         | 1.205 | .232 |       |      |          |
|       | Motivation    | .243           | .131       | .235         | 1.858 | .067 |       |      |          |
|       | Auditory      | .174           | .111       | .180         | 1.570 | .120 |       |      |          |
|       | Visual        | -.059          | .122       | -.060        | -.480 | .633 |       |      |          |

|   |               |       |      |       |       |      |       |      |
|---|---------------|-------|------|-------|-------|------|-------|------|
|   | Collaborative | .201  | .151 | .147  | 1.331 | .187 |       |      |
|   | Kinesthetic   | -.069 | .092 | -.081 | -.751 | .455 |       |      |
| 3 | (Constant)    | 1.456 | .731 |       | 1.991 | .050 | 3.163 | .012 |
|   | Access        | .579  | .501 | .119  | 1.156 | .251 |       |      |
|   | Motivation    | .216  | .118 | .209  | 1.839 | .070 |       |      |
|   | Auditory      | .170  | .110 | .176  | 1.544 | .127 |       |      |
|   | Collaborative | .179  | .143 | .131  | 1.251 | .215 |       |      |
|   | Kinesthetic   | -.068 | .091 | -.079 | -.742 | .461 |       |      |
| 4 | (Constant)    | 1.263 | .681 |       | 1.854 | .067 | 3.838 | .007 |
|   | Access        | .581  | .500 | .120  | 1.164 | .248 |       |      |
|   | Motivation    | .239  | .113 | .231  | 2.109 | .038 |       |      |
|   | Auditory      | .156  | .108 | .161  | 1.442 | .153 |       |      |
|   | Collaborative | .169  | .142 | .124  | 1.186 | .239 |       |      |
| 5 | (Constant)    | 1.613 | .613 |       | 2.633 | .010 | 4.645 | .005 |
|   | Motivation    | .246  | .113 | .238  | 2.171 | .033 |       |      |
|   | Auditory      | .168  | .108 | .174  | 1.563 | .122 |       |      |
|   | Collaborative | .167  | .143 | .122  | 1.172 | .245 |       |      |
| 6 | (Constant)    | 2.096 | .454 |       | 4.613 | .000 | 6.254 | .003 |
|   | Motivation    | .247  | .114 | .238  | 2.170 | .033 |       |      |
|   | Auditory      | .192  | .106 | .200  | 1.818 | .073 |       |      |

### **3.4.2 Research Question 4: To what Extent do Overall Attitudes Towards Tablet Usage, Learning Style Preferences, Motivation and Access Predict Academic Achievement?**

The backwards stepwise regression analysis to determine what predicts academic achievement in a blended learning environment was only conducted on the data obtained from the independent school due to the fact that parental consent was not obtained to gain access to marks for enough of the learners at the public. The assumptions for a regression analysis were checked using the following tests; normally distributed residuals were tested using studentised residuals, a histogram of residuals and normal probability plots (Field, 2009). The histogram of residuals showed a normal distribution as did the probability plot. The studentised values also indicated normality with no absolute values greater than 3 and less than 1% of the values greater than 2.5 (Field, 2009). The next assumption that none of the independent variables had zero variance was also met. The next assumption that there should be no multi-collinearity between the variables was also met as no correlations were above 0.8 and the VIF values were all less than 10 (Tabachnick & Fidell, 2007). Homoscedasticity was tested using a regression standardized residual versus regression standardized predicted value scatterplot (Field, 2009). The data points formed a rectangular shape and so the assumption was met. Independence of errors was investigated using the Durbin-Watson test, the values fell in the acceptable range between 1 and 3 (Field, 2009) and so this assumption was also met. The final assumption is linearity, this was tested using partial regression plots. The Loess lines were generally linear for all variables and so this assumption was also met. Next influential cases were investigated by means of Cook's D values (Field, 2009). None of the Cook's D values were greater than 1 and thus no influential cases were identified.

Model 1 as evidenced in table 3.13 included the variables attitude towards tablet usage, learning style preferences (kinesthetic, auditory, visual, collaborative and competitive), motivation and access and was statistically significant ( $F(8,151)=2.111, p<0.05$ ), with the model explaining 5.3% of the variance. Access had the greatest predictive value ( $b=.207, t=2.587, p<0.05$ ) followed by auditory learning styles which has a negative influence on learner achievement ( $b=-.184, t=-2.207, p=.029$ ). The remaining variables were not statistically significant predictors of learner achievement.

The final model (model 6) was statistically significant ( $F(3,156)=4.599, p<0.01$ ), with the model explaining 6.4% of the variance. The variable with the strongest predictive value was access ( $b=.209, t=2.656, p=.037$ ) followed by auditory learning style preference which was a negative predictor ( $b=-.166, t=-2.019, p=.009$ ) and then attitudes towards tablet usage ( $b=-.158, t=-2.019, p=.045$ ). A summary of the result appears in table 3.13 below.

**Table 3.13: Regression Summary: Predictors of Academic Achievement in a Blended Learning Environment at the Independent School**

|       |             | Unstandardized |            | Standardized |        |          |       |      |      |
|-------|-------------|----------------|------------|--------------|--------|----------|-------|------|------|
|       |             | Coefficients   |            | Coefficients |        | Adjusted |       |      |      |
| Model |             | B              | Std. Error | Beta         | t      | Sig.     | F     | Sig  | R    |
| 1     | (Constant)  | 66.690         | 9.242      |              | 7.216  | .000     | 2.111 | .038 | .053 |
|       | Kinesthetic | 1.501          | 1.328      | .093         | 1.130  | .260     |       |      |      |
|       | Auditory    | -2.247         | 1.018      | -.184        | -2.207 | .029     |       |      |      |
|       | Visual      | -1.328         | 1.110      | -.101        | -1.196 | .234     |       |      |      |

|   |               |        |       |       |        |      |       |      |
|---|---------------|--------|-------|-------|--------|------|-------|------|
|   | Competitive   | -.861  | .964  | -.073 | -.893  | .373 |       |      |
|   | Collaborative | .008   | 1.222 | .001  | .006   | .995 |       |      |
|   | Motivation    | 1.309  | 1.403 | .080  | .933   | .352 |       |      |
|   | Access        | 15.956 | 6.168 | .207  | 2.587  | .011 |       |      |
|   | Attitudes     | -2.446 | 1.422 | -.145 | -1.720 | .087 |       |      |
| 2 | (Constant)    | 66.694 | 9.190 |       | 7.257  | .000 | 2.428 | .022 |
|   | Kinesthetic   | 1.504  | 1.262 | .093  | 1.191  | .235 |       |      |
|   | Auditory      | -2.246 | 1.000 | -.183 | -2.245 | .026 |       |      |
|   | Visual        | -1.327 | 1.103 | -.101 | -1.203 | .231 |       |      |
|   | Competitive   | -.861  | .961  | -.073 | -.896  | .372 |       |      |
|   | Motivation    | 1.309  | 1.399 | .080  | .936   | .351 |       |      |
|   | Access        | 15.956 | 6.147 | .207  | 2.596  | .010 |       |      |
|   | Attitudes     | -2.444 | 1.366 | -.145 | -1.789 | .076 |       |      |
| 3 | (Constant)    | 65.004 | 8.989 |       | 7.232  | .000 | 2.703 | .016 |
|   | Kinesthetic   | 1.487  | 1.261 | .092  | 1.179  | .240 |       |      |
|   | Auditory      | -2.275 | .999  | -.186 | -2.277 | .024 |       |      |
|   | Visual        | -1.235 | 1.098 | -.094 | -1.125 | .262 |       |      |
|   | Motivation    | .997   | 1.354 | .061  | .737   | .462 |       |      |
|   | Access        | 16.297 | 6.131 | .211  | 2.658  | .009 |       |      |
|   | Attitudes     | -2.686 | 1.338 | -.159 | -2.008 | .046 |       |      |
| 4 | (Constant)    | 67.097 | 8.515 |       | 7.880  | .000 | 3.144 | .010 |
|   | Kinesthetic   | 1.402  | 1.254 | .087  | 1.118  | .265 |       |      |
|   | Auditory      | -2.132 | .979  | -.174 | -2.179 | .031 |       |      |

|   |             |        |       |       |        |      |       |      |
|---|-------------|--------|-------|-------|--------|------|-------|------|
|   | Visual      | -.982  | 1.041 | -.074 | -.943  | .347 |       |      |
|   | Access      | 16.168 | 6.119 | .210  | 2.642  | .009 |       |      |
|   | Attitudes   | -2.570 | 1.327 | -.152 | -1.937 | .055 |       |      |
| 5 | (Constant)  | 63.839 | 7.781 |       | 8.205  | .000 | 3.710 | .006 |
|   | Kinesthetic | 1.272  | 1.246 | .079  | 1.020  | .309 |       |      |
|   | Auditory    | -1.967 | .962  | -.161 | -2.044 | .043 |       |      |
|   | Access      | 15.576 | 6.085 | .202  | 2.560  | .011 |       |      |
|   | Attitudes   | -2.589 | 1.326 | -.153 | -1.953 | .053 |       |      |
| 6 | (Constant)  | 67.987 | 6.635 |       | 10.246 | .000 | 4.599 | .004 |
|   | Auditory    | -2.026 | .961  | -.166 | -2.109 | .037 |       |      |
|   | Access      | 16.105 | 6.064 | .209  | 2.656  | .009 |       |      |
|   | Attitudes   | -2.673 | 1.324 | -.158 | -2.019 | .045 |       |      |

### 3.4.3 Research Question 4.1: To what Extent do Perceived Enjoyability, Perceived Ease of Use, Perceived Usefulness, Motivation and Access Predict Academic Achievement?

In order to gain a more in depth understanding regarding the three dimensions of attitudes towards tablet usage, a backwards stepwise regression analysis was performed. The results appear in table 3.14. Model 1 which included the variables perceived enjoyability, perceived ease of use, perceived usefulness, motivation and access was not significant ( $F(10,149)=1.851$ ,  $p>0.05$ ). While the final model (model 8) was significant ( $F(3,196)=4.495$ ,  $p<0.01$ ). The variables in this model were access, auditory learning style preference and perceived usefulness. Access was the strongest predictor of overall achievement ( $b=.200$ ,  $t=2.557$ ,  $p=.012$ ), followed

by auditory leaning style preference ( $b=-.194$ ,  $t=-2.484$ ,  $p=.014$ ). While perceived usefulness was included in the model it was not found to be a significant predictor at the 0.05 level.

