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TABLET TECHNOLOGY EVALUATED AGAINST TRADITIONAL TEACHING AND LEARNING METHODS IN TWO ACCOUNTING CLASSROOMS AT A SECONDARY SCHOOL: A MIXED METHODS DESIGN

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A research report submitted to the Wits School of Education, Faculty of Humanities,

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ABSTRACT AND KEYWORDS

This study reports on the evaluation of tablet technology against traditional teaching methods in the accounting education of a set of grade 11 learners in one school. The use of tablet technology is increasing in Gauteng classrooms, as government initiatives to provide schools with tablet technology has already begun. This study was prompted by the need to determine whether it is possible for learners to learn better with tablet technology as opposed to traditional teaching methods; because of the presupposed positive expectations that many educational stakeholders (learners, parents, teachers and government) frequently have regarding technological integration as a whole and tablet technology in particular.

This study used a mixed methods research design, with both a quantitative dimension (quasi experiment) and qualitative dimension (interviews). It was conducted at a secondary school in Lenasia, an area south of Johannesburg.
The study revealed that tablet technology has led to increased learner performance in grade 11, for the accounting subject at this particular school.

This study, presents its findings at a time when technology integration, is seen as part of the future of education in South Africa and the world at large. While this study provides results based on one particular school, we hope that its findings can help provide insight to others who wish to research the topic further or those eager to learn about tablet technology and its integration in classrooms.

Key words: tablet technology; traditional teaching methods; Gauteng; accounting; grade 11.

DECLARATION

I declare that the research report titled " Tablet technology evaluated against traditional teaching and learning methods in two accounting classrooms at a secondary school: a mixed methods design" is my own unaided work and has been completed under the guidance and supervision of my supervisor, Mr Ian Moll. It is being submitted for the degree of Masters in Education at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

___ _____

Naseerah Nanabhai (710656)

_____-03-2021_____

Date of submission

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LIST OF ABBREVIATIONS

CAPS – Curriculum Assessment Policy Statements
DBE – Department of Basic Education
DoE – Department of Education
GDE – Gauteng Department of Education
ICT – Information and Communications Technology
NCS – National Curriculum Statements
MEC – Member of the Executive Council

CHAPTER 1

INTRODUCTION

1.1 Introduction

In 2019, President Cyril Ramaphosa stated that every school pupil in South Africa will have a tablet device within the next six years. “Over the next six years, we will provide every school child in South Africa with digital workbooks and textbooks on a tablet device” (*Why give every South African School Kid a Tablet*, 2019, para 2) The government has already begun the roll out of devices at disadvantaged schools located in poor communities, select schools received them in January 2020- when the academic year started. (*Government is giving every South African learner a tablet – here’s who is getting theirs first,* 2019, para. 11.)

An American research study showed that ‘students using iPads scored better on literacy tests than students that didn’t use the device’ (Bebell & Pedulla, 2015). “These devices have the potential to be valuable sources of knowledge, helpful teaching tools and motivators of learning. Studies proving the benefits of using iPads in the classroom range from pre-schoolers using devices getting better results for literacy than their peers not using devices, to iPad-equipped medical students scoring 23% higher in their final exams than previous classes who were unequipped.” (*Tablet Technology – helping your child improve his learning*, 2019, para 3)

Research regarding tablet technology in classrooms display both positives and negatives of the device. “Pros of tablets in education include personalization, more flexible learning, integrated teaching and so on, while cons include aspects such as, cost, teacher training and security.” (*Tablets in education: The pros and cons* , n.d., para 6)

Thus, the debate remains as to whether the incorporation of tablet technology will lead to higher- quality teaching and learning and improved learner results.
This study looked at one school where tablet technology was introduced and aimed to determine the exact effects, improvements or differences that are apparent due to the tablet integration.

1.2 Problem Statement

The purpose of this research project was to gain an indication of whether learners learn Accounting (grade 11) better with tablet technology, as opposed to traditional teaching methods, in the context of one South African school. It also sought to understand the school context in order to illuminate the reasons whether the intervention was successful or not. It aimed to find out; whether tablet technology was enabling teaching and learning or hindering it in this particular school, for these particular grade 11 accounting learners. It further investigated the extent to which this was the case. This research project focused on a set of two grade 11 accounting classes in one school.

The hypothesis that was considered is whether these learners produce better results after being taught using tablets as compared to traditional teaching methods. If so, then the tablet enables teaching and learning by accomplishing desired aims, meaning it is used practically and with purpose. This necessitates the dependent variable being the results attained and the independent variable being the tablet technology or traditional method.

By measuring the effectiveness and functionality of technology in one school the research envisions to advance our understanding of Information and Communication Technology (ICT) pedagogical integration at high schools. It emphasizes the advantages of using technology in an Accounting classroom as an alternative to traditional classroom practices and it may inform future practices at schools. It also aims to contribute to the small body of information available on this topic.

1.3 Research Questions

1. **In the selected school sample, do learners learn Accounting better with Tablet Technology as compared to Traditional Methods?**
2. **What are the possible determinants of this?**

CHAPTER 2

LITERATURE REVIEW

2.1 Literature Review

In 2019, president Cyril Ramaphosa announced that in 2020 the department of education would begin providing school children with digital workbooks and textbooks on a tablet device. The use of tablets are a norm in some private schools. However, not many reports have been published about its exact effects on the success of teaching and learning in South African schools. Without such information, it is difficult to determine if this evolution is beneficial. This research is an attempt to evaluate the use of tablets against traditional methods in one Gauteng secondary school in order to shed light on the various aspects that relate to tablet technology and its integration in classrooms.

We cannot assume that the mere presence of technology in school classrooms, will simply lead to better and more effective teaching and learning. Attaining such a goal is more difficult than it is presumed, but nonetheless it is still highly attainable. There are a lot of factors that need to be considered, prepared for and prevalent so that the integration of tablet technology can be as effective as possible, and lead to better teaching and learning experiences. In the following the pages, I will give a review of the main concepts, ideas, points and arguments that I found in the literature on tablet technology that relates to my research.

Let us begin by exploring what tablets are. Hennessy (2007) defines and explains tablets as “wireless touch screen portable devices, similar to personal computers, that are smaller than a notebook but larger than a smartphone. They have wireless internet capabilities, a variety of software applications, web browsers and games. They allow direct input via stylus or finger so that objects can be easily moved around the screen (‘drag and drop’) or transformed by the teacher or students.”

R.O. Briggs (2008) describes a tablet and it's functionalities as "a wireless device that has a large display that is accessible for the learner, and allows the possibility to manipulate content on the display using a stylus or finger. Specific modelling software for tablets often enables text or line recognition and transformation into digital text boxes and straight connection lines, which enhance the intuitiveness of the interface."

The two descriptions provide very similar, but accurate definitions of tablets. Tablets are portable, mobile devices with a touchscreen display, used by teachers and learners in schools that are beginning to replace traditional textbooks and notebooks. They are digital, and have overlapping features of both computers, smartboards and smartphones. They are similar to mobile devices but have a larger screen and can support more applications. They also support the use of peripheral devices such as a visualizer and a flexible camera, the way computers do.

While the above outlines the technological affordances of tablet technology, the pedagogical affordances are also vital to explore. A 2014 study in the USA, termed "Strategies and Challenges In Ipad Initiative" (Chou, Block and Jesness, 2014) reported on the pedagogical affordances of tablet technology such as, inspiring teachers to be more creative and productive with instructional activities and student assignments. Allowing increased learning circles which amplified opportunities for professional development. The technology also caused a shift in pedagogy, where teachers began to use more student centred activities and personalized learning. Lastly, it also resulted in an increase in the occurrence of modelling and teacher collaboration (because of professional development workshops and community of practice).

Understanding the pedagogical affordances of tablet technology is fundamental in conducting this research project and this relationship materializes greatly in the rest of this literature review. But before that, the pedagogical requirements of the subject that is focused on in this research project and its importance is explored.
The subject discipline involved in this research study is accounting. In understanding the pedagogical requirements of the subject we understand that accounting is a subject that necessitates the completion of practice activities. These activities allow

learners the opportunity to apply conceptual knowledge, to carry out procedures and processes of analysing and interpreting financial data (Ngwenya & Maistry,2012). Hence from this we understand that it is a practice based subject, which places a lot of importance on step by step demonstrations, practical exercises and reviewing examples. As learners need to view and understand examples and then individually complete tasks to improve their understanding. The subject requires an increased amount of independent learning.

These points are further elaborated on by Blaga (2016), where he mentions that in a subject like accounting, the transmission of content and knowledge includes approaches that involve the learner in the learning process. To do so, the use of individual activities that help stimulate critical thinking, develop creativity and an interest in learning are utilised. All of which promote active participation of the learner in the classroom.

What Blaga points out to us is that we should understand that the pedagogical requirements of the accounting subject include self-directed learning, which concentrate on developing the learner's ability to be creative and think clearly.
If we neglect this and overlook or undervalue the pedagogical requirements of the subject while teaching it (especially when incorporating technology), we lower the success of teaching and learning of the subject in our classrooms. Therefore if we truly want to evaluate whether learners learn better with tablet technology in comparison to traditional methods, we need to need to fully understand the pedagogical requirements of the subject we are researching in relation to the pedagogical affordances of tablet technology.

While teaching a subject like accounting, teachers have to provide learners with a comprehensive amount of information, this is often done by placing it on the chalkboard or issuing them with printed notes. *(Chalkboard and teacher aids*, n.d., para. 11.) After presenting learners with this information, the teacher then engages with the information through explanations and demonstrations. This subject involves a large amount of demonstrative content, as such accounting teachers require a platform that can assist with demonstrations during teaching. Without such a platform, they will not be able to demonstrate the procedures, processes and steps

in recording, analysing and interpreting of financial information- which is at the heart of the content in the accounting subject.

The argument here is that due to the nature of teaching and learning in accounting, visual graphical displays are necessary. Tablets have multimedia and multimodal affordances and therefore, appropriating these affordances pedagogically could enhance the teaching and learning of accounting. Therefore, if done correctly the technical affordances of tablet technology can be matched with the pedagogical requirements of the accounting subject. The emphasis then, is not only on the technological affordances of tablet technology but on how these assist, encourage and foster pedagogical affordances during the accounting lesson.

We can highlight the technical affordances of tablet technology that foster appropriate pedagogy for accounting to include, the large screen display that allows the teacher to easily modify content and text, which permits collaboration between the learners and teacher. The displaying of assessment tasks on the tablet, which allow learners to discuss and clarify, thus making them more aware of learning goals. The motivational interactions, that use a multimedia presentation, with different sensory modes, to introduce a new concept, this engages and motivates students. The access to prior knowledge, where students can show, categorize and manipulate their prior knowledge and understanding, on the tablet. (McGregor, 2011). All of these are distinctive qualities of tablet technology that are advantageous to the processes involved and required in successful teaching and learning of accounting.

Furthermore, teachers can use concept map software on the tablet to create a ‘class map’ of prior knowledge. These allow collaboration between the teacher the student and other students, in representing and understanding their prior knowledge and how it all fits together.

Additional pedagogical affordances of tablet technology in the classroom, include allowing the display and review of step by step examples on a topic. Allowing for the completion of activities by learners on the device, where learners have the opportunity to work individually or in pairs by way of the device. Allowing for the

promotion and highlighting of main ideas, important concepts and rules to remember. Providing learners with access to a large body of relevant knowledge on the particular topic or concept, i.e notes and examples. The tablet also allows for seamless and smooth transmission of content and feedback to learners during and after the lesson. (McGregor, 2011).

From the above we see that tablets have numerous technical affordances that can be used to engage learners, meet a variety of their learning styles, be versatile and allow interactivity. These affordances, allow active and cooperative learning so students can understand better. In general, tablet technology affords, a vivid screen display, the setting for both individual and collective learning, the presentation of various multimedia on a topic, the combinations of numerous perspectives; and the breakdown of knowledge and learning methods.

Consequently, if we want to understand more about the pedagogical affordances of tablet technology in accountancy education, we can look at a study by Sam & Abeysekera (2010). This study evaluated teachers' perceptions concerning the usefulness of tablet technology in the classroom. It revealed that technology can be used to spark enthusiasm for the subject at hand, and to promote increased student-centred learning. These were the two major pedagogical affordances that the study reported on in its findings. It is vital that we acknowledge the focus on these two affordances, as it helps us understand what tablet technology is capable of and the perceptions of these teachers ,which overall assist in helping to answer the main research question of this project.

Further findings indicated "that the teachers believed tablet technology to be an effective learning tool, and their enthusiasm, along with the frequency with which they utilised it, suggests that it is a valuable teaching resource" (Sam & Abeysekera 2010). What we need to keep in mind from this is that despite these teachers expressing their views on tablet technology in this way, not all teachers might agree to this and see tablet technology in the same light. This is because not all teachers teach the same subject and grade and therefore would not utilise the technology in the same way or have the same amount of know how or digital skills in relation to the tablet.

Another study by McCourt Larres and Radcliffe (2000) pointed out that, the implementation of tablet technology would promote learners' understanding of practical topics as it can facilitate the recurrence and duplication of practical examples within an interactive classroom environment, which then promote the occurrences of autonomous study. The findings of this study, point out the benefits of tablet technology in regard to practical subjects like accounting.

The studies' mentioned above are particularly relevant to this research, as we are attempting to evaluate the pedagogical affordances of tablet technology in accounting education. The results of this research project can hopefully aim to help combat, factors such as 'ever-increasing classroom sizes and overstretched teaching staff, that place a strain on the depth of understanding and learning that can be achieved in the traditional classroom environment'. It aims to show whether tablet technology is better and how can it improve or solve common problems within accounting classrooms.

In understanding why teachers use technology and in particular, tablet technology in the accounting classroom it is important to understand some of the difficulties they face. Teachers often feel that the teaching time in schools allocated for accounting is not sufficient, because a large amount of time is spent drawing up formats and memorandums on the chalkboard. Learners often misinterpret figures written on the board, because of poor teacher handwriting. This then results in misunderstandings and confusion of the content. A lot of the procedures/processes in accounting require viewing more than just an extract of the exercise or example to gain a full understanding; hence a lot needs to be displayed to learners which is often difficult to put onto one board. These challenges pose as great barriers for teachers, trying to effectively teach their content (Zraa, 2011).

The above paragraph points out some of the common difficulties faced by accounting teachers. It advocates the use of tablet technology as a way of overcoming these difficulties. However, in relation to these claims more in-depth enquiry is required on whether tablet technology can help resolve these difficulties, to what extent can it do so, and will it ultimately lead to an improvement in teaching and learning.

In today's fast-paced world, ICT integration is seen as a method to overcome difficulties in teaching and learning in all subject disciplines. Majority of teachers, consider technology as an integral component in providing high quality education (Ertmer, 2007). Thus, integration is seen by many as a rapid solution to educational problems; a mechanism that will instantaneously improve education; and something which will only result in beneficial outcomes. Its presence alone in a classroom, is regarded as something that will completely transform and improve learning in that classroom. Generally there are many optimistic claims and beliefs about technology in the classroom. Some of which are explored in the following paragraphs.

The Gauteng Department of Education's ICT and e-education strategy will use technology to improve education outcomes, rapidly and at scale. It will enhance teaching quality, pupil engagement and school administration *(Transforming the digital divide*,2015, para 2). This is a rather strong claim made by government officials with regards to the proposed value of technology in education. It assumes future benefits of strategies that have not yet been fully implemented.

The Member of the Executive Council (MEC) for education in Gauteng stipulate future prospects of integration where he states, "Integration assumes that both teacher and learner have some skills in how to operate the technology and that they are using it as part of their teaching and learning activities" (GDE Guidelines, 2011, p.24). This clearly outlines a presumed familiarity that teachers and learners ought to have with technology, without taking into account possible roadblocks that technology in the classroom could cause. It also neglects to highlight the difference between useful technology integration and ineffective technology integration in the classroom.

The use of ICT in the classroom, is built on a strong belief that it has the potential to greatly improve teaching and learning by providing teachers and learners with accessibility, flexibility and increased opportunities with regards to participation and collaboration *(Effective Integration of ICT in Teaching and Learning*, 2014 , para. 1.). This outlines another prevalent positive notion about the idea of technology in the classroom. This notion emphasizes the compensations of the technology but neglects to explore and explain the requirements necessary for these to occur.

The above paragraphs outline the current presupposition about having and using technology in the classroom. However, if we want to fully explore successful technology implementation, we need to be more comprehensive and realistic about the technology in the classroom. Effective integration has to do with being able to use the technology in educationally sound ways, it needs to be pedagogically fruitful. When focusing on successful technological integration in classroom we find, that it is inherently linked to three important facets of education. These being, curriculum, instruction and assessment (Hart 2007, p.82).

Successful instruction with technology, requires teachers to have a well written curriculum that guides their application of technological tools while meeting learning outcomes. It also requires the correct technological tools, sound content knowledge and the application of outstanding pedagogical, and technological expertise. Corresponding and effective methods of assessment is also integral to successful integration and needs to be well incorporated and emphasized in a model of technology integration in the classroom (Hart, 2007).

The aspects of successful technological integration are vital to our quest of determining whether technology improves or hinders learning at the particular school we have chosen to research at. Moreover, other research projects that aim to answer the same or similar question are also important. In the next few pages, the main aspects of these research reports are explored.

Tamim (2011) mentions that there is still no clarity as to whether ICT alone improves learner understanding and learning. He points out that, the effects of ICT integration on students' performance and learning is a recurring subject of debate; with the question remaining, does ICT offer the benefits it is believed to offer. The subtleties of ICT integration in education, presents a challenge for instructional designers, educators and learners. He explains that this mainly due to the fact that educational technology is not a homogenous intervention and its effectiveness lies with its dependency to assist teachers and students in achieving their learning goals (Lowther as cited in Tamim et al., 2011, p.17).

Tamim's argument is that, ICT in education can only be deemed beneficial if it resourcefully helps teachers reach their teaching goals in better and more effective ways and promotes increased and deeper learning experiences for learners. When ICT does not do this its presence in a classroom or educational institute is given less importance. However, we do need to keep in mind that ICT is only one component of a mixed instructional design system and there are other factors that impact learner performance. Hence ICT in education should be viewed as one of many factors that impact learning and could potentially improve learning.

A 2016 research study on the effectiveness of tablets, also using a quasi-experimental design was done in Jordon. It revealed in its findings that there was a statistically significant difference in a post-test between the control group and the experimental group. The experimental group (which was taught with a tablet) performed much better on the post-test than the control group (Khazer, Al Abdallat & Shamayleh, 2016).

In a few regards, this research is similar to our study, as it aims to measure the same thing- the effectiveness of tablet technology in the classroom and also uses a quasi-experimental design which matches the quantitative dimension of my mixed methods approach. However, it does not include any other research methods and researches a different subject i.e. social studies. Nevertheless the research study reported that tablet integration lead to increased learner learning, as compared to the textbook and notebook. The findings were all interpreted from numerical data produced by the quasi-experimental design. The positive effects of tablet technology reported on in this research study is vital to the research questions of my research project, as it provides prevailing, pertinent and relatable points that need to be understood.

Another recent study in Botswana, examined the perceptions of secondary school accounting teachers; on the use of tablets in the classroom. In its findings it reported that the accounting teachers involved in the study displayed positive attitudes' towards the integration of tablet technology in the classroom. The attitudes were attributed to the numerous capabilities of tablets, which include a better display of learning resources as compared to traditional instruments; the ability to save and print materials generated during the lesson; the permitting of teachers to give clear

explanations which enhance learner understanding; and ability to keep learners focused and engaged, which in turn reduces discipline issues (Nhete, Sithole & Solomon, 2016).

This study provides current, valued, and relevant points for my research project. The subject discipline of accounting education matches the subject discipline of my research project, it also uses the qualitative methods that match the qualitative dimension of my mixed methods research approach. In addition to that, this research was also conducted in a developing country in Southern Africa. It provides evidence that tablet integration has numerous benefits, which lead to improved and increased learner learning.

Another smaller research study on the effects of tablet technology, conducted in the United Kingdom also produced positive findings. It reported that tablets can be used in the classroom to increase learner engagement during the learning process. With the main reason for this being the appearance of visual aspects of using the tablet. Therefore, it promoted that school and technology leaders be aware of the potential that these devices have for increasing student achievement through increased student engagement (Beeland, 2012).

This study emphasized the visual aspects of tablet technology, in contributing to increased learner learning. The positive results of the study were accredited to some of the technical affordances of tablet technology. This findings reported on in this study also provides useful and relevant information in relation to my research. It looks at and highlights a different positive perspective of tablet technology as compared to the other two research studies mentioned above.

International Society for Technology in Education (2009), stipulates that for technology integration to be effective, the following conditions need to present, a shared vision, implementation planning, ‘consistent and adequate funding, equitable access, skilled personnel, ongoing professional learning, technical support, curriculum framework, student centered learning, assessment and evaluation, engaged communities, support policies and a supportive external context’. This clarifies that these aspects are important features of successful technology

integration in the education system. When measuring or evaluating the success and effectiveness of tablet technology in the classroom, these need to be fully understood.

From all the literature I have reviewed, it is still unclear as to whether teaching with a tablet will lead to improved learning as compared to traditional methods. But I have so far clarified, the idea of a tablet, technological and pedagogical affordances, the subject matter that has been researched and its relevance, the pedagogical requirements for the subject matter to be taught effectively and how the technological affordances of tablets can foster sound pedagogy in teaching Accounting. Moreover, I have explored why Accounting teachers use technology in their classrooms by identifying the difficulties that they face and the barriers it creates in trying to effectively teach their content. I have elaborated on the assumption that technology can be used to ease, and/or solve the problems teachers face in teaching and the need to approach this comprehensively. Thereafter, the findings from similar research conducted on tablets were stated. This research study will attempt to give a more focused response, to whether teaching with a tablets leads to improved learning as compared to traditional methods, by using a quasi-experimental research design on two grade 11 accounting classrooms.

2.2 Gaps in the Literature

As mentioned above, I found that there is a ‘lack of research literature, about using tablets in teaching accounting, particularly in South Africa. I also found that, there is more research conducted on the subjects like Mathematics and Science. Considering the low performance of Accounting learners; I believe that government, school officials and teachers should put more energy into ensuring that, the effects of different technological interventions are measured’. Researching the success of current practices can inform better future technological interventions.

2.3 Conceptual Framework

The conceptual framework for this research was derived from the literature review. It will be used to guide the research methodology and data collection. It will help to gain an indication of whether learners learn Accounting (grade 11) better with Tablet Technology, as opposed to Traditional Methods, in the context of one South African school.
Gay, Mills and Airasian (2006) explain “that conceptual maps give the participants an opportunity to display their analyses of the problem and help answer the research question. It is a map which the research study is based around”. Figure 1.1. represents the conceptual framework that will be used in this study.

The research aims to understand whether tablet technology leads to better teaching and learning, for the given subject and grade in one particular school. In order to do this, seven attributes were acknowledged and included: tablet technology’s characteristics and history of implementation; expectations by stakeholders of the implementation of tablet technology in classrooms; technological affordances of tablet technology; pedagogy affordances of tablet technology; pedagogical and technological requirements of the subject discipline of accounting; the pedagogical affordances of tablets in accountancy education; requirements for the integration of tablet technology to be effective. These were seen as the most crucial aspects in answering the research question.