**Table 3.14: Regression Summary: Perceived Enjoyability, Perceived Ease of Use, Perceived Usefulness, Motivation and Access as Predictors of Academic Achievement in a Blended Learning Environment at the Independent School**

|       |               | Unstandardized |            | Standardized |        |          |       |      |
|-------|---------------|----------------|------------|--------------|--------|----------|-------|------|
|       |               | Coefficients   |            | Coefficients |        | Adjusted |       |      |
| Model |               | B              | Std. Error | Beta         | t      | Sig.     | F     | R    |
| 1     | (Constant)    | 68.910         | 9.496      |              | 7.257  | .000     | 1.851 | .057 |
|       | Kinesthetic   | 1.938          | 1.380      | .120         | 1.404  | .162     |       |      |
|       | Auditory      | -2.438         | 1.032      | -.199        | -2.363 | .019     |       |      |
|       | Visual        | -1.389         | 1.115      | -.105        | -1.246 | .215     |       |      |
|       | Competitive   | -.852          | .965       | -.073        | -.883  | .378     |       |      |
|       | Collaborative | -.129          | 1.238      | -.009        | -.104  | .917     |       |      |
|       | Motivation    | 1.205          | 1.407      | .074         | .856   | .393     |       |      |
|       | Access        | 15.658         | 6.187      | .203         | 2.531  | .012     |       |      |
|       | Enjoyability  | .203           | 1.412      | .016         | .144   | .886     |       |      |
|       | Ease of use   | -1.110         | 1.631      | -.073        | -.680  | .497     |       |      |
|       | Usefulness    | -1.900         | 1.194      | -.141        | -1.592 | .114     |       |      |
| 2     | (Constant)    | 68.813         | 9.419      |              | 7.306  | .000     | 2.069 | .036 |
|       | Kinesthetic   | 1.896          | 1.316      | .117         | 1.441  | .152     |       |      |
|       | Auditory      | -2.455         | 1.015      | -.201        | -2.418 | .017     |       |      |
|       | Visual        | -1.398         | 1.108      | -.106        | -1.262 | .209     |       |      |

|   |              |        |       |       |        |      |       |      |
|---|--------------|--------|-------|-------|--------|------|-------|------|
|   | Competitive  | -.854  | .962  | -.073 | -.887  | .376 |       |      |
|   | Motivation   | 1.207  | 1.402 | .074  | .861   | .391 |       |      |
|   | Access       | 15.671 | 6.165 | .203  | 2.542  | .012 |       |      |
|   | Enjoyability | .168   | 1.366 | .013  | .123   | .902 |       |      |
|   | Ease of use  | -1.106 | 1.625 | -.072 | -.680  | .497 |       |      |
|   | Usefulness   | -1.905 | 1.189 | -.141 | -1.603 | .111 |       |      |
| 3 | (Constant)   | 68.745 | 9.372 |       | 7.335  | .000 | 2.341 | .021 |
|   | Kinesthetic  | 1.889  | 1.310 | .117  | 1.442  | .151 |       |      |
|   | Auditory     | -2.443 | 1.007 | -.200 | -2.426 | .016 |       |      |
|   | Visual       | -1.400 | 1.104 | -.106 | -1.268 | .207 |       |      |
|   | Competitive  | -.847  | .957  | -.072 | -.885  | .378 |       |      |
|   | Motivation   | 1.215  | 1.396 | .074  | .870   | .386 |       |      |
|   | Access       | 15.757 | 6.106 | .204  | 2.581  | .011 |       |      |
|   | Ease of use  | -.994  | 1.341 | -.065 | -.741  | .460 |       |      |
|   | Usefulness   | -1.878 | 1.164 | -.139 | -1.613 | .109 |       |      |
| 4 | (Constant)   | 66.900 | 9.022 |       | 7.415  | .000 | 2.604 | .014 |
|   | Kinesthetic  | 2.100  | 1.277 | .130  | 1.645  | .102 |       |      |
|   | Auditory     | -2.548 | .996  | -.208 | -2.559 | .011 |       |      |
|   | Visual       | -1.447 | 1.101 | -.110 | -1.315 | .191 |       |      |
|   | Competitive  | -.945  | .946  | -.081 | -.999  | .320 |       |      |
|   | Motivation   | 1.141  | 1.391 | .070  | .820   | .413 |       |      |
|   | Access       | 15.394 | 6.077 | .200  | 2.533  | .012 |       |      |
|   | Usefulness   | -2.220 | 1.066 | -.164 | -2.082 | .039 |       |      |

|   |             |        |       |       |        |      |       |      |      |
|---|-------------|--------|-------|-------|--------|------|-------|------|------|
| 5 | (Constant)  | 68.958 | 8.657 |       | 7.966  | .000 | 2.933 | .010 | .068 |
|   | Kinesthetic | 2.002  | 1.270 | .124  | 1.577  | .117 |       |      |      |
|   | Auditory    | -2.397 | .977  | -.196 | -2.453 | .015 |       |      |      |
|   | Visual      | -1.154 | 1.040 | -.087 | -1.109 | .269 |       |      |      |
|   | Competitive | -.739  | .911  | -.063 | -.811  | .419 |       |      |      |
|   | Access      | 15.382 | 6.070 | .200  | 2.534  | .012 |       |      |      |
|   | Usefulness  | -2.224 | 1.065 | -.165 | -2.088 | .038 |       |      |      |
| 6 | (Constant)  | 66.558 | 8.126 |       | 8.191  | .000 | 3.395 | .006 | .070 |
|   | Kinesthetic | 2.050  | 1.267 | .127  | 1.618  | .108 |       |      |      |
|   | Auditory    | -2.488 | .970  | -.203 | -2.566 | .011 |       |      |      |
|   | Visual      | -1.153 | 1.039 | -.087 | -1.110 | .269 |       |      |      |
|   | Access      | 15.610 | 6.057 | .203  | 2.577  | .011 |       |      |      |
|   | Usefulness  | -2.339 | 1.055 | -.173 | -2.218 | .028 |       |      |      |
| 7 | (Constant)  | 62.438 | 7.233 |       | 8.632  | .000 | 3.930 | .005 | .069 |
|   | Kinesthetic | 1.883  | 1.259 | .117  | 1.496  | .137 |       |      |      |
|   | Auditory    | -2.293 | .954  | -.187 | -2.403 | .017 |       |      |      |
|   | Access      | 14.868 | 6.025 | .193  | 2.468  | .015 |       |      |      |
|   | Usefulness  | -2.268 | 1.053 | -.168 | -2.153 | .033 |       |      |      |
| 8 | (Constant)  | 67.199 | 6.521 |       | 10.305 | .000 | 4.495 | .005 | .061 |
|   | Auditory    | -2.376 | .957  | -.194 | -2.484 | .014 |       |      |      |
|   | Access      | 15.437 | 6.036 | .200  | 2.557  | .012 |       |      |      |
|   | Usefulness  | -2.000 | 1.042 | -.148 | -1.919 | .057 |       |      |      |

### **3.4.4 Research Question 5: To what Extent do Overall Attitudes, Learning Style Preferences, Access and Motivation Predict Learners' Desire to Continue / Discontinue Using Tablets in a Blended Learning Environment?**

A Binary Logistic regression was performed to determine what best predicts whether learners want to continue/discontinue using tablets. The results appear in table 3.14. The assumptions for the regression were tested in the following ways. The probability of wanting to continue using tablets is the same regardless of the category  $\chi^2 (8) = 22.750, p < 0.01$ . The error variation/badness of fit was investigated using the -2log likelihood. The final model had a lower value (182.390) than the null model (209.260) indicating that the final model performs better than the baseline model. The Hosmer and Lemmestow value is not significant ( $p > 0.05$ ) indicating that the model is correctly specified (Osborne, 2014).

The overall statistic was significant ( $p < 0.01$ ) therefore adding variables to the model does improve the model prediction. The Nagelkerke  $R^2$  value indicated that 15.6% of the variance is explained by the model. Roa's efficient score statistic shows that adding attitudes towards tablet usage to the model will improve it significantly (Wald  $\chi^2 (1) = 96.165, p < 0.01$ ). While adding access, motivation and learning style preferences did not improve the model significantly ( $p > 0.05$ ). The Exp (B) value was 4.145 indicating that every one unit increase in attitudes towards tablet usage resulted in the odds of wanting to continue using tablets that were 4.145 times that of learners with attitudes one unit lower on any point of the attitude scale while holding all other variables constant.