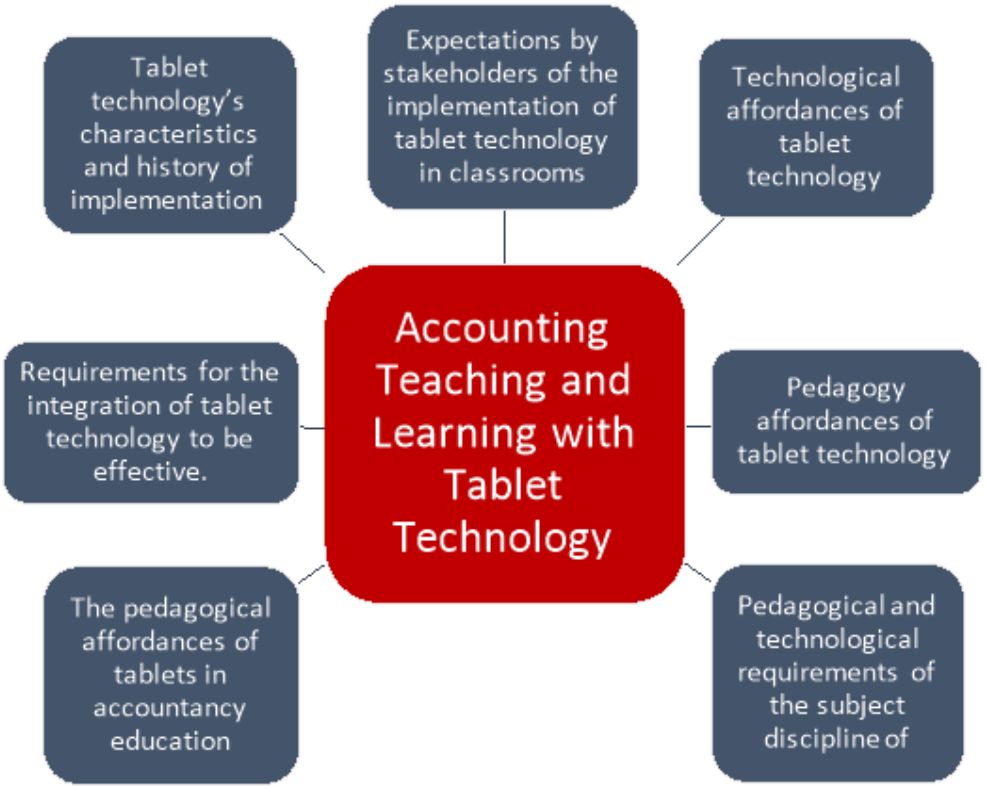


Figure 1.1. The conceptual framework that will be used in this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The research design is the basis for the attainment of valid research. It is the plan that governs what will be done (i.e. treatment definition), to whom (i.e. sample selection), what will be measured (i.e. definition of constructs), how and when data will be collected, and how the results will be interpreted (Hanley-Maxwell & Skivington 2007). The research design outlines the approach to be taken and is determined and influenced by the nature of the problem area or interest that interested the researcher.

In this research project, the hypothesis considered is whether these learners produce better results after being taught using tablets as compared to traditional teaching methods. The research then aimed to evaluate this, by specifically looking at the grade 11 accounting pupils in the school. To accurately evaluate the effectiveness of a tablet against traditional teaching methods, a mixed methods design was used. This encompassed of a quantitative dimension and a qualitative dimension. The quantitative dimension comprised of a quasi- experimental design and its purpose related to answering the first research question i.e. "in the selected school sample, do learners learn Accounting better with tablet technology as compared to traditional Methods?". While the qualitative dimension comprised of a interviews and its purpose related to answering the second research question i.e. "what are the possible reasons for this?"

In the Quasi-experimental design the researcher worked with two groups and administered different interventions to each group. Group one received a tablet intervention and group two received a traditional intervention. A beneficial feature of this design was that, it allowed the groups to be tested before and after the interventions, so that accurate conclusions could be made on; whether the groups were similar to begin with; whether the learners already knew the section; whether learners gained more knowledge after the intervention and which group gained the

most knowledge after their intervention. In using the design, there was an experiment group and a control group, which were not randomly selected but were almost similar in nature (both groups were grade 11 accounting students from the same school). Since the groups were not randomly selected the control group functioned as the comparison group. Thus, the quasi-experimental design was used to research, whether an intervention of technology, such as a tablet, in the teaching and learning of accounting, improved learners learning or hindered it.

In the qualitative dimension of this mixed method design the researcher used a set of questions to conduct interviews with teachers and learners. It was carried out to determine their attitudes and beliefs regarding the use of tablet technology in the classroom. The data of which aimed to formulate hypothetical explanations on the empirical connections that were established in the quasi- experiment. The purpose of the qualitative dimension of this research project was to allow for careful reflection on the numbers in the quantitative results.

“When combined with quantitative techniques, gathering qualitative data and using qualitative analysis ideally helps to better understand the topic of study and conduct stronger research”. (Bernard, Wutich, & Ryan, 2016). This relays the importance of incorporating the qualitative dimension in this research design and the eventual selection of a mixed methods design.

In this study, the qualitative dimension complements the quantitative research, as it incorporates the voice of participants into the study, which then allow for better understanding of how the research participants think, feel and behave. Ultimately enriching the findings of the quantitative dimension.

A mixed methods study was used because the quasi-experimental study is carried out in one school only and therefore it is not generalizable to all school settings. Thus, the quasi-experimental design alone, can only allow one to establish a causal relationship within the confines of the study. It will not allow attributing general or universal causality with any certainty as one school cannot statistically (probabilistically) be representative of any population (of schools). The qualitative data allows for the illumination, of the findings of the quasi-experiment, and allows for speculation on possible causality.

3.2 Characteristics of the quantitative dimension of the mixed methods research approach

The quantitative dimension consisted of an empirical study and served to ensure that the research correctly captured the core question of the intended research. "Quantitative research is explaining phenomena by collecting numerical data that are analysed using mathematically based methods (statistics). Some phenomena are best studied in quantitative ways and some are best studied in qualitative ways" (Muijs, 2011, p.1). Quantitative research was carried out by instructing learners from both groups to write a pre-test before the interventions, and a post-test, after the interventions. The marks of both tests for each group were recorded and analysed using a statistical method t-test. In total four t-tests were conducted, between the pre-tests of both groups, between the pre-test and post-test of the experimental group, between the pre-test and post-test of the comparison group and between the post-tests of both groups.

The idea of analysing these marks was to, firstly ensure that learners of both groups were on the same level before interventions (pre-test of both groups). Secondly to see if both groups' knowledge increased after the intervention (pre-test and post-test of each group). And lastly to determine which group's knowledge increased more after the intervention (between post-tests of both groups). This analysis helped to measure the learning of knowledge and enabled the researcher to work out whether the knowledge gained in the one group was more than the other group - by seeing if the results were statistically significant or different between groups. As the researcher, I believe that a quantitative method was most suitable for the phenomena researched. As the phenomena measured was the learners' performance, which is most commonly exhibited in numerical data (test scores, term marks etc.).

The foundations of quantitative research methods are often defined as realist or positivist. Meaning, that the researcher uncovers an prevailing reality, a truth that already exists out there. Therefore in order to maximise his or her objectivity the researcher must be detached from the research. This can then be done by using a positivist view of the world as according to "positivism the world works according to fixed laws of cause and effect" (Muijs 2011, p.3). However, it is not always easy to

detach yourself as a researcher from the research you are doing, since we are part of the world we are observing. This is then why I as a researcher have chosen not to research my own teaching and classroom, but rather the teaching of another teacher in her classroom, so that I could maximise my objectivity during the research project.

3.2.1 Rationale for using a quasi-experimental approach

An experimental research approach is commonly used in psychology, education, physical and social sciences. It usually involves collecting quantitative data and statistically analysing it. There are three types of experimental research, pre-experimental, quasi-experimental and true experimental research. Experimental research is carried out using two sets of variables, one acts as a constant which is used to measure the differences of the second. True experimental research utilises statistical analysis to prove or disprove a hypothesis and is considered the most accurate type of research. Quasi-experimental designs, are typically used to evaluate interventions in schools and are similar to true experimental designs.
A key distinction between these two designs is, in experimental design, persons are randomly allocated to groups whereas; in quasi-experimental design persons are precisely chosen for groups. In a quasi-experimental design, we compare two groups, the first is the experimental group which receives an intervention and the second is the comparison group that receives a different intervention. It uses a pre-test–intervention–post-test design (Muijs, 2011, p.23). Quasi- experimental design was chosen between the three because it allowed the framework to compare the effects of the different interventions on both classes without conducting a random allocation of persons to groups.
In a quasi-experimental design, it is imperative that the experimental and comparison groups are largely alike on aspects such as parental socio-economic status, gender, ethnicity, and ability. This ensures that the research produced accurately concludes, that the differences between the findings of both groups, are because of the intervention alone – and not because of the differences between the groups. For this reason, Instead of random allocating, the propensity score matching (PSM) technique was used to match the experimental and control group. In PSM, “an individual is not matched on every single observable characteristic, but on their

propensity score, which is the likelihood that the individual will participate in the intervention, given their observable characteristics. PSM thus matches treatment individuals with similar comparison individuals, and subsequently calculates the average difference in the indicators of interest" (White & Sabarwal 2014). . In other words, PSM ensures that the average characteristics of the treatment and comparison groups are similar, and this will be sufficient to obtain an unbiased impact estimate. Despite concerns that the PSM technique would be inappropriate for such a sample, I found it suitable as it simplified the matching task and reduced bias by confounding variables, which could have affected the results of the study. The quasi-experimental design was found to be a non-complex and straightforward way of evaluating teaching with tablet technology against traditional teaching methods and answering the ultimate research question and therefore was selected for this study. It is valuable, as it is carried out in a school setting and thus the results will be applicable to actual classrooms and schools and not research laboratories. For these reasons it was deemed suitable for evaluating new ingenuities at schools, like tablets. The design produced numerical data as results which were simple to analyse as differences were easily noticeable. However, the controlling of extraneous variables, within the quasi-experimental design did pose a challenge. These were the variables that could have caused the intervention in the experiment and comparison group to differ. If the intervention differed it would have caused an inaccurate evaluation of the effects. The variables were identified and managed to prevent this, a detailed description of this follows in subsequent pages.

3.2.2 Research design

The quasi-experimental design was used to look at the effects of two different interventions on two similar classes of the same grade, for the same subject - where the one was anticipated to improve learner understanding more than the other. The five steps of the PSM technique were used to match the experiment and comparison group. The classes both received the different interventions during the same time frame. Before and after the intervention learners wrote a pre-test and a post-test. The marks of both tests for each group were recorded and analysed using a statistical method called a t-test. The findings of the research were based on the

numerical data achieved from the t-tests. The writing the pre-tests and post-tests and analysing the marks was to ensure that learners of both groups were on the same level before interventions, to confirm that both groups' knowledge increased after the intervention and to determine which group's knowledge increased more after the intervention. To ensure that the teacher quality was the same for both interventions, the same teacher conducted the intervention in both classes.

3.2.3 Independent and Dependent variables

This research aimed to evaluate teaching accounting to grade 11 learners with tablet technology against teaching with traditional methods. The two variables were the interventions and the change brought about by the interventions.

The independent variable

This was the process which caused the change, i.e. the intervention. An intervention was carried out in both the experiment group and comparison group classes, it was carried out during the same time frame and covered the same content but was not of the same nature. In the experiment group the intervention of teaching with tablet technology occurred. Whereas in the comparison group the intervention of teaching with traditional methods occurred. Both interventions were regarded as independent variables.

The dependent variable

This was the change brought about by the independent variable. In this case, it was the learning or lack of learning caused by the interventions. This was determined from the analysis of the results of the pre-test and post-test, which occurred before and after the interventions.

3.2.4 Design diagram

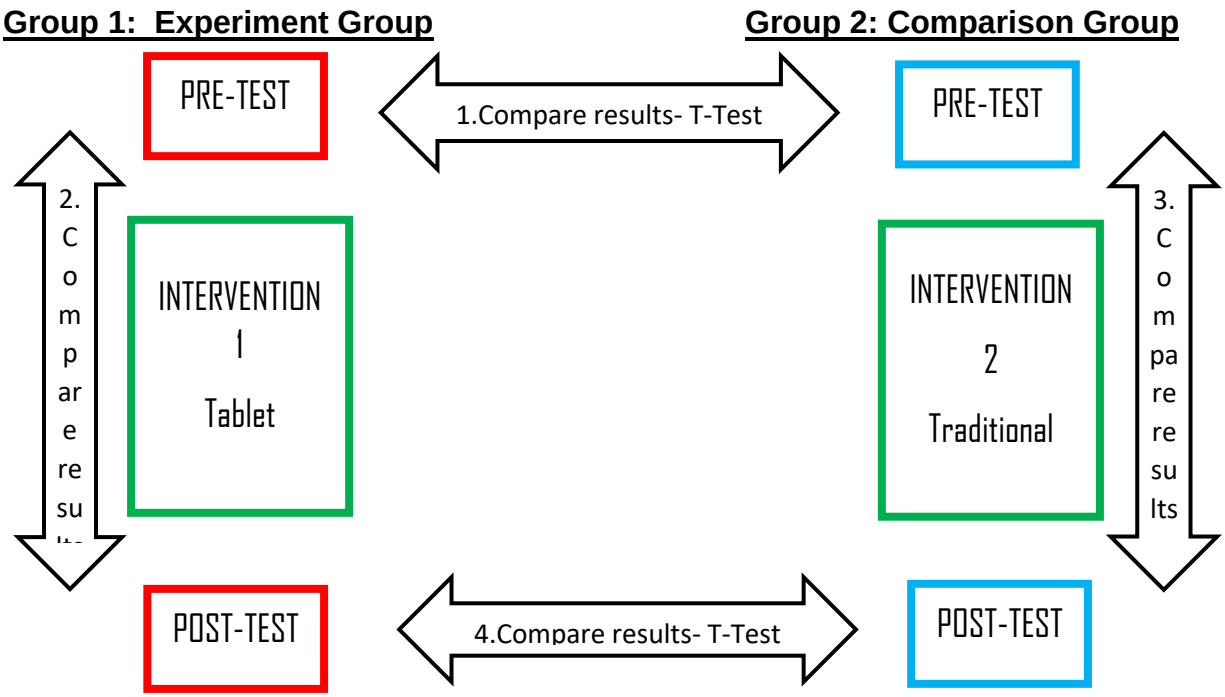


Figure 1.2 : Diagram of the Quantitative Quasi-Experimental Design Process with Pre-test, Intervention and Post-test.

Figure 1.2, is an illustration of the quasi experimental design, characterised by a pre-test, intervention, post-test and comparative t-tests. Group one refers to the experiment/treatment group and group two refers to the comparison group, both groups were Grade 11 Accounting classes. In the first step, they both groups wrote the same paper based pre-test, which aimed at assessing their knowledge before the intervention. Then both groups received an intervention, but the intervention they received was not be the same. The intervention administered to the experiment group, comprised of being taught the section on cash budgets with the use of tablet technology. The intervention administered to the comparison group however, comprised of being taught the same section on cash budgets but using traditional teaching methods.

The intervention for both classes took two weeks and a total of ten lessons each. The same homework and classwork activities were used for both the groups. A paper based post-test was conducted on both groups after the intervention was

complete. The tests were marked and the scores recorded (using a statistical test called the *t* test on Microsoft excel) four comparisons were made based on the test scores:

1. Comparisons between the pre-test results of both groups.
2. Comparisons between the pre-test results and post-test results of group 1 were made.
3. Comparisons between the pre-test results and post-test results of group 2.
4. Comparisons between the post-test results of both groups were ma

3.2.5 Managing extraneous variables other than the selection of learners

Extraneous variables are variables that could weaken the effect of the independent variable. To ensure that this did not occur, each extraneous variable was identified and their possible threat to the validity of the results explored and describe. Mitigation strategies that were put in place to control each variable, is also specified.

Teacher

This refers to the person who was responsible for conducting the intervention. If the same teacher was not used to conduct the interventions in both groups, the comparisons made from the pre-tests & post-tests and post-test & post-test, would not be accurate. I would not know for sure, if it was the intervention that caused the improvement/worsening of the test scores or if it was the teacher quality that caused it. To prevent this from happening, the same teacher was used in both groups; this was the appointed teacher of these classes at this school. In this way, another sub-extraneous variable of *anxiety and unfamiliarity* caused by having a new teacher teach learners was negated.

Content

this refers to the content that was covered during the intervention in both groups. If the content was not the same, it would not have affected the results of the post-test.

But I would not be able to come to an accurate conclusion when comparing the post-test results of both groups, as they would have been taught different knowledge. Thus, I would not be able to determine whether it was the type of intervention that caused a difference in scores of the post-test or the type of knowledge that did. To prevent this from happening, I ensured that the same content was covered in both groups during the intervention. I did this by speaking to the teacher beforehand and explaining to him the significance of this. He taught the same content, using the same textbook and homework activities for both groups.

Teaching time

This relates to the time spent on the intervention that occurs in each individual group. If the teaching time was not the same in both groups, it would have affected the results of the tests. As I would not know for sure, if it was the intervention that caused the improvement/worsening of the test scores or if it was the increased/decreased time spent in teaching the section. To prevent this from occurring, I made sure that the teacher spent the same amount of time teaching both classes. This was a total of ten lessons, over a two-week period.

Pedagogy

This refers to the practice and method of teaching the content during the interventions. The pedagogy of both groups needed to be the same, to ensure that the results were accurate. This is a serious difficulty in this kind of research as the literature is ambiguous on whether ICTs (tablets) bring with them a different pedagogy. To control for this, I spoke to the teacher beforehand, about keeping the lessons as similar as possible despite the different instruments used. He pointed out a few challenges that may arise and how he would try his best to ensure that the pedagogy used remains the same. He kept his teaching styles and methods as similar as possible in both interventions.

Noise outside the classroom

This pertains to noise outside the classroom that could have impacted on learners learning. If the noise levels were too loud outside the classroom, learners would have missed out on vital information and this would have affected what they remember from the lesson. This in turn, would then result in lower tests scores in one class compared to the other (one class might be affected more by the noise than the other class). To prevent this from happening, I asked the teacher and principal if we could conduct these in classrooms away from the main building to reduce possible noise disturbances. The principle allowed it and lessons were conducted in a quiet block, where most of the neighbouring classrooms were not used.

Structure of the tests

This refers to the structure and layout of the pre-test and post-test. Learners may have endued a kind of unfamiliarity, if I used a completely different or new structure and layout, than what they are already used to. This will result in time being wasted while writing the tests, and it may affect the results of the tests. To ensure that this did not happen, I made sure that the tests I gave them, met the structural requirements of a standard accounting test that they were used to writing at school.

Communication between Learners

It might be that learners from the different classes attempt to communicate with each other about the test they have written. To prevent this from happening, arrangements were made to ensure that, the learners of both groups wrote the tests during the same time frame (simultaneously).

Contamination of Data

Contamination occurs when an intervention administered to one group filters into the other group. To prevent this from happening, the total time period of the intervention

was made shorter, instead of using a three week period it was reduced to two weeks. To lessen the chances of contamination. Also each group was not told much about the nature of the intervention in the other group. Meaning group one was only informed about what they would be doing and their structure over the two weeks and the same occurred in group 2. In this way the participants of the groups did not know about the characteristics of the intervention in the other group.

These extraneous variables were managed to ensure that, both interventions' in the experimental and comparison group were teaching interventions of the same section, in the same grade and at the same school done by the same teacher. And only, the nature of the intervention was different between the two groups. Before the commencement of this research project, I spent time with the teacher to plan the process. I discussed these variables with him and was assured that he would cooperate with helping me manage them, which he did, during the process. I observed all the lessons, this helped me understand and control extraneous variables. It also helped me guarantee that I was measuring the impact of the intervention and not anything else.

3.3 Characteristics of the qualitative dimension of the mixed methods research approach

To assist in developing an explanation for the qualitative findings of the study, I included a qualitative dimension. This dimension consisted of interviews that I conducted on teachers and learners to determine their attitudes and beliefs on the use of tablet technology in the accounting classroom. The data of this was used to illuminate on the empirical connections that were established in the quasi-experiment.

Qualitative research is defined as a "method that focuses on obtaining data through open-ended and conversational communication. This method is not only about what people think but also why they think so. Therefore, qualitative research methods allow for in-depth and further probing and questioning of respondents based on their responses, where the interviewer also tries to understand their motivation and feelings." (Muijs, 2011).

In comparison to the quantitative dimension of this research, the qualitative dimension provides results that are broader and more descriptive. From qualitative data, inferences can be drawn in a way that is different to quantitative data. As most commonly experiences, attitudes and ideas are gained from qualitative data analysis. As such, qualitative data analysis is based on interpretative philosophy. Thus the qualitative dimension was included to substantiate and expand on the findings of the quantitative dimension. It was aimed at finding out why the quantitative dimension resulted in such findings and what were possible reasons for that.

3.3.1 Rationale for using interviews

A qualitative research method aims to uncover the behaviour and perceptions of a group of people with regards to a specific topic. There are various kinds of qualitative research methods such as focus groups, in-depth interviews, ethnographic research and case study research.

In this research the type of qualitative research method used was interviews with teachers and learners. Today our world is complex and it not easy to determine what individuals perceive and think. But by asking them questions that directly relate to what we want to understand about their situation and experiences we are able to gain a lot of information. The nature of the interviews allowed for unrestrained and descriptive feedback regarding the thoughts, beliefs and attitudes of teachers' and learners' about tablet technology in the classroom.

3.3.2 Research Design

A personal interview was conducted with each respondent at a time. This was purely a conversational process that aimed acquire in depth information from the respondent.

An advantage of this method was that it afforded me a good opportunity to obtain exact data regarding what people 'believe and what their motivations are'. It was the concise, rich circumspect questions that allowed for the collection of meaningful data.

The interviews were conducted over the phone and were between 15 to 20 minutes each. Questions related to the attitudes and beliefs regarding tablet technology in the accounting classroom. The teachers and learners that were interviewed provided insightful and informative responses to the questions they were asked. While doing this I learnt a lot about what they know and believe about tablet technology in the accounting classroom. Their responses has richly contributed to my research project.

3.3.3 Structure of Interviews

Each interviews consisted of seven open-ended questions that aimed to gauge the attitudes and beliefs about tablet technology from teachers and learners. The questions for teachers were different to that of learners, but had the same aims. The data from the interviews enriched the quantitative data that was already been collected.

Interviews were conducted over the phone and took approximately 15 to 20 minutes each. The interviews were recorded and analysed later on to write up the findings and results of this research project.

3.4 COVID-19

In February 2020 an initial plan of this research design, the proposal, how and where it will be conducted and the structure of the report was briefly sketched. Not long after that the effects of COVID-19 began to emerge. It caused a few changes to the initial plan and a few additions but the plan remained majorly the same. Fortunately, the effects of COVID-19 did not result in large barriers for the carrying out and completion this research project. How it was proactively controlled and averted is explained as follows.

Prior to the closing of schools in March, I had met with the principal and teachers of the school I intended on doing research at. The principal was welcoming to the idea and gave me verbal permission. In May, I contacted her again, and she said it was still fine but that we should speak about possible challenges, while doing the research and how it will be conducted given the current situation. The principal and

staff were supportive and helpful with the idea of me doing research at their school, despite the current situation.

In September, once schools had fully re-opened I conducted my research. I took all necessary precautions that included wearing a mask at all times, sanitizing frequently and maintaining social distance from learners and other teachers while at the school.

CHAPTER 4

DATA PRESENTATION

4.1 Introduction

This chapter elaborates on the data collected from the research project. It details on data collected from the quantitative dimension and data collected from the qualitative dimension of this research project. The data is presented in a logical and neat format, with broad explanations in terms of relevance and it's relation to the research questions. The data presentation provides the basis to discuss the main findings which is detailed in chapter five.

4.2 Results from the Quantitative Dimension of the Research Project.

"A hypothesis is a conjectural statement of the relation between two or more variables" (Kerlinger, 1956). "This generalization made between the variables must be subject to a test. This testable proposition is known as the hypothesis" (Yadav, 2014, pg.14**).** In this research project, the hypothesis considered is whether these learners produce better results after being taught using tablets as compared to traditional teaching methods.