**Table 3.15: Binary Logistic Regression Summary: Attitudes, Motivation, and Access as Predictors of Wanting to Continue/Discontinue Using Tablets in a Blended Learning Environment.**

|                     |               | B      | S.E.  | Wald   | df | Sig. | Exp(B) |
|---------------------|---------------|--------|-------|--------|----|------|--------|
| Step 1 <sup>a</sup> | Attitudes     | 1.422  | .369  | 14.885 | 1  | .000 | 4.145  |
|                     | Access        | .122   | 1.309 | .009   | 1  | .926 | 1.129  |
|                     | Motivation    | -.071  | .332  | .046   | 1  | .830 | .931   |
|                     | Kinesthetic   | .474   | .275  | 2.974  | 1  | .085 | 1.607  |
|                     | Auditory      | -.220  | .236  | .872   | 1  | .351 | .802   |
|                     | Visual        | .232   | .272  | .728   | 1  | .393 | 1.261  |
|                     | Collaborative | -.113  | .282  | .160   | 1  | .689 | .893   |
|                     | Competitive   | -.328  | .221  | 2.203  | 1  | .138 | .721   |
|                     | Constant      | -3.021 | 1.956 | 2.386  | 1  | .122 | .049   |

The reasons for learners wanting to continue using the tablets were explored by examining the responses to the open ended question “Would you like to continue using the tablet/iPad at school? Please provide reasons for your answer”. The 160 responses from the independent school and 90 responses from the public school appear in table 3.16. The results were in favour of continuing with 86.3% and 77.78% of learners from the independent and public school respectively wanting to continue. The most common response given from learner at both schools (independent 35%, public 3.2%) was that they were better or easier to learn from, this was coded

as a different item to ease of use which referred more to the process of using the tablet rather than learning with it although there was some overlap. Better and easier learning encompasses the usefulness dimension in that learners mentioned how they could be used to help them, for example using the school portal to get information, watching videos when they didn't understand a concept and taking pictures/videos of the teacher when he/she was explaining a difficult concept so they could watch it again later. 15.6% of learners from the independent school and 20% of learners from the public school cited ease of use as a reason for wanting to continue using the tablets, this includes being easier to find things on a tablet and better easier access to information. The second most common reason given at the independent school (25.6%) and third most common response at the public school (17.7%) was that they provided a physical benefit in that they were lighter to carry however only a few students noted the benefit of it being mobile and thus providing the opportunity to learn anywhere at any time (independent 2.5%, public 1.1%). Another popular response was that tablets are faster and more efficient than hardcopy textbooks. At the independent school, 18.8% of learners stated that they were fast and efficient while 21.1% of learners at the public school stated this. Again there was some overlap here where many learners referred to its ease of use and efficiency at the same time. Enjoyment and importance for the future were not very common responses. Only 10.6%(independent) and 5.5%(public) of learners found tablets to be enjoyable, fun or interesting to use while 13.1% (independent) and 6.7% (public) of learners saw the importance of using tablets for their future, this included comments such as needing to learn about technology in this technological era, being aware of the fact that universities use more technology and so it is helpful for them to learn how to use it now and that being technologically proficient could provide career opportunities as well as the fact that tablets were more environmentally friendly than hardcopy books.

Fewer learners reported not wanting to continue using tablets however their responses give us valuable information about what can be improved. 10% of learners from the independent school and 8.9% of learners from the public school mentioned that tablets were a distraction to them and in some cases they even stated that their marks had dropped as a result of this (2.2% public). The distractions come in the form of games, music, social media and non educational videos. On the other hand, a few learners (1.3%) from the independent school who wanted to continue using tablets stated that they could focus better when using tablets. The fact that tablets were not easy to use (independent 2.5%, public 4.4%) and were not efficient (5.6% independent, 1.1% public) was also given as a reason for not wanting to continue using tablets. Learners stated that it was difficult to write notes on the tablets, and that they caused eye strain, they reported that learners did not know how to use tablets properly and that their tablets were slow and had viruses. The physical limitations of tablets were also reported as reasons for not wanting to continue using tablets. Learners mentioned the fact that they break easily as a limitation as well as the fact that they had battery issues and that when there is load shedding they cannot charge their tablets.

**Table 3.16: Summary of Responses Given for Wanting to Continue/Discontinue Using Tablets**

| Reasons given                               | Independent        | Public             |
|---------------------------------------------|--------------------|--------------------|
| <b>Yes I want to continue using tablets</b> | <b>138 (86.3%)</b> | <b>70 (77.78%)</b> |
| Efficient/faster                            | 30 (18.8%)         | 19 (21.1%)         |
| Easy to use                                 | 25 (15.6%)         | 18 (20%)           |
| Mobility                                    | 4 (2.5%)           | 1 (1.1%)           |
| Physical benefits                           | 41 (25.6%)         | 16 (17.7%)         |
| Better/easier learning                      | 56 (35%)           | 29 (32.2%)         |

|                                                   |                    |                   |
|---------------------------------------------------|--------------------|-------------------|
| Enjoyment                                         | 17 (10.6%)         | 5 (5.5%)          |
| Improved marks                                    | 4 (2.5%)           | 0 (0%)            |
| Importance for the future                         | 21 (13.1%)         | 6 (6.7%)          |
| Communication                                     | 1 (0.6%)           | 0 (0%)            |
| Increased focus                                   | 2 (1.3%)           | 0 (0%)            |
| <b>No I do not want to continue using tablets</b> | <b>22 (13.75%)</b> | <b>20 (22.2%)</b> |
| Distraction                                       | 16 (10%)           | 8 (8.9%)          |
| Physical limitations                              | 4(2.5%)            | 5 (5.6%)          |
| Not easy to use                                   | 4 (2.5%)           | 4 (4.4%)          |
| Not efficient/faster                              | 9 (5.6%)           | 1(1.1%)           |
| Poorer marks                                      | 0 (0%)             | 2(2.2%)           |

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### **3.3 Conclusion**

Learners reported high levels of access to all forms of technology such as access to the internet, mobile phones, computers and tablets. Tablets were used in class by all learners, and the majority of learners used their tablets for assignments at school, homework and studying. Learners reported using tablets less for communication purposes than for schoolwork. Levels of access between the schools was not significantly different between the schools with the exception of lower access to the internet at home for learners at the public school.

The results show that learners' attitudes towards using tablets in a blended learning environment are somewhat positive. A factor analysis revealed three attitude subscales namely; Perceived Enjoyability, Perceived Ease of Use and Perceived Usefulness thus, each is considered separately. Learners scored highest for perceived ease of use, followed by perceived usefulness and then perceived enjoyability. An independent samples T-test revealed that attitudes towards tablet usage were significantly more positive for the independent school in each of the subscales as well as overall attitudes.

A series of backwards stepwise regression analyses showed that (a) collaborative and competitive learning style preferences at the independent school and access motivation and collaborative learning style preference predicted overall learner attitudes, (b) kinesthetic, collaborative and competitive learning style preferences and access at the independent school and collaborative learning style preference at the public school predicted perceived enjoyability, (c) kinesthetic, collaborative and competitive learning styles at the independent school and access and visual and kinesthetic learning style preferences at the public school predicted perceived ease of use and (d), kinesthetic learning style preference at the independent school and motivation at the public school predicted perceived usefulness.

Another backwards stepwise regression analysis also revealed that overall achievement in the independent school is predicted by attitudes towards tablets as well as access and auditory learning styles. Learner achievement was only explored at the independent school as parental consent for marks was not obtained from the public school.

Learners were also asked whether they wanted to continue using tablets at school. A binary logistic regression revealed that attitudes towards tablet usage strongly predicted whether or not learners wished to continue using the tablets. While the open ended responses provided insights into the reasons for wanting to continue/discontinue using the tablets. These results will be discussed in chapter 4.

## **Chapter 4: Discussion**

### **4.1 Introduction**

Technology is rapidly advancing and becoming increasingly available and as a result the use of technology in education is becoming progressively more popular. Technology can be integrated into the classroom in a number of ways. Blended learning is one method of incorporating technology. Blended learning refers to the use of a combination of both online and face to face modes of instruction. Tablets offer a convenient way to enable learners to have a blended learning environment.

In South Africa, the Education department hopes to provide learners with tablets through initiatives such as the Smart School Project (Mawson, 2015). Many believe that the solutions to the problems within the education system lie in the provision of technology. It is assumed that technology will augment sparse resources and bring access to internet, e-textbooks and educational apps, thereby bridging the digital divide (Partridge 2007) and creating equality opportunities in education. This has been a priority of the Department of Education since democracy (Rohleder, Bozalek, Carolissen, Leibowitz & Swartz, 2008).

The focus on the digital divide has recently shifted away from the idea that is it a gap between those who have access to technology and those who do not have access to technology. This is due to the fact that personal and psychological factors have been found to influence the use of this technology over and above access (Partridge, 2007). Evidence also suggests that mere access to technology, while necessary is not sufficient for the successful integration of technology in schools (Partridge, 2007).

The Technology Acceptance Model (TAM) as a theoretical framework for studying attitudes towards educational technology has been well established (Cheung & Vogel, 2013; Edmunds et al., 2012). The extended TAM which includes the addition of enjoyability alongside perceived usefulness and perceived ease of use as important determinants of learner attitudes has also been supported in various studies (Bere, 2013; Venkatesh et al., 2012). The extended TAM is also in accordance with Ajzen and Fishbien (2010) and the Theory of Planned Behaviour, in that it postulates that attitudes are the antecedents of behavioural intentions and thus actual behaviour. According to Ajzen (1991), attitudes are made up of an affective, cognitive and behavioural dimension. This is demonstrated in the TAM with enjoyability (affective component), ease of use (behavioural component) and usefulness (cognitive component). Furthermore, the TAM also operates on the same assumptions as the Diffusion of Innovations Theory which states that relative advantage and compatibility (perceived usefulness) and complexity (ease of use) determine attitudes. This attitude formation according to Rogers (2003) occurs in the second stage of integration – persuasion. The preceding stage, the knowledge stage is where access and experience have an influence. Lastly, it is also important to note that The TAM (like the Theory of Planned Behaviour) postulates that attitudes towards technology influence an individual's behavioural intentions to use technology in the future which in turn predicts the actual use of the technology. Thus it is imperative that we assess learner attitudes towards technology when implementing it to ensure that the integration is successful. Over and above attitudes, several studies have identified certain personal factors which may also have an impact on the successful integration of technology. Among these are learning style preferences and motivation which were addressed in this study as well as attitudes (Crook, 2000; Jones et al., 2006; Passey & Rogers, 2003; Sucaromana, 2013).

In many studies, the use of blended learning has yielded positive results in terms of learner achievement (see Hsu & Hsieh, 2011; Lopez-Perez et al., 2011; Mahmoudi et al., 2012) although Torissi-Steele and Drew (2013) note that the reasons for this are not sufficiently explored. It must also be noted that a popular method of measuring the success of technology integration is through examining learner achievement. Hence this study considered access to technology as well as attitudes towards tablets, learning style preferences, and motivation in conjunction with learner achievement in order to gain a better understanding of blended learning and what makes it successful.

#### **4.2. Levels of Access to Tablets and Other Forms of Technology**

The first question addressed in this study was the levels of access to various forms of technology that the learners in the sample had. Learners reported high levels of access to the internet, computers and tablets. All learners had tablets and used their tablets in the classroom and the majority of learners used their tablets for homework assignments and studying. Fewer learners reported using their tablets for communication purposes and social media. The high levels of access to these types of technology were expected as the schools who participated in this study had already implemented tablets into the learning environment. Based on the learners response to the open ended question it was found that the tablets were used primarily as an e-textbook as well as to create Power Points for projects, to find educational videos and to access educational resources on the school's educational portal.

### **4.3 Learner Attitudes Towards Tablets in a Bended Learning Environment**

The next question in this study assessed learner attitude towards tablet usage in a blended learning environment. The component of learner attitudes which was the most positive was that of perceived ease of use. Technology has become an integral part of everyday life for most children. They are more digitally aware than previous generations and as McHugh (2005) notes, the current generation is more likely to be equipped with cell phones laptops and iPads than with notebooks and pencils. In the increasingly technological world we live in and with the amount of technology that learners are exposed to on a daily basis, it would be expected that learner's find tablets easy to use, especially in this sample where we know that levels of access to technology were high and thus learners were experienced in using technology for various tasks such as communication, homework and studying. Over and above the ease of use scores, the fact that tablets were easy to use, were fast and efficient, and had physical benefits over using hardcopy textbooks such as the fact that they were light to carry and the fact that they were mobile made up a substantial portion of the reasons given for wanting to continue using tablets at both schools. This is in accordance with research conducted at schools by Ludwig and Mayrberger (2012) who remark that the speed and convenience offered by tablets is their greatest advantage.

A report by UNESCO (2002), suggests that there are four stages along a continuum which explain the level of technology integration in schools. These four stages are Emerging, Applying, Infusing and Transforming. Schools in the Emerging Stage have begun to acquire technology and are beginning to explore the possibilities of technology use. In the Applying Stage, a new understanding of the technology has emerged although teachers still dominate the learning environment. The Infusing Stage is where technology is integrated and embedded across the

curriculum and finally the Transforming Stage is where schools re-think and renew school organisation in creative ways (UNESCO, 2002).

After ease of use, perceived usefulness was the next most positive aspect of learner attitudes towards tablet usage. In the responses provided by learners as to why they wished to continue/discontinue using tablets, concepts dealing with perceived usefulness did not feature as much as those which encompassed ease of use. Whilst the idea that tablets enabled better or easier learning did occur often, the idea that tablets may improve their marks or be important for the future did not feature as much. Thus overall ease of use reasons were still the most frequent. The fact that perceived usefulness was not mentioned as frequently by the learners was reflected in the slightly less positive perceived usefulness scores.

If we follow the logic of this stage theory, if learners were in the Applying Stage of technology integration they would appreciate the technology and gain a new understanding of what it could do for them. Hence they would have a better understanding or appreciation of the perceived usefulness of tablets. Due to the fact that the perceived usefulness scores were not overwhelmingly positive and the fact that the reasons provided did not convey a good sense of understanding the importance and usefulness of tablets, it is likely that the schools which learners in this study were from are still in the Emerging Stage and are only moving towards the Applying Stage now. These results, suggests that more needs to be done to ensure that learners are aware of the usefulness of using tablets and what can be achieved when using them in order for them to move fully into the Applying Stage.

The least positive aspect of learner attitudes towards the use of tablets was perceived enjoyability. The fact that learners did not score very high in terms of this aspect was not

expected as previous research suggests that there is an innate pleasure derived from using tablets and other technology in education (Hu et al., 2011).

Malone and Lepper (1987) state that the use of mobile technologies such as tablets has the ability to enhance learning through challenge, curiosity, recognition, competition and co-operation and this in turn will make learning more fun. This being said, learners did not score very high in terms perceived enjoyability. Therefore, low enjoyability scores may be a result of the way tablets were used at the schools. According to learner descriptions in this study, the main function of the tablets at the schools in this study were as an e-textbook with more limited use of additional features such as educational applications and online learning. Hence the mode of technology use does not necessarily create challenge, curiosity, recognition, competition and co-operation and is thus perceived as less enjoyable.

Another possible reason for the low enjoyability scores could be due to the fact that several learners mentioned that they found tablets to be distracting. The distracting nature of the tablets is not in accordance with previous research which suggested that learners were more attentive when using tablets (Enriquez, 2010) however, as mentioned in the literature review, the majority of studies on learner attitudes towards tablets have been conducted on university students. Thus, the higher levels of attentiveness could be a product of the developmental stage that the learners are in. This highlights the need for more research on high school aged learners to be conducted in order to gain more insight into this.

It was found that the independent school had more positive overall attitudes towards tablets as well as all of the components of attitudes towards tablet usage than the public school. The independent school has been using tablets for under a year whereas the public school was one of

the first schools to start introducing tablets. These findings are in contrast to previous studies which show more positive attitudes towards technology over time (Weisburg, 2011). However, there are various other factors which need to be considered. Knezek and Christiansen (2008) provide a possible explanation for the fact that the public school had significantly less positive attitudes towards tablet usage than the independent school. In a review of the literature they found that many studies reported that learner attitudes towards computers decrease with age and that this is linked to a general decrease in attitudes towards school as a whole. Therefore, the fact that learners at the public school were on average older than the learners at the independent school may also be a contributing factor to the less positive attitudes towards tablets that were found. A one-way ANOVA with Tukey HSD post-hoc tests as evidenced in Table 4.1 was conducted to examine whether learner attitudes towards tablets decreased as learners progressed to higher grades in the sample used in this study. The results showed that grade 8 learners did not have significantly different attitudes from grade 9 and 10 learners however they did differ significantly from grade 11 and 12 learners. Grade 9 and 10 learners were also found to have significantly different attitudes to grade 12 learners. The results showed a general decrease in attitudes towards tablet usage in learners in higher grades providing support for the idea that Knezek and Christiansen (2008) put forward. Further research in this area could provide more valuable information regarding this.

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**Table 4.1: ANOVA Showing Difference in Overall Attitudes Toward Tablet Usage**  
***Between Grades at the Independent School***

|           |           | Mean           | 95% Confidence Interval |      |             |             |
|-----------|-----------|----------------|-------------------------|------|-------------|-------------|
|           |           | Difference (I- |                         |      |             |             |
| (I) grade | (J) grade | J)             | Std. Error              | Sig. | Lower Bound | Upper Bound |

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|                       |    |          |        |       |         |        |
|-----------------------|----|----------|--------|-------|---------|--------|
| 8 (mean= 9<br>4.12)   | 9  | .08494   | .14265 | .976  | -.3086  | .4785  |
|                       | 10 | -.01056  | .15190 | 1.000 | -.4296  | .4085  |
|                       | 11 | .40678*  | .12638 | .013  | .0581   | .7554  |
|                       | 12 | .72672*  | .14265 | .000  | .3332   | 1.1202 |
| 9 (mean=4.10<br>04)   | 8  | -.08494  | .14265 | .976  | -.4785  | .3086  |
|                       | 10 | -.09550  | .16677 | .979  | -.5556  | .3646  |
|                       | 11 | .32184   | .14391 | .172  | -.0752  | .7189  |
|                       | 12 | .64179*  | .15839 | .001  | .2048   | 1.0787 |
| 10 (mean 8<br>=4.14)  | 8  | .01056   | .15190 | 1.000 | -.4085  | .4296  |
|                       | 9  | .09550   | .16677 | .979  | -.3646  | .5556  |
|                       | 11 | .41734   | .15309 | .054  | -.0050  | .8397  |
|                       | 12 | .73728*  | .16677 | .000  | .2772   | 1.1974 |
| 11(mean 8<br>= 3.72)  | 8  | -.40678* | .12638 | .013  | -.7554  | -.0581 |
|                       | 9  | -.32184  | .14391 | .172  | -.7189  | .0752  |
|                       | 10 | -.41734  | .15309 | .054  | -.8397  | .0050  |
|                       | 12 | .31994   | .14391 | .176  | -.0771  | .7170  |
| 12 (mean 8<br>= 3.40) | 8  | -.72672* | .14265 | .000  | -1.1202 | -.3332 |
|                       | 9  | -.64179* | .15839 | .001  | -1.0787 | -.2048 |
|                       | 10 | -.73728* | .16677 | .000  | -1.1974 | -.2772 |
|                       | 11 | -.31994  | .14391 | .176  | -.7170  | .0771  |

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

## **4.4 What Influences Learner Attitudes?**

### **4.4.1 Learning styles and Learner Attitudes**

The fact that learning styles influence attitudes regarding educational technology is supported by previous research in the field (Marlow & Shaw, 1999; Pruet et al., 2014). Certain learning styles have been found in this study to have an impact on learner attitudes towards tablets and the three constructs which make up these attitudes, perceived enjoyability, perceived ease of use and perceived usefulness. Perceptions about blended learning have been found to differ across learning styles in previous research (Akkoyunlu & Soylu, 2008). Torissi-Steele and Drew (2013) conducted a review of the literature on blended learning and they found that satisfaction with blended learning was affected by learners preferred learning styles in a number of studies. In order to design blended learning programs, it is essential to know how learners learn. Thus examining the learning styles which effect learner attitudes and thus their desire to use tablets is essential and it can provide valuable insight into the design of such courses and how they would best suit individuals with different learning styles and how instructional time should be allocated to various learning types (Graf et al., 2007). Kinshuk, Lui and Graf (2009) also note that it is important to provide learners who are not matched to the learning environment with suggestions on how to learn differently. Equipped with this knowledge, learners may develop more positive attitudes towards the use of tablets if they do not have learning styles which are matched to their learning environment.

Attitudes at the independent school were predicted by collaborative and competitive learning styles while attitudes at the public school were influenced by among other things, a collaborative learning style preference. Collaborative learning styles were thus found to predict attitudes at

both schools. Several researchers state that the use of tablets results in a more collaborative learning environment (Enriquez, 2010; Lee et al., 2009; Ludwig & Mayrberger, 2012) thus indicating that collaborative learners would be matched to the learning environment and would therefore have more positive attitudes towards the use of tablets (Kinshuk, Lui & Graf, 2009).