According to Ary, Jacobs, Razavieh, (1984) "The null hypothesis is a tentative explanation that accounts for a set of facts and can be tested by further investigation." It is a kind of conjecture commonly used in statistics that suggests there is no difference between specific characteristics of a population. The alternative hypothesis suggests that there is differences. Testing the alternative hypothesis allows for a way of rejecting the null hypothesis.

For the results of each of the four t-tests that were conducted, there was a null hypothesis and an alternate hypothesis. In this study, the null hypothesis, states that there is no significant difference between the means of the two sets of scores.

Whereas, the alternate hypothesis states that, there is a significant difference between the means of the test scores. In determining which hypothesis to accept or reject, we look at the results of the t-test, if the p-value is greater than 0,05 and the t-stat value is less than the t- critical value, we accept the null hypothesis and reject the alternate hypothesis. If the p-value is less than 0,05 and the t-stat value is greater than the t- critical value, we accept the alternate hypothesis and reject the null hypothesis. Depending on which t-test is being looked at, the researcher would either want to accept the null hypothesis and reject the alternate hypothesis or vice versa, in order to prove the research hypothesis.

For the first t-test, between the pre-test scores of the experiment group and comparison group, the researcher would want to accept the null hypothesis, to ensure, that the groups were on par, before the intervention and that no group already had excessive prior knowledge on the topic; which the intervention was meant to teach. For the second t-test, between the pre-test and post-test scores of the experiment group, the researcher would want to accept the alternate hypothesis, to demonstrate, that the group did learn something from the intervention. For the third t-test, between the pre-test and post-test scores of the comparison group, the researcher would also want to accept the alternate hypothesis, to demonstrate that this group also did learn something from the intervention. For the fourth t-test, between the post-test scores of the experiment group and comparison group, the researcher would want to accept the alternate hypothesis, to demonstrate that the experiment group learnt more than the comparison group.

Although four t-tests were done, the key t-test (if all the other t-tests were valid) is the last t-test between the post-test scores of the experiment and comparison groups'. The null hypothesis states that there is no statistically significant difference between the performance of accounting learners taught tablet technology and those taught with a traditional chalkboard. The research hypothesis is the alternate hypothesis. The alternate hypothesis states that there is a statistically significant difference between the performance of accounting learners taught with tablet technology and those taught with a traditional teaching methods- meaning the use of tablet technology to teach accounting led to increased achievement of learners in comparison to the use of the traditional methods. Here accepting the alternate hypothesis and rejecting the null hypothesis, supports the researcher's claims.

4.2.1 Criticism of the Null Hypothesis Significant Testing (NHST)

As mentioned in Levine (2008) NHST is often criticised because of a high probability of type II errors. Type II errors are also referred to as a false negative. The researcher commits a type II error when he/she fails to reject the null hypothesis which is actually false (he/she accepts the null hypothesis). Subsequently concluding that there is no substantial effect, when there actually is.

Type II errors occur, commonly in research that uses small sample sizes. To lower the chances of type II errors the researcher needs to ensure that the test has enough power. This can be done by ensuring the sample size is large enough to detect a practical difference when one truly exists.

Field (2005) mentions a number of thirty participants, to be the standard minimum sample size. In this research, the sample size was twenty-eight participants, which is very close to the standard minimum of thirty participants. This allowed the test to have more power as compared to having for example ten participants. The sample size was large enough to detect a practical difference and therefore type II errors were averted.

4.2.2 Outliers

As mentioned in (Macmillan. et.al, 2013). “Outliers refer to a data point that falls far outside the main distribution of scores”. Outliers, negatively affect the validity of the research results; because they refer to ‘scores that do not follow the usual pattern’. This means, the t-test will be conducted at infrequent data points. Thus, to ensure validity of the results, we exclude outlier points.’ A few scores from the pre-test and post-test were regarded as outlier points and were then omitted from the t-tests and data analysis as they would negatively alter the analysis and subsequently, produce inaccurate findings. These are attached in appendix I.

4.2.3 Data Analysis

To analyse the data, I used the t-test feature on Microsoft excel. As mentioned in Hermon (2011), “a t-test compares two means and determines within a specified degree of certainty whether the two means really are different or whether the difference might have occurred by chance”.

A t-test was conducted, to determine if there was a statistically significant difference between the means of the two groups. Statistically significant, means that the relationship between the two groups is caused by something other than random chance (deals with its probability). As mentioned in Harmon (2011), “we can describe the *t* value as the test statistic for *t* tests. In Excel, the t value is called the t-stat. The calculated *t* value is compared to a *t* (critical) value on a t-distribution table. The greater the *t* value the more certain the two groups are different. If the *t*-value falls outside the region of certainty (5%) then it can be stated the means between the groups are different.” Thus, if the t value is greater than the t critical value, it proves that there is a significant difference between the means and if the t value is less than the t critical value, it proves that there is no significant difference between the means.

According to Harmon (2011), “a two-tailed test is more stringent than a one tailed *t*-test, because the alpha region of uncertainty (5%) is divided between two outer tails on the normal distribution curve. The p-value is defined as the probability, under the null hypothesis of obtaining a result equal to or more extreme than which was actually observed. The smaller the p-value, the larger the significance because it tells the investigator that the hypothesis under consideration may not adequately explain the observation. The larger the p-value, the smaller the significance because it tells the investigator that the hypothesis under consideration may adequately explain the observation.” Thus, if the p-value is greater than 0,05 it suggests that the difference between the means is not significant, whereas if the p-value is less than 0,05, it suggests that the difference between the means are significant.

The results of all t-Tests are included in appendixes and summarised in the following tables.

4.2.4 Analysis of results

Null Hypothesis: There is no significant difference between the means of the scores, of the two groups. This hypothesis is proven correct if the p-value is greater than 0,05, and the t-stat value is less than the t-critical value.
Alternate Hypothesis: There is a significant difference between the means of the scores, of the two groups. This hypothesis is proven correct if the p-value is less than 0,05, and the t-stat value is greater than the t-critical value.

TABLE 4.1: *Two Sample assuming unequal variances t*-test, of Pre-test Scores for both the Comparison and Experiment Group

Group	N	Mean	*SD*	t-stat	t-critical	p-value
Comparison Group (pretest)	28	9,46	5,17	0,02	2,01	0,49
Experiment Group(pretest)	28	9,43	5,84			

A two-sample *t*-test was conducted to compare the means of learner scores between two groups, before the intervention occurred in either group (the pre-tests scores). The purpose of this t-test was to ensure that the learners from both groups did not have previous knowledge of the content that would be taught to them during the intervention, that they were on the same level.

The t-test revealed no significant difference between the means of the scores of the **Experiment Group (N=28; M=9,46; SD=5,17)** and **Comparison Group (N=28; M=9,43.; SD=5,84)**. Because the **p>0,05 (p=0,49)** and the **t-stat (0,02)** is less than the **t-critical (2,01).** Therefore, we accept the null hypothesis and reject the alternate hypothesis.

Hence the groups were on the same level before the intervention and the content of the intervention was not taught previously to learners from both groups.

TABLE 4.2: *Paired Two Sample for Means t*-test, of Pre-test and Post-test Scores for the Comparison Group.

Group	N	Mean	*SD*	t-stat	t-critical	p-value
Comparison Group (pre-test)	28	9,46	5,17	-8,58	2,05	0,0000000016
Comparison Group(post-test)	28	18,11	6,45			

A two-sample *t*-test was conducted to compare the means of learner scores between the Comparison Group, before and after the intervention occurred (pre-tests and post-test scores). The purpose of this t-test was to determine if learners knowledge increased after the intervention (in the comparison group).

The t-test revealed a significant difference between the means of the pre-test scores of the **Comparison Group (N=28; M=9,46; SD=5,17)** and post-test scores of the **Comparison Group (N=28; M=18,11.; SD=6,45).** Because the **p<0,05 (p=0,0000000016)** and the **t-stat (-8,58)**[1] is greater than the **t-critical (2,05).** Therefore, we reject the null hypothesis and accept the alternate hypothesis. Hence, in the comparison group learners knowledge increased after the intervention as they scored higher in the post-test then pre-test.

[1] **Even though in actual arithmetic, a figure with a negative sign is less than a figure without one, we ignore this here. Because the t-test recommends that we take absolute values into account when analysing, therefore we do not consider the signs in front of the figures.** (Ravid,[1] 1994)

TABLE 4.3: *Paired Two Sample for Means* t-test, of Pre-test and Post-test Scores for the Experiment Group

Group	N	Mean	*SD*	t-stat	t-critical	p-value
Experiment Group (pretest)	28	9,43	5,84	-12,21	2,05	0,00000000000082
Experiment Group(posttest)	28	22,90	5,76			

A two-sample *t*-test was conducted to compare the means of learner scores between the Experiment Group, before and after the intervention occurred (pre-tests and post-test scores). The purpose of this t-test was to determine if learners knowledge increased after the intervention (in the experiment group).

The t-test revealed a significant difference between the means of the pre-test scores of the **Experiment Group (N=28; M=9,43; SD=5,84**) and post-test scores of the **Experiment Group (N=28; M=22,90.; SD=5,76)**. Because the **p<0,05 (p=0,00000000000082)** and the **t-stat (-12,21)** is greater than the **t-critical (2,05).** Therefore, we reject the null hypothesis and accept the alternate hypothesis. Hence, in the experiment group learners knowledge increased after the intervention as they scored higher in the post-test then pre-test.

TABLE 4.4: *Two Sample assuming unequal variances* t-test, of Post-test Scores for both the Comparison and Experiment Group

Group	N	Mean	*SD*	t-stat	t-critical	p-value
Comparison Group (posttest)	28	18,11	6,45	-2,93	2,01	0,0049
Experiment Group(posttest)	28	22,90	5,76			

A two-sample *t*-test was conducted to compare the means of learner scores between the Comparison Group and the Experiment Group, after the intervention occurred (post-test scores). Given that in both the comparison group and experiment group learners knowledge increased after the intervention (as they did better in the post-test scores), this t-test was done in order to determine which group learnt more.
The t-test revealed a significant difference between the means of the post-test scores of the **Comparison Group (N=28; M=18,11; SD=6,45)** and post-test scores of the **Experiment Group (N=28; M=22,90.; SD=5,76**). Because the **p<0,05 (p=0,0049)** and the **t-stat (-2,93)** is greater than the **t-critical (2,01).** Therefore, we reject the null hypothesis and accept the alternate hypothesis.
Hence the experiment group learnt more after the intervention than the comparison group which answers the main research question of this project. It was found the learners in the experiment group learnt more from their intervention than the learners in the comparison group, learnt from their intervention. Meaning that tablet technology has led to increased learner performance in this grade and for this subject in this school.

4.3 Results from the Qualitative Dimension of Research

Each of the interviews consisted of seven questions that aimed to gauge the attitudes and beliefs about tablet technology from teachers and learners. The questions for teachers were different to that of learners, but had the same aims. The data from the interviews enriched the quantitative data that was already been collected. Interviews were conducted over the phone and took approximately 15 to 20 minutes each. After processing and analysing the responses of the interviews', similarities and differences among the responses gave rise to themes. Three themes emerged, the first being, teachers' and students' perceptions about the role of teacher regarding the introduction of tablet technology in classrooms and the consequences for teaching practices. The second being, the perceptions' of teachers and learners about changes in learning practices in relation to the prevalence of tablet technology in the classroom. And the last being, The perceptions of the conditions required to support these teaching and learning practices.

4.3.1 Teachers' and students' perceptions about the role of teacher regarding the introduction of tablet technology in classrooms and the consequences for teaching practices.

In the responses from the interview, teachers and learners described two types of teaching styles that occurred during the implementation of tablet technology in the classroom. I labelled these styles as 'instrumental teachers' (67%) and 'innovative teachers' (33%). The findings show that the teachers' perceptions of tablet technology have an effect on the way they teach (while this might be a concern for the interventions conducted within the quantitative data collection process, it was considered and managed, see extraneous variables: pedagogy).