In this study, it was found that a competitive learning style also predicted learner attitudes towards tablet usage at the independent school. In general, learners who are more competitive, or who have a more competitive learning style preference aim to perform better than their peers (Diaz & Carnal, 1999). Jones et al. (2006) as well as Eales et al., 2002, posit that the use of tablets results in increased perceived control or autonomy which would suit competitive learners. Thus, amongst learners in this study, those who had more competitive learning style preferences were also more likely to have more positive attitudes towards the use of tablets. Results from Pruet et al., (2014) were in accordance with the findings of this study. Their results indicated that competitive learners had more positive attitudes towards tablets and that they appreciated the time allocated for tablet use.

To gain a more in depth understanding of attitudes, the predictors of perceived enjoyability, perceived ease of use and perceived usefulness were also considered separately. Looking only at learning styles in this section, it was found that in the independent school, enjoyability was predicted by competitive, collaborative and kinesthetic learning style preferences, although the relationship between kinesthetic learning style preference and enjoyability was negative. At the public school, collaborative learning style preference was the only predictor of enjoyability.

As mentioned above, competitive learners would favour an environment where there was an increased level of autonomy and that this results in more positive overall attitudes towards the

use of tablets. Furthermore, competitive learning style preferences influenced perceptions of enjoyability. Extending this idea to Malone and Lepper's motivation theory (1987) if motivation is enhanced then learning is perceived as fun and thus the use of tablets is perceived as more enjoyable.

Collaborative learning style preferences also influenced perceived enjoyability associated with tablet use. Due to the fact that blended learning practices encourage collaborative learning (Enriquez, 2010; Lee, Yoon, & Lee, 2009; Ludwig & Mayrberger, 2012), learners with a collaborative learning style preference are matched to their learning environment, thus enabling higher perceptions of enjoyability (Kinshuk et al., 2009).

The third learning style preference which had an influence on perceived enjoyability was a preference for a kinesthetic learning style. This relationship however was negative. If we consider the fact that kinesthetic learners prefer the use of concrete examples and active movements when learning (Fleming, 2006), it is evident that the learning environment created by the use of tablets does not match this learning style preference hence, learners who prefer active movements when learning perceive tablets as less enjoyable to use for learning.

Ease of use was predicted by competitive, collaborative and kinaesthetic learning styles at the independent school while at the public school, the learning styles which predicted ease of use were visual and kinesthetic. The relationship between ease of use and kinesthetic learning style preferences was also negative as it was with perceived enjoyability.

Ease of use is also influenced by whether or not a learner is matched in terms of learning styles. Collaborative and competitive learning style preferences are more suited to the use of tablets as mentioned previously which is a contributing factor as to why they perceive tablets to be easier

for these learners to use for learning. Additionally, visual learners prefer learning with the aid of pictures and diagrams (Fleming, 2006). The use of tablets is a highly visual task thus explaining why a visual learning style preference influences perceived ease of use.

Perceived usefulness was again predicted by kinesthetic and collaborative learning style preferences at the independent school while at the public school, only auditory learning style preferences predicted perceived usefulness. It is interesting to note however that kinesthetic learning style preferences have a positive relationship with perceived usefulness and not a negative relationship as in the case of perceived enjoyability and perceived ease of use. This indicates that the mismatch between learning style and learning environment, while having a negative impact on perceived enjoyability and perceived ease of use, does not have the same effect on perceived importance.

Auditory learning style preferences were found to influence perceived importance. Pruet et al. (2014) mentioned that auditory learners enjoyed working with tablets however no direct link has yet been established between auditory learning style preference and perceived usefulness.

#### **4.3.2 Motivation and learner attitudes**

Motivation was also found to be a predictor of overall learner attitudes at the public school. When looking at the three attitude subscales separately one can see that motivation predicts perceptions of ease of use as well as the perceived usefulness of using tablets. Educational material is seldom inherently interesting or enjoyable i.e. intrinsically motivating (Ryan & Deci, 2000). However, Passey et al., (2003) note that the use of various forms of educational technology such as tablets increases intrinsic motivation. Ryan and Deci (2000) note that if learners' value and self-regulate activities they are more likely to be motivated – tablets provide

an opportunity for learners to self regulate thereby increasing motivation. Eales et al., (2002) also note the importance of learners being in control of learning, thus they claim that the use of tablets and the resulting perceived control learners have when learning with tablets is a motivational factor. The use of tablets in the classroom thus has the potential to motivate students if used correctly. The fact that learner motivation is not high in this sample is an indication that this is not being fully accomplished and the fact that learners do not have high levels of motivation could be one of the reasons that attitudes towards technology were not altogether positive in this sample. Lim and colleagues (2014) also mention the fact that learners who lack self motivation have a limited ability to benefit from blended learning environments, the results of this study are in accordance with this statement in that motivation influences attitudes and these attitudes in turn influence achievement and the desire to continue using tablets as will be discussed later.

#### **4.4.3. Access and Learner Attitudes**

Access to technology was also found to predict overall learner attitudes as well as perceived ease of use in the public school. Access to technology has a dual function. Firstly it allows learners to be familiar with technology and when they are comfortable with the technology, they will find it easier to use. Secondly, access also includes access to the internet which will make learning with a tablet more beneficial thus creating more positive attitudes towards tablets in a blended learning environment.

According to Rogers Diffusion of Innovations theory (Rogers 2003), access has more of an impact in the knowledge stage. This suggests that learners at the public school may not have

successfully navigated the first stage of the innovation process where access plays a role and thus access was found to have predictive power over learners' attitudes.

One of the reasons for not wanting to continue using tablets at the public school was the fact that the e-textbooks didn't work properly. This included the fact that they battled to connect to the internet and they had issues during load shedding as they could not charge their tablets. This was among the most prominent reasons provided by those learners who expressed that they did not wish to continue using tablets. It is thus possible that infrastructure at the public school is not as stable as it should be which is why higher levels of access and subsequent use of tablets result in more positive attitudes towards tablets, specifically with relation to perceived ease of use.

#### **4.5 What Influences Learner Achievement?**

Improving learner achievement is the ultimate goal of blended learning which aims to be a more efficient and effective pedagogy. The predictors of learner achievement were examined in order to gain a better understanding about learner achievement and how best to improve levels of achievement in a blended learning environment. Learner achievement is also often seen as an indication of the success of an innovation (Torissi-Steele & Drew, 2013). Learning style preference, access and learner attitudes towards tablet use were all found to influence learner achievement. This supports the idea that there is more to successful integration of technology than the mere provision of the technology itself. Thus, whilst access is certainly a necessary component of successful integration, it is not sufficient.

#### **4.5.1 Attitudes**

Evidence from this study suggests that attitudes towards technology also predict learner achievement. This is in accordance with findings from several studies. Mahmoudi et al. (2012) found that positive attitudes were associated with learner achievement as did Grasha and Hicks (2000) who looked at learner achievement in a blended learning environment as well as Hsu and Hsieh (2011). Lopez-Perez and colleagues (2011) also explored blended learning environments and they found that blended learning was related to increased learner performance and decreased drop-out rates. Furthermore they discovered that this relationship between blended learning and achievement was as a result of attitudes towards blended learning. It is worrying to note that attitudes towards technology are not all together positive in this study as they have such an impact on learner achievement (and learner attitudes). Perceived ease of use received the highest scores followed by perceived usefulness. However the learners did not score as high on the perceived enjoyability. In order for overall attitudes to be more positive, all of these aspects need to be addressed, with particular attention being paid to increasing learners understandings of the importance and usefulness associated with using tablets and not only the, easy and convenient aspects of using tablets to facilitate blended learning as well as promoting enjoyability through course design which promotes autonomy and motivates learners. Improved attitudes towards tablets would then result in higher marks thus reflecting the success of the integration of the tablets.

#### **4.5.2 Learning Styles**

Learning styles were found to predict learner achievement, more specifically, auditory learning style preferences. Auditory learners prefer discussions and verbal explanations. A more

collaborative environment as created through the use of tablets in a blended learning environment makes use of small group discussions which provides a possible explanation as to why auditory learning style preferences predict learner achievement. The fact that learning style preferences predicted learner achievement in this sample is in accordance with results from several other international studies (Chamorro-Premuzic & Arteche, 2008; Grasha & Hicks, 2000; Pruet et al., 2014) as well as a study conducted here in South Africa (Koorse, Cilliers & Calitz, 2010) which also found that auditory learning style preferences predicted learner achievement. This result however was found in an information technology (IT) class and not in a blended learning environment per se. Kinshuk, Lui and Graf (2009) conducted a study on learners who were taking courses that did not match their learning style preferences. They found that learners with stronger learning style preferences had more difficulty learning and thus had lower levels of achievement when there was a mismatch between learning style and learning environment than learners who did not have such a strong preference for a particular learning style. Thus it is imperative to consider learning style preferences when designing blended learning environments so that all learners can benefit.

#### **4.5.2 Access**

The results from this study indicate that access to technology predicts learner achievement. Access measured this such as levels of use of the technology for communication, access to the internet and using tablets for homework, studying and in class. Thus if learners scored higher on the access scale, that would mean that they are making/ able to make better use of their tablets.

From this perspective it is clear to see that increased access to and use of the tablets is more beneficial to learners and this reflects in their overall marks.

Much focus in recent years has fallen on the provision of technology to reduce the digital divide and provide equal access to educational material. The fact that access to technology influences learner achievement (and to some extent learner attitudes) proves that access to technology is a very necessary component in introducing a blended learning environment. However, this result cannot be seen in isolation and it is imperative that we also consider the intrinsic factors which have been explored in this study.

#### **4.6 The role of Attitudes in Learners Desires to Continue Using Tablets**

The Theory of Planned Behaviour (Ajzen, 2005) is a well established theory which looks at how attitudes are related to behavioural intentions. Due to the fact that certain attributes that are associated with a behaviour are already valued positively or negatively, we automatically develop a favourable or unfavourable attitude towards that behaviour. The TPB is included in this literature review as it forms the foundation of many other theories. The core aspect of this theory is the idea that attitudes affect behaviour. Davis (1989) developed the Technology Acceptance Model, like many others, drawing on the TPB. In fact, the TAM uses TPB as a theoretical framework to explain the antecedents of behavioural intentions which in turn determines actual use.

The initial TAM consisted of two factors, Perceived Usefulness and Perceived Ease of Use. The original TAM has undergone several modifications over the years, one of the more prominent being the addition of perceptions of enjoyability (Venkatesh et al., 2012). This study supports the

extended technology acceptance model in that learners attitude towards using tablets (as measured by perceived ease of use, perceived usefulness and perceived enjoyability) in a blended learning environment predict their intentions or desires to continue using tablets.

Furthermore, the reasons which learners provided for wanting to continue/discontinue the use of tablets also reflected these attitude components. Many learners expressed that it was the ease of use associated with tablet use which was a driving factor. This included characteristics of the tablets such as the fact that they were light and easy to carry as well as the fact that easier to use than textbooks, in part due to the fact that they were perceived as being faster or more efficient in terms of being able to access information. The mobility of tablets was another factor pertaining to ease of use which was mentioned by the learners. In terms of perceived enjoyability, factors mentioned by the learners included the fact that they were fun to use but on the other hand, the distracting nature of tablets was something which detracted from the positives associated with tablets. Some learners indicated that they believed their marks were declining because they were using tablets and couldn't concentrate well in class which was why they did not wish to continue using the tablets. Only a few learners mentioned the fact that tablets were important for their future, in terms of being able to use technology at University when they finished high school or even for future job prospects. This reflected their perceptions of perceived usefulness associated with the use of tablets.

These results show that attitudes towards the behaviour, as made up of perceived enjoyability, perceived ease of use and perceived usefulness predict behavioural intentions to continue the behaviour thus supporting the Extended Technology Acceptance Model. This further supports the idea that learner attitudes are a key aspect to consider when integrating technology in education in order for the integration to be successful.

## 4.7 Conclusion

It is evident that blended learning is an important aspect in education today. It is therefore necessary to investigate which factors influence the integration of technology such as learner attitudes and which factors influence them as well as learning style preferences and motivation. This study found that attitudes towards tablets predict learner achievement. Moreover, attitudes were found to predict learners' desires to continue using the tablets. It is thus imperative that learners should have positive attitudes towards technology for successful integration to occur. Motivation, access and collaborative and competitive learning styles predict attitudes towards tablets and so these elements need to be addressed in order for attitudes to be more positive.

In South Africa, academic achievement has been attributed to many external factors such as socio-economic status, attendance and English proficiency, as well as internal factors such as locus of control, and self discipline (Fraser & Killen, 2003; Howie, 2003). The results from this study indicate that internal factors such as attitudes towards technology learning styles and motivation also predict learner achievement in a blended learning environment.

It is therefore possible to see from this research that the relationships explored are more complex than just a linear examination of models as the arguments illustrate. While the qualitative information in this study provided a wealth of information, in order to better understand the nuances of these relationships, more qualitative findings would be beneficial.

## **Chapter 5: Limitations and Recommendations**

### **5.1. Introduction**

This aim of this study was primarily to measure learner attitudes towards the use of tablets in a blended learning environment and to determine whether attitudes would predict learner achievement and learners desire to continue using tablets in the future. The factors which were thought to influence attitudes such as motivation and learning style preferences were also examined in order to gain a more in depth understanding of the situation. This chapter discusses the various conceptual limitations pertaining to this study as well as the methodological limitations of this study regarding the scale and the sample. It also identifies recommendations for future research in this area stemming from the limitations of this study.

### **5.2 Conceptual Limitations**

Within social psychology, many theories exist which attempt to explain human behaviour in various contexts. In line with this, there are also a wide variety of theories which attempt to understand human behaviour in the context of technology integration. Many of these theories consider attitudes towards technology in education when examining what make technology integration successful. Several prominent theories regarding attitudes towards technology were identified in this study. These theories are the Theory of Planned Behaviour (Ajzen, 2005), The Diffusion of Innovations Theory and the Diffusion of Innovations process (Rogers, 2003), and the Technology Acceptance Model (Davis, 1989) and its extended version (Venkatesh et al., 2012). Each of these theories provide valuable insights into the factors which influence attitudes

as well as how these attitudes in turn influence behaviour. Due to the fact that each of these theories consider slightly different aspects, it was difficult to find a composite scale which encompassed all of the theoretical underpinnings from each of the studies although several scales were identified which contained overlapping items. As a result this study had to make use of an adapted scale which contained all of the necessary items. A conceptual limitation which stems from this is that there has not been a sufficient amount of research conducted on any of these theories in a South African context. The methodological limitations pertaining to this are discussed in the following section.

### **5.3 Methodological Limitations**

#### ***Sample***

Participants who choose to volunteer to participate in the research are usually the individuals who have strong opinions about a topic and so the results obtained are not always as true a reflection as when a random sample is used. A convenience sample was also obtained in this study. As with every study this has the potential to influence results. The use of qualitative information in relation to the quantitative results helped in overcoming this to an extent.

An additional limitation of this study was that the sample size used in this study was relatively small. Furthermore, non-probability convenience sampling was used which only focused on a specific region. This affects the extent to which these results may be generalised.

Unfortunately, parental consent was not obtained for accessing marks of the learners from the public school and as such it was not possible to determine whether attitudes towards the use of tablets in a blended learning environment predicted learner achievement in this school. A further limitation regarding the public school was that data was only obtained from learners in grade 11 and thus a representative sample was not obtained.

### ***Design***

Due to the fact that this was a cross-sectional design and the questionnaire was only administered at one point in time, it was not possible to track learner attitudes over time. Furthermore, it was not possible to explore whether or not academic achievement improved or diminished as a result of the integration of tablets. There was some evidence from the qualitative portion of this study to suggest that this may be the case as a few of the learners indicated that they believed their marks had improved as a result of using tablets. The opposite affect may occur for other learners however such as the learners in this study who reported difficulty in concentrating while using tablets and the fact that this did not have a positive impact on their marks.

### ***Scale***

Despite paying careful attention to the methodology, this study was based on a self-report questionnaire which may result in common method variance whereby the associations between variables are found as a result of the method of data collection rather than associations between the constructs themselves (Kline, Sulksy & Rever-Moriyama, 2000)

Blended learning refers to a mode of introducing technology into the classroom. The term blended learning, as discussed, is a well used but ill defined concept (Alammary, 2014). This

study made use of the definition of blended learning which refers broadly to a combination of online and face-to-face instruction, made possible by the use of tablets. However, a limitation of this study was that it relied on information provided by the students regarding how they used their tablets as well as the principals' explanations regarding how the school was implementing the tablets. Torissi-Steele and Drew (2013) refer to transformative blends and minimally impacting blends. As a result of the way information was gathered, it was not possible to determine the degree of blending and the impact this may have had on learner attitudes and achievement.

Two different learning style scales were piloted for use in the current study. Following the pilot study, the scale used by Pruet et al (2014) was deemed the most appropriate for use in this study. However, no previous reliability information was found for the scale as is the case with many studies which make use of learning style scales. In the current study, the learning styles measures did not have particularly good reliability. This means that interpretation of the learning styles results should be treated with caution.

Learners' marks were only obtained mid-year due to the time constraints of the study. It would be beneficial to examine learners' marks over the course of the year or even a longer period of time in order to get a true representation of their achievement.

#### **5.4 Recommendations**

In order to address the limitations outlined with regards to the instruments, it is recommended that a study be conducted which considers the validity and reliability of using such a scale in the

South African context. While this study did consider aspects of reliability and validity, it is necessary for a focussed study on just the instruments to be conducted.

To expand the representativeness of participants, questionnaires would need to be administered to a larger number of participants from a larger geographical region. Due to the fact that learners in this study make use of the internet on their tablets, it would be possible for them to fill in an online version of the questionnaire. Future studies could incorporate the use of online as well as hard copy questionnaires in order to reach a wide sample and obtain a larger and more representative sample.

Evidence from this study suggests that attitudes vary between the grades or the developmental stages of the learners and so it would have been beneficial to have a more representative sample to see whether a similar pattern occurred at the public school as well as the independent school across grades in order to more fully investigate this phenomenon. Thus a recommendation for future studies would be to include a representative sample from all grades and this could also include primary school learners as well and high school learners.

Due to the time limitation of the current study, it was not possible to conduct a longitudinal study which tracked learners' attitudes towards tablet usage as well as their academic achievement over time. A recommendation for future studies in this area would be to make use of a longitudinal study design. This type of design could be used to track learners' attitudes towards tablets both before and during the process of tablet integration in schools as well as to see whether the integration of tablets had a positive impact on learner achievement.

Additionally a qualitative study or a mixed method study with these two schools could reveal further reasons why the public school had less positive attitudes towards the use of tablets than the independent school which have not been identified by the researcher. Observations would provide valuable information into how the technology is being used in the classroom and the effects of this which could be incorporated alongside the quantitative data.

The fact that this study made use of a self-report questionnaire exposed it to issues of common method variance. A recommendation to avoid this and improve the validity of the study is to include multiple measures i.e. a multi-trait/multi-method matrix which has been suggested as an appropriate way to decrease common method variance in future studies (Kline et al., 2000). It would not be recommended to exclude the use of self-report questionnaires all together as there are numerous rationales for using self-report questionnaires for research on attitudes towards technology. These include the fact that they provide an anonymous quality which is not possible through observation as well as the fact that it is often difficult to observe attitudes (Kenezek & Christiansen, 2008).

It was not possible to identify the degree to which learners were exposed to a blended learning environment. Recommendations for future research conducted in an environment where traditional face to face instruction is combined with online activities is to include a scale which determines the degree of blending. This would also enable comparisons between transformative blends and minimally impacting blends in terms of learners' attitudes towards the particular type of tablet usage.

It is still necessary to explore different scales especially the learning styles scale which did not have particularly good internal consistency reliability. Reliability information is seldom found

for learning style measures thus an important recommendation for future studies would be to address the reliability issues and develop a suitable learning styles scale, especially one which is appropriate for the South African context.