'Instrumental teachers' are teachers who do not believe that tablet technology impacts or alters their role as a teacher. Thus, they did not radically change their teaching approaches with the introduction of tablet technology. These teachers view

tablet technology as merely instrumental in that they believe it saves them the hassle of accessing a computer or photocopying worksheets and notes. They state that tablet technology is mainly useful in replacing the textbook (they do not see or believe in any other values tablet technology). Consequently, they continue to teach in the same way as before with little or no changes to their teaching styles and practices.

These teachers use tablet technology as if it were a ‘book behind glass’ (a term used in their responses). The learners mentioned that besides using ‘text processing applications’ like PDF reader, other instructive applications are barely used or not used at all. These teachers are fearful that the technology will result in them losing control over the class- as students can be drawn into playing games or using social media.

On the other hand, innovative teachers are teachers who have become more of coaches or instructors. For these teachers the introduction of tablet technology in their classrooms has led them to change their teaching style. They opted to incorporate multimedia and develop interactive activities. Innovative teachers use and promote the use of ‘didactical applications’ over applications that allow one to read text. These teachers place importance on the connection between the objectives of the lesson and the application being used and therefore make sure learners understand this.
Innovative teachers emphasis active learning ‘through applications that mobilise students’ learning processes’. In their responses they point out that tablet technology is meant to be used didactically in a way that moves teaching and learning from being teacher-centred to being learner centred (where learners are individually engaging with the tablet). In this way, innovative teachers leave behind the notion of learners being passive and knowledge can only be transmitted to them using traditional teaching methods.

The emphasis on altering and reconsidering didactical practices is what classifies these teachers as ‘innovative’. However, these teachers do stress the challenges that come with this change in their role, such as increased time to prepare lessons and pressure- but they remain positive on it being worthwhile. They are also positive that learners will learn to use digital technology in a safe way. They stress the need

for learners to be introduced to and acquainted with technology in order to be successful members of society.

The view that teachers perceptions about tablet technology have an effect on the way they teach and the distinction between instrumental and innovative teachers, help to illuminate on the findings from the quantitative research that was carried out. From here it is clear that different teachers view tablet technology differently and their practice and of use of it in the classroom is dependent on their perception of it. While we cannot confirm that the way innovative teachers use tablet technology in the classroom leads to improved teaching and learning, or the way instrumental teachers use tablet technology leads to improved teaching and learning we do understand that tablet technology in the classroom has the ability to change the way some teachers have been teaching and inspires the search for improved and better methodologies in getting content across to learners.

4.3.2 The perceptions' of teachers and learners about changes in learning practices in relation to the prevalence of tablet technology in the classroom.

The responses to the questions in the interview demonstrated that both teachers and learners understand and value the benefits of tablet technology. Some of the affordances they highlight include, instant access to various resources, availability of lesson enhancements, ease of use, the ability to assimilate notes and mainly having to carry less textbooks.

However, despite stressing on these instrumental gains of tablet technology. Teachers and learners also pointed out some of the negative impacts on teaching and learning the tablet technology causes, such as having less of an overview of course content and causing a distraction in the classroom.

Subsequently this separates instrumental teachers from innovative teachers, as the role teachers take and the benefits or weaknesses (of tablet technology in the classroom) that they choose to focus on, impacts on learning practices.

Teachers and learners agree that if tablet technology is implemented meaningfully- the role of the innovative teacher is taken on by teachers. Then, extensive teaching and learning will occur as innovative teachers strongly believe in and work to stimulate the ability of tablet technology to encourage deep learning. This deep learning is sparked by the shift in learning, which traditionally entailed learning from one or two sources, to learning through an array of multimedia and digital resources.

The responses showed that tablet technology had increased the likelihood of collaboration among learners and sharing of resources and information. This was as a result of online social networks and discussion forums that the applications of tablet technology allowed. This also led to an increase in and enrichment of the communication between teachers and learners.

The prevalence and use of tablet technology in teaching and learning has also caused a blurring in the boundary between ‘school and recreation’. Both teachers and learners highlighted the extension of teaching and learning beyond the four walls of the classroom- allowing for access to course content at almost any time and place. The blurring of this boundary was stressed as positive by some respondents and negative by others. Among the reasons for this were, having to respond to learner emails after hours and the attraction to play games and or communicate with peers about topics non-school related.

The aspects pointed out by teachers and learners regarding the changes in learning practices in relation to the prevalence of tablet technology in the classroom, gives rise to the possibility of various enhanced learning experiences. While we cannot confirm that these new learning experiences leads to improved teaching and learning, we do understand that the prevalence of tablet technology causes a shift away from traditional ways and promotes a search towards practical newer experiences for learners.

4.3.3 The perceptions of the conditions required to support these teaching and learning practices.

From the responses of teachers and learners that were interviewed it was clear that more support was required for teaching and learning practices. These preconditions were differentiated into two types, which were ‘material conditions’ and ‘required professionalization’.

The lack of adapted material was previously highlighted in the first theme. Therefore it must be noted that during interviews majority of time lapsed as teachers and students pointed out that the tablet is somewhat of “book behind glass”. Where there is a lack of suitable teaching and learning material within the tablet design and the support required in relation to this is crucial.

For this reason teachers are required to take on the role of creators themselves, this then results in a higher workload for teachers and less enthusiasm with regards to utilising tablet technology in their classrooms and courses. Subsequently, this view remains a major obstacle in the successful integration of tablet technology in classrooms, the impact of which is worse for teachers who have not taken on the role of innovators.

Besides the lack of materials, another factor that increased teachers workload was the speed at which tablet technology was introduced and implemented in schools. Teachers believed that this technology was introduced without much planning and knowledge of the resources and materials that would be required to use it effectively. This then caused teachers to spent much more time familiarising themselves with the device and its capabilities.

Teachers and learners also emphasised the need for a strong and reliable internet connection in order for the device to be utilised effectively. In addition to this, support was also required in relation to websites and applications that crash often, as well as software problems.

In terms of the requirement for professionalization. Some students were sceptical regarding ‘the digital competence of their teachers’. With many suggesting that teachers should go for training and learn to use tablet technology creatively during lessons. It is important for teachers to acquire the skills that will allow them to ‘promote interactive learning during content delivery’.

Teachers themselves had a difference in opinion regarding this. Innovative teachers believe that they have sufficient skills when it comes to utilising tablet technology effectively and are willing to take responsibility to train and share their knowledge with colleagues. Instrumental teachers on the other hand, had a spilt of opinion with some stating that they could benefit from training, while others stated they did not see the need for it. Despite this, teachers and learners all agreed that a workshop from IT experts would lead to better teaching and learning practices.

The crucial points mentioned by teachers and learners about the conditions required to support teaching and learning with tablet technology expands on the idea of prerequisite requirements of tablet technology implementation. Often overlooked by schools and government this is an important factor in successful integration. While we cannot confirm which conditions are most important and should be attained first, we do understand the importance of preparing for implementation before introducing tablet technology. This illuminates on the findings of the quantitative dimension as draws attention to the fact that certain conditions required to support teaching and learning with tablet technology (such as strong internet connection, teacher and leaner familiarization with the device, digital content, etc.) were met prior to the research being conducted and this could have contributed to it resulting in positive findings.

CHAPTER 5

FINDINGS AND CONCLUSION

5.1 Main findings from the quantitative dimension

The main findings from the quantitative dimension are as follows:

- Learners from both classes (Comparison and Experiment group) performed similarly in the pre-test -in other words the differences between the means were not significant. Here the null hypothesis was accepted, which states that there is no significant difference between the means.
- Learners from the Comparison group performed better in the post-test as compared to the pre-test - in other words the differences between the means were significant. Here the null hypothesis was rejected (which states that there is no significant difference between the means) and the alternate hypothesis was accepted (which states there is a significant difference between the means).
- Learners from the Experiment group performed better in the post-test as compared to the pre-test - in other words the differences between the means were significant. Here the null hypothesis was rejected, and the alternate hypothesis was accepted.
- Learners from the Experiment group performed better in their post-test as compared to the performance of the Comparison group in the post-test - in other words the differences between the means were significant. Here the null hypothesis was rejected and the alternate hypothesis was accepted.

All four t-tests were conducted and the means analysed please see appendix K for more detail. It was found the learners in the experiment group learnt more from their intervention than the learners in the comparison group, learnt from their intervention. Meaning that tablet technology has led to increased learner performance in this grade and for this subject in this school.

The analysis of the fourth t-test in Table 4 is of great importance. By looking at it, we determined that tablet technology has led to improved learner performance in accounting, grade 11.

5.2 Main findings from the qualitative dimension

From the qualitative data collected three themes emerged, each theme and how it illuminates and supplements on the quantitative data is described below:

- Teachers' and students' perceptions about the role of teacher regarding the introduction of tablet technology in classrooms and the consequences for teaching practices - This helps us understand that tablet technology in the classroom has the ability to change the way some teachers have been teaching and inspires the search for improved and better methodologies in getting content across to learners.
- The perceptions' of teachers and learners about changes in learning practices in relation to the prevalence of tablet technology in the classroom- This helps us understand that the prevalence of tablet technology causes a shift away from traditional ways and promotes a search towards practical newer experiences for learners.
- The perceptions of the conditions required to support these teaching and learning practices - This helps us understand that certain conditions required to support teaching and learning with tablet technology (such as strong internet connection, teacher and leaner familiarization with the device, digital content, etc.) were met prior to the research being conducted and this could have contributed to it resulting in positive findings.

All in all, the responses from teachers and learners points out that tablet technology in the classroom does change things around. Whether teachers are instrumental or innovative the presence of this technology is bound to change their teaching and learners learning in some way or the other (unless they strictly control for it). These changes that the tablet brings can be positive or negative, thus it can either lead to improved teaching and learning or unaltered teaching and learning. But this would be

dependent on the actual setting, the subject and grade, the content, the teacher and learners familiarity with the devices and so on. Meaning that each educational setting is different and the ability of tablet technology to lead to improved teaching and learning would not always result positively. Thus, helping us to understand that the positive results obtained from the quantitative dimension in this research cannot be generalized to all classroom settings.

5.3 Conclusion

This study, was meant to answer the research question: In the selected school sample, do learners learn Accounting better with Tablet Technology as compared to Traditional Methods. It was sparked by the problem topic which sought to understand whether tablet technology was enabling teaching and learning or hindering it in this particular school and aimed to illuminate the reasons whether an intervention would be successful or not. The research then set out to gauge whether the digital enhancement in this school would lead to higher- quality teaching and learning and improved learner results.

After a comprehensive research project, I can conclude that the accounting grade 11 learners of the school that was researched have learnt better with tablet technology as compared to traditional methods -in terms of the section, cash budgets in the third term in 2020.

This was confirmed by thoroughly analysing results of the study.

The assumption that learners learn better with tablet technology is true for this grade and subject in this particular school.

5.4 Limitations of this study

Despite achieving positive findings, there are still mandatory limitations of this study that need to be understood. First, the sample of students was only two grade 11 classes at one school. This means that, the findings cannot be generalizable to the larger population of South African accounting students. It is only, applicable to the classes used in the study. Secondly, the study can only contribute to the assumption

that tablet integration leads to improved teaching and learning. Meaning that it cannot say anything about the positive or negative effects of other technological devices, or even technological integration of classrooms in general.

5.5 Recommendations

The use of ICT in classrooms will not simply lead to an improvement in students results. In achieving that, it is imperative that educators receive digital training regarding the use of ICT in the classroom. The benefits of ICT in schools should be promoted by government by way of disseminating information on ICT policies to schools, support should also be provided to schools that face barriers in ICT integration.

In South Africa, research on ICT integration is still in its infancy, much more research regarding the affordances of ICT integration needs to be conducted and the findings explored. Professional learning communities should be promoted and encouraged, to allow teachers to share their knowledge and expertise about ICT integration. All of which may lead to the establishment of high levels of teaching quality which in turn may improve learner results.