Lastly, it is recommended that in future studies; learner achievement is measured at more than one point in time to gain a more accurate representation of how well learners are performing at school. This links to a previously mentioned point regarding a longitudinal study whereby learner marks could also be obtained before and after the implementation of tablets into the learning environment.

## **5.5 Conclusion**

In an increasingly technological world, the use of tablets in the classroom is becoming more and more common. According to Ajzen's theory of planned behaviour (Ajzen 1991), attitudes predict behaviour and this was proved in this study. It is thus of vital importance to investigate learner attitudes and how to improve them as they play a vital role in the integration of tablets in schools.

Despite the limitations of this study it provides valuable insights into learner attitudes towards technology and the factors that influence these attitudes as well as which factors influence learner achievement. Findings will be useful for policy makers within the education industry to ensure that future implementations of tablets in the classroom are effective and beneficial.

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- working paper, available at <http://danlockton.co.uk>

## **Appendix A: Principal Approach Letters**



Psychology  
School of Human & Community Development  
**University of the Witwatersrand**  
Private Bag 3, Wits, 2050  
Tel: 011 717 4503 Fax: 011 717 4559



Dear Principal

Good day. My name is Ms Samantha Hart. I am currently completing my Masters in Research Psychology at the University of the Witwatersrand. My research is in the field of information communications technology (ICT) in education. The use of ICT in the classroom is rapidly increasing, yet there is not enough research on learner attitudes towards ICT. This study is of value because it will have implications for how ICT programmes for the classroom should be designed and implemented.

My study will consider the general computer attitudes, motivation, and learning styles of the learners, which will be measured by means of a questionnaire (please see attached). The aim of this research is to determine how the learners' motivation and learning styles influence their attitudes towards the use of iPads in school subjects. In order to gather data on this topic, I require the voluntary participation of learners from Grades 8 to 12 from Blue Hills College.

This study would benefit from access to learners' marks in order to determine how learning styles, motivation, and computer attitudes influence academic achievement. I would greatly appreciate your permission to access learners' marks. If this is agreed upon, we can discuss a system that would allow anonymity for the learners so that I would not be able to identify them by their marks. However, this study can be carried out with or without access to these marks and it is therefore of no consequence should you decide against access to marks.

Participation in the study will involve learners completing the questionnaire on learning styles, motivation, and the different facets of computer attitude. I will request consent from the learner's parent or guardian if he or she is under the age of 18. I have attached the information letter and consent form to this letter for your information. I will provide the copies of the information letters and consent forms for the parents. If possible, I would greatly appreciate it if your school assisted in the distribution and the collection of the parental consent forms if you grant me permission to conduct my research at your school. I will also require approximately 45 minutes per class at a time convenient for you during which to test the learners. If this is not possible, I am happy for the learners to complete the questionnaire at their convenience and I will collect the questionnaires from the school a week later.

Since the questionnaires request no identifying information, learners' anonymity is preserved. This does mean that individual feedback cannot be provided but the overall results of this study

will be made available to Blue Hills College. There are no risks or benefits associated with this study for the learners. This study will contribute to a broader understanding of how ICT can be used effectively in teaching and it is therefore of general benefit for learners and teachers in South Africa.

I would kindly like to ask your permission to collect data from your school. I have obtained ethical clearance from the University of the Witwatersrand. I would like to collect my data between April and June this year.

Should you grant me permission to conduct research, it would be appreciated if you could complete the attached consent form and fax or e-mail it to my supervisor, Prof. Sumaya Laher. You may also e-mail the letter to me or I can come and collect it. My contact details, together with those of my supervisor, appear below.

I look forward to hearing from you.

Yours sincerely,

Samantha Hart  
Cell: 0724366770  
E-mail: samantha.anne.hart@gmail.com

Prof. Sumaya Laher  
Tel: 011 717 4532  
Fax: 086 553 4913  
E-mail:



Psychology  
School of Human & Community Development  
**University of the Witwatersrand**  
Private Bag 3, Wits, 2050  
Tel: 011 717 4503 Fax: 011 717 4559



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This study would benefit from access to learners' marks in order to determine how learning styles, motivation, and computer attitudes influence academic achievement. I would greatly appreciate your permission to access learners' marks. If this is agreed upon, we can discuss a system that would allow anonymity for the learners so that I would not be able to identify them by their marks. However, this study can be carried out with or without access to these marks and it is therefore of no consequence should you decide against access to marks.

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I look forward to hearing from you.

Yours sincerely,

Samantha Hart  
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Tel: 011 717 4532  
Fax: 086 553 4913  
E-mail: [sumaya.laher@wits.ac.za](mailto:sumaya.laher@wits.ac.za)



Psychology

School of Human & Community  
Development

**University of the Witwatersrand**

Private Bag 3, Wits, 2050

Tel: 011 717 4503 Fax: 011 717 4559



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I, \_\_\_\_\_, principal of \_\_\_\_\_ (name of school), do/ do not consent for Samantha Hart to conduct research at this school. I do/ do not consent for her to have access to learners' marks. I am aware that this research will not interrupt class time or extra-curricular activities, unless otherwise agreed to by the principal and the relevant teacher(s) involved. I understand that pupils' participation in this study is completely voluntary and that all details will be kept confidential at all times.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## **Appendix B: Parental Consent Letter**



**Psychology**

**School of Human & Community  
Development**

**University of the Witwatersrand**

**Private Bag 3, Wits, 2050**

**Tel: 011 717 4503 Fax: 011 717 4559**



I, \_\_\_\_\_ do/do not consent for my child/ ward  
\_\_\_\_\_ (name of child) in Grade \_\_\_\_\_ (insert Grade) at Blue  
Hills College to participate in the research study to be conducted by Samantha Hart. I am aware  
that:

- By virtue of agreeing for my child/ward to participate in this study, I also agree to his/her marks being accessed in an anonymous and confidential manner.
- All information will remain anonymous and confidential.
- No information that may identify my child/ward or me will be included in the research report.
- Participation in this study is completely voluntary.
- My child/ward will not be harmed in any way during the assessment.
- My child's/ward's information will be kept confidential at all times.
- There are no risks or benefits associated with participation in this study.
- My child's/ward's participation or non-participation in the study will have no impact on her academic input and evaluation.

Name of Parent/Guardian: \_\_\_\_\_

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## **Appendix C: Participant Information Sheet**



Psychology

School of Human & Community  
Development

**University of the Witwatersrand**

Private Bag 3, Wits, 2050

Tel: 011 717 4503 Fax: 011 717 4559



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Dear Learner

Good day. My name is Samantha Hart and I am currently completing my Masters degree in Research Psychology at the University of the Witwatersrand. As part of my research project, I am conducting research into learners' attitudes towards information communications technology (ICT) in education. I would like to invite you to participate in my research.

Participation will involve the completion of the attached questionnaire as well as access to your marks. It should take you approximately 45 minutes to complete the questionnaire. Your response is valuable, as it will contribute towards determining how ICT can be used effectively in the classroom and how learners' attitudes toward the use of technology in the classroom affect academic performance.

Your responses will remain confidential. Completion and return of the questionnaire will be considered to indicate permission for me to use your responses and marks for my research project. There are no negative consequences of participating in this study and, should you choose not to participate, this will not be held against you in any way. As I am only interested in group trends, and have no way of linking any individual's identity to a particular questionnaire, I will not be able to give you individual feedback. You may request general feedback from me on the results of this study after 3 months. If you have any further questions or require feedback on the research, please feel free to contact me. My contact details appear below.

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

Yours sincerely

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Ms S Hart

Cell: 0724366770

E-mail: Samantha.anne.hart@gmail.com

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Prof S Laher

Tel: 011 717 4532

E-mail: sumaya.laher@wits.ac.za

## Appendix D: Ethics Clearance Certificate



Research Office

**HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)**  
R14/49 Laher

**CLEARANCE CERTIFICATE**

**PROTOCOL NUMBER: H15/05/16**

**PROJECT TITLE**

Investigating attitudes towards educational technology in South African learners and the impact of educational technology on learner motivation, learning styles and academic achievement

**INVESTIGATOR(S)**

Professor S Laher

**SCHOOL/DEPARTMENT**

Human and Community Development/

**DATE CONSIDERED**

22 May 2015

**DECISION OF THE COMMITTEE**

Approved unconditionally

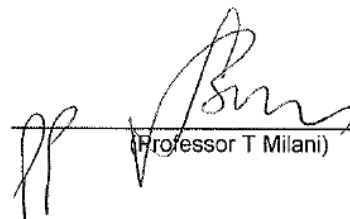
**EXPIRY DATE**

28 June 2017

**DATE**

29 June 2015

**CHAIRPERSON**

  
\_\_\_\_\_  
(Professor T Milani)

cc: Supervisor : N/A

---

## Appendix E: GDE Clearance Certificate



### **GAUTENG PROVINCE**

Department: Education  
REPUBLIC OF SOUTH AFRICA

For administrative use:  
Reference no: D2016 / 243  
enquiries: Diane Buntling 011 843 6563

### **GDE RESEARCH APPROVAL LETTER**

|                                |                                                                                                                                                         |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date:                          | 26 August 2015                                                                                                                                          |
| Validity of Research Approval: | 26 August 2015 to 2 October 2015                                                                                                                        |
| Name of Researcher:            | Hart S.A.                                                                                                                                               |
| Address of Researcher:         | P.O. Box 771; Fourways North; 2086                                                                                                                      |
| Telephone / Fax Number/s:      | 011 467 6988; 072 436 6770                                                                                                                              |
| Email address:                 | Samantha.anne.hart@gmail.com                                                                                                                            |
| Research Topic:                | Investigating the relationship between tablet/iPad attitude, learning styles, motivation and the learner performance in a blended learning environment. |
| Number and type of schools:    | TWO Primary and TWO Secondary Schools                                                                                                                   |
| District/s/HO                  | Johannesburg North and Johannesburg West                                                                                                                |

#### **Re: Approval in Respect of Request to Conduct Research**

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

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

#### ***CONDITIONS FOR CONDUCTING RESEARCH IN GDE***

1. The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter;

*Makhado*  
*2015/08/27*

1

*Making education a societal priority*

#### **Office of the Director: Knowledge Management and Research**

9<sup>th</sup> Floor, 111 Commissioner Street, Johannesburg, 2001  
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0508  
Email: David.Makhado@gauteng.gov.za  
Website: www.education.gpg.gov.za

2. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB);
3. A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned;
4. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, SGBs, teachers and learners involved. Participation is voluntary and additional remuneration will not be paid;
5. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage;
6. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year;
7. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
8. It is the researcher's responsibility to obtain written parental and learner consent;
9. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources;
10. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations;
11. On successful completion of the study the researcher must supply the Director: Education Research and Knowledge Management with an electronic copy (and a Hard copy if possible) as well as a Research Summary of the completed Research Report;
12. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned; and
13. Should the researcher have been involved with research at a school and/or a district office level, the Director and school concerned must also be supplied with the Research Summary of the study.

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

Kind regards



**Dr David Makhado**

**Director: Education Research and Knowledge Management**

DATE: 2015/08/27

## **Appendix E: GDE Clearance Certificate**

### **Demographic Information**

(Please cross the option that applies to you, where appropriate)

Age: \_\_\_\_\_

Grade: \_\_\_\_\_

Gender:

☐ MALE

☐ FEMALE

Subjects in which you use a tablet/iPad: \_\_\_\_\_

\_\_\_\_\_

How do you use the tablet/iPad? (eg. teacher asks for research, to view your e-textbook, to view a video in class, to do a presentation, to connect with teacher and friends on social media, to design or program things for projects, etc).

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

|    |                                                                                   |     |    |
|----|-----------------------------------------------------------------------------------|-----|----|
| 1  | Do you have access to the internet at home?                                       | YES | NO |
| 2  | Do you have a computer at home?                                                   | YES | NO |
| 3  | Do you have a tablet/iPad at home?                                                | YES | NO |
| 4  | Do you have a mobile phone?                                                       | YES | NO |
| 5  | Do you use the tablet/iPad during classes at school?                              | YES | NO |
| 6  | Do you use the tablet/iPad for assignments at school?                             | YES | NO |
| 7  | Do you use the tablet/iPad for homework?                                          | YES | NO |
| 8  | Do you use the tablet/iPad to study?                                              | YES | NO |
| 9  | Do you use the tablet/iPad to contact your classmates about schoolwork?           | YES | NO |
| 10 | Do you use your tablet/iPad to contact your classmates socially?                  | YES | NO |
| 11 | Do you use the iPad to contact your teachers for schoolwork?                      | YES | NO |
| 12 | Do you use your tablet/iPad for social media (Twitter, Facebook, Instagram, etc)? | YES | NO |

**INSTRUCTIONS:**

This questionnaire contains 25 statements. Please read each item carefully and place a cross (X) on the answer that best represents your opinion. There are no right or wrong answers. Please state your opinions as accurately as possible.

|     |                                                             | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----|-------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| 1.  | I like sitting still in the classroom.                      | 1                 | 2        | 3       | 4     | 5              |
| 2.  | I like to use my hands to describe things.                  | 1                 | 2        | 3       | 4     | 5              |
| 3.  | I like to walk around when I'm working.                     | 1                 | 2        | 3       | 4     | 5              |
| 4.  | I like note-taking while I'm studying.                      | 1                 | 2        | 3       | 4     | 5              |
| 5.  | I like to act and do drama.                                 | 1                 | 2        | 3       | 4     | 5              |
| 6.  | I remember when listening to the teacher.                   | 1                 | 2        | 3       | 4     | 5              |
| 7.  | I remember better when listening.                           | 1                 | 2        | 3       | 4     | 5              |
| 8.  | I like listening to music or songs.                         | 1                 | 2        | 3       | 4     | 5              |
| 9.  | I can remember my friends from their voices.                | 1                 | 2        | 3       | 4     | 5              |
| 10. | I love telling stories or jokes.                            | 1                 | 2        | 3       | 4     | 5              |
| 11. | I like looking at maps and pictures.                        | 1                 | 2        | 3       | 4     | 5              |
| 12. | I remember something better if I write it down.             | 1                 | 2        | 3       | 4     | 5              |
| 13. | I like to doodle and make notes when I learn something new. | 1                 | 2        | 3       | 4     | 5              |
| 14. | I can remember people's faces.                              | 1                 | 2        | 3       | 4     | 5              |
| 15. | I can do it if my teacher shows me how to do it.            | 1                 | 2        | 3       | 4     | 5              |
| 16. | I like group study.                                         | 1                 | 2        | 3       | 4     | 5              |
| 17. | I like to share my ideas with my friends.                   | 1                 | 2        | 3       | 4     | 5              |

|     |                                                                  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----|------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| 18. | I like to work alone.                                            | 1                 | 2        | 3       | 4     | 5              |
| 19. | I know more when I talk to my friends.                           | 1                 | 2        | 3       | 4     | 5              |
| 20. | My friends' ideas are useful.                                    | 1                 | 2        | 3       | 4     | 5              |
| 21. | If I practise more, I will get a good mark.                      | 1                 | 2        | 3       | 4     | 5              |
| 22. | I want to win when I compete with my friends.                    | 1                 | 2        | 3       | 4     | 5              |
| 23. | I like competitive class activity.                               | 1                 | 2        | 3       | 4     | 5              |
| 24. | My current mark is OK.                                           | 1                 | 2        | 3       | 4     | 5              |
| 25. | When I get home from school, I practise what I learned that day. | 1                 | 2        | 3       | 4     | 5              |

#### INSTRUCTIONS:

This questionnaire contains 31 statements. Please read each item carefully and place a cross (X) on the answer that best corresponds to your agreement or disagreement. The responses range from 1 to 5 with 1 indicating 'Strongly Disagree' and 5 indicating 'Strongly Agree'. There are no right or wrong answers. Please state your opinions as accurately as possible.

|    |                                                       | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|----|-------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| 1. | I enjoy doing things on a tablet/iPad.                | 1                 | 2        | 3       | 4     | 5              |
| 2. | Using the tablet/iPads is exciting.                   | 1                 | 2        | 3       | 4     | 5              |
| 3. | I enjoy tablet/iPad games very much.                  | 1                 | 2        | 3       | 4     | 5              |
| 4. | Lessons/studying on the tablet/iPad is fun.           | 1                 | 2        | 3       | 4     | 5              |
| 5. | I am not scared to use the tablet/iPad.               | 1                 | 2        | 3       | 4     | 5              |
| 6. | I concentrate well when I use a tablet/iPad.          | 1                 | 2        | 3       | 4     | 5              |
| 7. | I feel that I am in control when I use a tablet/iPad. | 1                 | 2        | 3       | 4     | 5              |

|     |                                                                                 | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----|---------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| 8.  | The tablet/iPad is easy to use for schoolwork.                                  | 1                 | 2        | 3       | 4     | 5              |
| 9.  | I use the tablet/iPad to help me to do my schoolwork.                           | 1                 | 2        | 3       | 4     | 5              |
| 10. | It does not take up much time for me to find things on the tablet/iPad.         | 1                 | 2        | 3       | 4     | 5              |
| 11. | I like to do assignments that allow me to use the tablet/iPad.                  | 1                 | 2        | 3       | 4     | 5              |
| 12. | The tablet/iPad allows me to do my work faster.                                 | 1                 | 2        | 3       | 4     | 5              |
| 13. | I can learn more from books than from a tablet/iPad.                            | 1                 | 2        | 3       | 4     | 5              |
| 14. | I know that tablet/iPads give me opportunities to learn many things.            | 1                 | 2        | 3       | 4     | 5              |
| 15. | I believe that it is very important for me to learn how to use a tablet/iPad.   | 1                 | 2        | 3       | 4     | 5              |
| 16. | I will be able to get a good job if I learn how to use a tablet/iPad.           | 1                 | 2        | 3       | 4     | 5              |
| 17. | Knowing how to use a tablet/iPad is important for university.                   | 1                 | 2        | 3       | 4     | 5              |
| 18. | I prefer learning from teachers to learning with tablet/iPads.                  | 1                 | 2        | 3       | 4     | 5              |
| 19. | Tablets/iPads are useful inside the classroom.                                  | 1                 | 2        | 3       | 4     | 5              |
| 20. | Tablets/iPads re useful outside the classroom.                                  | 1                 | 2        | 3       | 4     | 5              |
| 21. | Using tablet/iPads will stop future generations from learning their traditions. | 1                 | 2        | 3       | 4     | 5              |

|     |                                                                                  | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----|----------------------------------------------------------------------------------|-------------------|----------|---------|-------|----------------|
| 22. | Working with tablet/iPads will decrease people's relationships with one another. | 1                 | 2        | 3       | 4     | 5              |
| 23. | Knowing about how to use tablet/iPads earns one the respect of others.           | 1                 | 2        | 3       | 4     | 5              |
| 24. | I study by myself without anyone forcing me to study.                            | 1                 | 2        | 3       | 4     | 5              |
| 25. | If I do not understand something, I will not stop thinking about it.             | 1                 | 2        | 3       | 4     | 5              |
| 26. | When I don't understand a problem, I keep working until I find the answer.       | 1                 | 2        | 3       | 4     | 5              |
| 27. | I try to finish whatever I begin.                                                | 1                 | 2        | 3       | 4     | 5              |
| 28. | I enjoy working on a difficult problem.                                          | 1                 | 2        | 3       | 4     | 5              |
| 29. | I think about many ways to solve a difficult problem.                            | 1                 | 2        | 3       | 4     | 5              |
| 30. | I always remember to do my homework.                                             | 1                 | 2        | 3       | 4     | 5              |
| 31. | I study hard.                                                                    | 1                 | 2        | 3       | 4     | 5              |

**Would you like to continue using the tablet/iPad at school? Please provide reasons for your answer.**

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**Thank you for your participation!**