APPENDIX A

ETHICS CLEARANCE LETTER

WITS SCHOOL OF EDUCATION

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF EDUCATION ETHICS COMMITTEE

CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: 2020ECE037M**
PROJECT TITLE	Evaluating whether learners learn better using Tablet technology or with traditional methods, in Accounting Grade 11 classrooms.
INVESTIGATOR	Naseera Nanabhai
SCHOOL/DEPARTMENT OF INVESTIGATOR	WITS SCHOOL OF EDUCATION
DATE CONSIDERED	17 August 2020
DECISION OF THE COMMITTEE	Approved unconditionally
EXPIRY DATE	Date of submission of the project report

ISSUE DATE OF CERTIFICATE 27 August 2020 **CHAIRPERSON** _____ (Dr Paul Goldschagg)

cc: Supervisor: Dr Ian Moll

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** emailed to the Ethics Office: Matsie.Mabeta@wits.ac.za .

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

_____ 27-08-2020

Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX B1
LETTER TO PRINCIPAL

Dear Mrs Suliman DATE: 2 May 2020

My name is **Naseerah Nanabhai** I am an **Masters Student** in the School of Education at the University of the Witwatersrand. I am doing research on **Tablet Integration in the classroom using a Quasi Experimental approach.** My research involves looking at two grade 11 Accounting classes.

Both classes will receive a pre-test to determine their prior knowledge of a section in accounting (budgeting). This test will be marked, but the marks will only be used for analytical purposes in the research and not for the assesment purposes in the school. Both classes will then receive an intervention, by their accounting teacher.The experiment group will be taught the section on budgets using the tablet and the comparison group will be taught the section on budgets without the use of a tablet. A post test will then be conducted. This test will also, only be used for analytical purposes in the research and not for the assesment purposes in the school.The findings of the research will be written up, to determine whether learners' knowledge increased, when they were taught with the intergation of the tablet or when they were taught without a tablet.

The reason why I have chosen your school is because it is well settled in using tablet technology. As opposed to other schools, where they have not yet been introduced. I am inviting your school to participate in this research on **Tablet Integration in the classroom using a Quasi Experimental approach,** in 2020.

The research participants will not be advantaged or disadvantaged in any way. They will be reassured that they can withdraw their permission at any time during this project without any penalty. There are no foreseeable risks in participating in this study. The participants will not be paid for this study. The names of the research participants and identity of the school will be kept confidential at all times and in all academic writing about the study. Your individual privacy will be maintained in all published and written data resulting from the study. All research data will be destroyed between 3-5 years after completion of the project.
Please let me know if you require any further information. I look forward to your response as soon as is convenient.
Yours sincerely,

N.Nanabhai

Naseerah Nanabhai
51 Rose Avenue Extension 2 Lenasia.
naseerahnanabhai@gmail.com
061 418 6677

APPENDIX B2
SCHOOL PERMISSION LETTER



24th July 2020

Respected Student

Assalaamu-Alaikum

LETTER WITH REGARDS TO PERMISSION TO DO RESEARCH

We have received your invitation for our school to participate in your research on *Evaluating Tablet Integration In The Classroom.*

We are honored to have been considered and would gladly assist, by allowing you to conduct your research at our school. Our school and learners are well equipped with operative tablets and the latest software, which will ensure smooth researching.

We do however need to be assured that the names of our learners will not be exposed in your research findings and confidentiality is maintained throughout.

We look forward to having you at our school and wish you all the best!

Yours faithfully

N. Suliman
(PRINCIPAL)

APPENDIX C1
LETTER TO TEACHER

Dear: Mr Khan DATE: 2 May 2020

My name is **Naseerah Nanabhai** and I am an **Masters Student** in the School of Education at the University of the Witwatersrand. I am doing research on **Tablet Integration in the classroom using a Quasi Experimental approach.**

My research involves looking at two grade 11 Accounting classes.Both classes will receive a pre-test to determine their prior knowledge of a section in accounting (budgeting). This test will be marked, but the marks will only be used for analytical purposes in the research and not for the assesment purposes in the school.Both classes will then receive an intervention, by you the accounting teacher.The experiment group will be taught the section on budgets using the tablet and the comparison group will be taught the section on budgets without the use of a tablet. A post test will be conducted to determine the learners understanding of the content. This test will be marked, but the marks will only be used for analytical purposes in the research and not for the assesment purposes in the school.The findings of the research will determine whether learners knowledge increased, when they were taught with the intergation of a tablet or when they were taught without a tablet.

The reason why I have chosen your school is because it is well settled in using tablet technology. As opposed to most government schools, where they have just recently been installed. I would like to discuss the nature of the intervention in more detail with you and I would like to observe your lessons. I am seeking your permission for the pre-test and post-test to be conducted in your classroom. And permission to observe your lessons as part of my research. Your name and identity will be kept confidential at all times and in all academic writing about the study. Your individual privacy will be maintained in all published and written data resulting from the study.

All research data will be destroyed between 3-5 years after completion of the project. You will not be advantaged or disadvantaged in any way. Your participation is voluntary, so you can withdraw your permission at any time during this project without any penalty. There are no foreseeable risks in participating and you will not be paid for this study.
Please let me know if you require any further information. Thank you very much for your help.

Yours sincerely,
Naseerah Nanabhai
N.Nanabhai

51 Rose Avenue Extension 2 Lenasia
naseerahnanabhai@gmail.com
061 418 6677

APPENDIX C2
TEACHER'S CONSENT FORM

Please fill in and return the reply slip below indicating your willingness to be a participant in my voluntary research project called: **Tablet Integration in the classroom using a Quasi Experimental approach.**

I, _____ give my consent for the following:

Circle one

Permission to observe you in class

I agree to be observed in class. YES/NO

Informed Consent

I understand that:

- My name and information will be kept confidential and safe and that my name and the name of my school will not be revealed.
- I understand I can be taken out of the study at any time.
- I can ask any questions and query anything about the research project at any time.

- All the data collected during this study will be destroyed within 3-5 years after completion of my project.

Sign_____ Date_____

APPENDIX D1
LETTER TO LEARNER

Dear Learner DATE: 2 May 2020

My name is **Naseerah Nanabhai** and I am an **Masters Student** in the School of Education at the University of the Witwatersrand. I am doing research on **Tablet Integration in the classroom using a Quasi Experimental approach.**

My investigation involves looking at two grade 11 Accounting classes. Both of the classes will receive a pre-test to determine your prior knowledge of a section in accounting (budgeting). This test will be marked, but the marks will only be used for analytical purposes in the research and not for the assesment purposes in the school.

Both classes will then receive an intervention, by your accounting teacher.The experiment group will be taught the section on budgets using the tablet and the comparison group will be taught the section on budgets without the use of a tablet. A post test will be conducted to determine your understanding of the content. This test will be marked, but the marks will only be used for analytical purposes in the research and not for the assesment purposes in the school. You will not be required to write your name on the test, only a number to ensure the annonymity of the test. The findings of the research will be written up, to determine whether your knowledge increased, when you were taught with the intergation of a tablet or when you were taught without a tablet.

I need your help by allowing me to observe the lessons,participate in the tests and allow me to use the results analytically in my research.Remember, this is not a test, it is not for school marks and it is voluntary, which means that you don't have to do it. Also, if you decide halfway through that you prefer to stop, this is completely your choice and will not affect you negatively in any way.

I will not be using your own name but I will make one up so no one can identify you. All information about you will be kept confidential in all my writing about the study. Also, all collected information will be stored safely and destroyed between 3-5 years after I have completed my project. Your parents have also been given an information sheet and consent form, but at the end of the day it is your decision to join us in the study.

I look forward to working with you! Please feel free to contact me if you have any questions.

Thank you
N.Nanabhai
Naseerah Nanabhai
51 Rose Avenue Extension 2 Lenasia.
naseerahnanabhai@gmail.com
061 418 6677

APPENDIX D2
CONSENT FORM OF LEARNER

Please fill in the reply slip below if you agree to participate in my study called: **Tablet Integration in the classroom using a Quasi Experimental approach.**

My name is: _____

Circle one

Permission to observe you in class

I agree to be observed in class. YES/NO

Permission for test

I agree to complete the tests for this study. YES/NO

Informed Consent

I understand that:

- My name and information will be kept confidential and safe and that my name and the name of my school will not be revealed.
- I should answer every question in the tests.
- I understand I can be taken out of the study at any time.
- All the data collected during this study will be destroyed within 3-5 years after completion of my project.

Sign_____ Date_____

APPENDIX E1
LETTER TO PARENTS'

Dear Parent: DATE: 2 May 2020

My name is **Naseerah Nanabhai** and I am an **Masters Student** in the School of Education at the University of the Witwatersrand. I am seeking your permission to use data from your son/daughter in my research. I am doing research on **Tablet Integration in the classroom using a Quasi Experimental approach.**

My research involves looking at two grade 11 Accounting classes. Giving both classes a pre-test to determine their prior knowledge of a section in accounting (budgeting). This test will be marked, but the marks will not be used for school assesment purposes it will only be used for analytical purposes in the research. Both classes will then receive an intervention, by their accounting teacher.The experiment group will be taught the section on budgets using a tablet and the comparison group will be taught the section on budgets without the use of a tablet. I will observe the class to see how the lessons are being delivered. A post test will then be conducted to determine the learners understanding of the content. This test will be marked, but the marks will only be used for analytical purposes in the research and not for the assesment purposes in the school.The findings of the research will be written up, to determine whether learners knowledge increased, when they were taught with the intergation of the tablet or when they were taught without a tablet.

The reason why I have chosen your child's class is because I want to look specifically at grade 11 classrooms as, the GDE (Gauteng Department Of Education) is planning to introduce tablet technology across the country. I have chosen your child's school as it is one of the only schools in this area that is well settled in using tablet technology and thus I believe will be an excellent place to conduct my research. I am asking your permission to allow your son/daughter to participate in my research project. By allowing me to observe the lessons and letting him/her write the pre-test and post-test. And permission to use the results of this test in my research project.

Your child will not be advantaged or disadvantaged in any way. S/he will be reassured that s/he can withdraw his/her permission at any time during this project without any penalty. There are no foreseeable risks in participating and your child will not be paid for this study. Your child's name and identity will be kept confidential at all times and in all academic writing about the study. His/her individual privacy will be maintained in all published and written data resulting from the study. All research data will be destroyed between 3-5 years after completion of the project.

Please let me know if you require any further information. Thank you very much for your help.

Yours sincerely,
Naseerah Nanabhai
N.Nanabhai
51 Rose Avenue Extension 2 Lenasia.
naseerahnanabhai@gmail.com

APPENDIX E2
CONSENT FORM OF PARENTS'

Parent's Consent Form
Please fill in and return the reply slip below indicating your willingness to allow your child to participate in the research project called : **Tablet Integration in the classroom using a Quasi Experimental approach.**

I, _____ the parent of _____

Circle one

Permission to observe my child in class
I agree that my child may be observed in class. YES/NO

Permission for test
I agree that my child complete the tests for this study YES/NO

Informed Consent
I understand that:

- My child's name and information will be kept confidential and safe and that my name and the name of my school will not be revealed.
- He/she should answer every question in the tests.
- I understand I can be taken out of the study at any time.
- All the data collected during this study will be destroyed within 3-5 years after completion of my project.

Sign_____ Date_____

CASH BUDGETS
PRE TEST

30 MINUTES
45 MARKS

CASH BUDGET

You are provided with the Cash Budget and related information of Pinetown Furnishers for the three months ended 30 June 2014. The business is owned by Marco Swallows.

REQUIRED:

1.1 Complete the debtors' collection schedule for the three months ended 30 June 2014. (10)

1.2 Calculate the figures indicated by A—F in the Cash Budget. (13)

1.3 Debtors collection:

- Calculate the debtors average collection period (in days) for the financial year ending 31 March 2014 (calculate to one decimal place). (5)
- Explain whether Marco Swallows should be satisfied with this collection period. Give **ONE** reason for your opinion. (3)

1.4 Calculate the amount owing on the loan on 30 June 2014.

The interest rate on the existing loan from Mangwe Bank is 18% p.a. The repayment on the loan is due at the beginning of each month. (4)

1.5 Marco Swallows is thinking of purchasing the business premises rather than renting it. Provide **TWO** separate **advantages** and **TWO** separate **disadvantages** of this option. **Note:** the business has no financial investments. (4)

1.6 As the internal auditor you are provided with the following actual figures for May 2014. With regard to each expense, explain what you would include in your internal auditors report.

	Actual May 2014
Telephone	R2 200
Water and electricity	R1 900
Advertising	R1000

(6)

INFORMATION:

A. Sales, cost of sales and purchases:

- The total sales for the past financial year amounted to, R890 000.
- The total expected sales are:
  April R60 000 May R80 000 June R90 000.
- 80% of monthly sales are on credit, the rest are for cash.
- The business uses a mark-up of 60% on cost at all times.
- Stock is replaced on a monthly basis.
- 50% of all purchases are for cash, the rest are on credit.
- Creditors are paid in full the month after purchase to receive a 2% discount.

B. Debtors are expected to pay as follows:

- 40% pay in the month of sale and receive a 5% settlement discount.
- 50% pay in the first month after the date of sale.
- 8% pay in the second month after the date of sale.

C. The balance in the Debtors Control Account was R 52 000 at the beginning of the year and R64 000 at the end of the financial year.

D. **Cash Budget for the three months ended 30 June 2014**

	APRIL 2014	MAY 2014	JUNE 2014
RECEIPTS			
Cash sales	12 000	16 000	**A**
Collection from debtors	41 440	**?**	**?**
Fee-income	1 000	1 000	1 000
Interest on bank current account	310	280	0
PAYMENTS			
Purchase of stock for cash	18 750	**B**	28 125
Payment to creditors	19 000	18 375	**C**
Repayment of loan	10 000	10 000	10 000
Interest on loan	750	600	450
Interest on overdraft	0	0	
Rent expense	11 000	11 000	11 000
Bank charges	560	560	560
Telephone	1 500	1 500	**D**
Salaries and wages	**E**	17 850	17 850
Water and electricity	3 000	3 000	3 000
Advertising	3 000	**F**	4 500
Sundry expenses	14 000	14 000	15 000
Drawings	1 200	1 200	1 300

E. Telephone is expected to decrease by 8% on 1 June 2014.

F. Salaries and wages is expected to increase by 5% on 1 May 2014.

G. Advertising is calculated at a fixed percentage of total sales.

45

CASH BUDGETS
PRE TEST - MEMORANDUM

45 MARKS

1.1 Debtors collection schedule for three months ended 30 June 2014

	Credit sales	April	May	June	
February	40 000	3 200			
March	40 000	20 000	3 200	-	
April	48 000	18 240	24 000	3 840✓	
May	64 000✓		24 320✓✓	32 000✓	
June	72 000✓			27 360✓✓	
		41 440	operation if one part correct 51 520☑	operation if one part correct 63 200☑	10

1.2

	CALCULATIONS	ANSWER	
A	90 000 X 20 / 100✓	18 000✓	
B	80 000 X 100 / 160= 50 000✓ X 50/100	25 000✓	
C	25 000 ☑ x 98 / 100	24 500☑	
D	1 500 X 92 / 100✓	1 380✓	
E	17 850 X 100 / 105✓	17 000✓	
F	3 000 X 100 / 60 000 = 5%✓ 80 000 ✓ X 5 / 100	4 000✓	13

1.3

Calculate the debtors average collection period (in days) for the financial year ending 31 March 2014 (calculate to one decimal place).

½(52 000✓ + 64 000)✓ X 365 712 000 ✓ 1 29.7 Days✓☑ operation if one part correct	
Explain whether Marco Swallows should be satisfied with this collection period. Give ONE reason for your opinion.	
Opinion: Yes✓ **Reason** Debtors are paying within the credit term of 30 days. ✓✓	**8**

1.4

Calculate the amount owing on the loan on 30 June 2014.	
600 X 100 / 18 X 12 = 40 000 ✓✓ 40 000 – 10 000 = 30 000✓☑ operation if one part correct Or 450 x 100/18 x12 = 30 000	**4**

1.5

Marco Swallows is thinking of purchasing the business premises rather than renting it. Provide TWO separate advantages and TWO separate disadvantages of this option.	
ANY RELEVENT ANSWER **Two separate advantages**✓✓ • Saving on rent otherwise to be paid. • Earn capital gains on property value **Two separate disadvantages**✓✓ • Repairs maintenance and rates to be paid • Bond is required to finance this option (repayment of loan and interest)	**4**

1.6

As the internal auditor you are provided with the following actual figures for May 2014. With regard to each expense, explain what you would include in your internal auditors report.
Comment on telephone: Good answer = 2 marks; Satisfactory =1; Incorrect = 0 Expected response: ✓✓ The telephone costs are R420 over the projections. These have not been well controlled. Control measures have to be put in place to monitor the usage of the telephone.

Comment on water and electricity: Good answer =2 marks; Satisfactory =1; Incorrect =0 Expected response: ✓✓ • The water and electricity costs are R1 100 under the projections. These have been well controlled. • Poor budgeting by the accountant.	
Comment on advertising: Expected response: ✓✓ Good answer =2 marks; Satisfactory =1; Incorrect =0 The advertising costs have exceeded projections by R3 00. (compare 3.2, F for learners variation) These have not been well controlled and measures must be put in place to rectify this.	**6**

TOTAL MARKS
45
45

APPENDIX G1
POST-TEST QUESTION PAPER

CASH BUDGETS
POST TEST

30 MINUTES
45 MARKS

You are provided with the Cash Budget of and related information of Lekazi Furnishers for the three months ended 31 December 2014. The business is owned by Alfred Celtic.

REQUIRED:

1. Preparethe Debtors' Collection Schedule for November 2014. (8)

2. Calculate the figures indicated by A – E in the Cash Budget (11)

3. Calculate the Debtors' Average collection period (in days) for the financial year ended 31 October 2014

Note:

The actual balance in the Debtors' Control Account was R79 500 at the beginning of the financial year and R83 500 at the end of the financial year.
Explain whether Alfred should be satisfied with this collection period.
Give one reason for your opinion. (8)

4. Refer to the Debtors' Age Analysis. Alfred feels that he has problems in controlling debtors. Give TWO different reasons why he feels this way.
Briefly explain. In each case identify the problem debtor(s). (6)

5. Calculate the percentage (%) increase in salaries and wages in December 2014. One of the employees. Mona Lott, is not happy with this increase.
State TWO points in response to her complaint. (4)

6. On 31 October 2014 you identified the figures below.
Explain what you would say to Alfred about each of the following items at the end of October, and give ONE point of advise in each case: (8)

	OCTOBER 2014	
	BUDGETED	ACTUAL
Advertising	1 000	1 000
Sundry expenses	2 600	1 900
Telephone	900	3 800
Rent income	7500	1 150

INFORMATION:

1. **Credit terms and credit limits:**

It is Alfred's policy to grant debtors credit limits of R15 000 each. They are expected to settle their accounts within 30 days from the date on the statement.

2. **Sales and Cost of Sales**:
    - Total sales for the past the past financial year, R960 000.
    - 75% of sales are on credit, the rest are for cash.
    - The total sales for October to December were as follows:

October	November	December
81 000	78 000	75 000

    - The business uses a mark-up of 50% on cost at all times.
    - Stock is replaced on a monthly basis.
    - 50% of all purchases are for cash, the rest are on c**redit.**
    - Creditors are paid in the month after the purchases in order to receive 5% discount.

3. Debtors collection:

Debtors are to pay as follows:

- 25% of the debtors settle their accounts in the month of the sale (current)
- 40% settle in the month following the sales transaction month (30 days)
- 30% settle in the second month (60 days).
- 5% are written off.

4 Debtors' Age analysis:

DEBTORS' AGE ANALYSIS ON 31 OCTOBER 2014					
NOTE: Business policy sets credit limits at R15 000 per account. The credit terms are 30 days.					
Name	**Total**	**Current month**	**30 days**	**60 days**	**60 days +**
A. Botha	15 000	15 000			
D. Scott	29 000	10 000	5 000	2 000	12 000
P. Raj	8 500			8 500	
C. Ntuli	16 400	11 200	5 200		
N. Mpo	14 600	5 800	5 300	3 500	
	83 500	**42 000**	**15 500**	**14 000**	**12 000**

5 Cash budget

Lekazi Furnitures

Cash Budget for the three months ended 31 December 2014

	October	November	December
RECEIPTS	**137 715**	**84 825**	**81 940**
Cash sales	C	19 500	18 750
Collection from debtors	59 965		55 690
Rent income	?	?	?
Mortgage loan from XYZ Bank	?		
PAYMENTS	**81 300**	**110 350**	**105 160**
Purchase of stock for cash	D	26 000	25 000
Payment to creditors	26 600	E	
Repayment of loan		5 000	5 000
Interest on loan		750	750
Bank charges	1 200	1 350	?
Salaries and Wages	22 000	22 000	23 750
Telephone	900	900	900
Advertising	1 000	1 000	1 000
Sundry expenses	2 600	2 700	2 800
Drawings	?	?	?
Surplus / Deficit	56 415	(25 525)	(23 220)
Cash at the beginning of the month	8 300	64 715	A
Cash at the end of the month	64 715	39 190	B

CASH BUDGETS
POST TEST - MEMORANDUM

45 MARKS

1. Prepare a Debtors' Collection Schedule for November 2014. [8]

	Credit Sales	November Collections
September	**R63 000**	18 900√√
October	60 750√	√√24 300 **(if 40% of credit sales)**
November	**58 500**	14 625√√
TOTAL		**57 825**√

2. Calculate the figures indicated by A – E in the Cash Budget [11]

A	39 190 √
B	39 190 – 23 220 = 15 970 √√
C	81 000 x 25% = 20 250 √√
D	81 000 x 100/150 x ½ = 27 000 √
E	27 000 x 95% = 25 650 √√

3. Calculate the debtors' average collection period (in days) for the financial year ended 31 October 2014. [8]

81 500 √√/720 000 √√ x 365/1 = 41,3 days √

4. Refer to the Debtors' Age Analysis. Alfred feels that he has problems in controlling debtors. Give two different reasons why he feels this way. Briefly explain. In each case identify the problem debtor(s) [6]

Reasons √√ √√
Names √ √
Any two valid points

- Two debtors are exceeding the credit limit of R15 000

(D. Scott – R29 000 and C. Ntuli – R16 400)

- Three debtors are taking longer than 30 days. (D Scott - R12 000 for more than 60 days(, P. Raj – R8 500 for 60 days and N. Mpo – R3 500 for 60 days)
- One debtor, R8 500, appears to have absconded (P. Raj – legal action should be taken)

Figures are not required. Any ONE relevant debtor may be mentioned

5. Calculate the percentage increase in Salaries and Wages in December 2011 [4]

1 760/ 22 000 x 100% = 8%√√

One of the employees, Mona Lott, is not happy with the increase. State TWO points in response to her complaint

Response to Mona Lott √ √

- Compare to inflation rate
- Sales are decreasing per month
- Economy is declining. She is lucky to have a job.

6. Explain what you would say to Alfred about each of the following items at the end of October, and give ONE point of advise in each case:
[8]

Comment √ **each**
Advice √ **each**

	COMMENT TO ALFRED	ADVICE
Advertising	The expense is within the budget	They should consider more as sales figures are declining
Sundry expenses	Favourable varience (actual sales less than budget) efficient and well controlled	Mantain controll over sundry expenses.
Telephone	Significantly overspent (actual more than budget)	Extra control needed/ unnecessary (private) calls not related to business should be avoided.
Rent income	Significantly under budget(actual less than budget) budget was unrealistically high.	Investigate shortfall e.g. poor collection, tenant has left etc. To rectify this problem

APPENDIX H
TEST SCORES

Comparison Group	Experimental Group	Comparison Group	Experimental Group
Pre-test scores of 11H	**Pre-test scores of 11A**	**Post-test scores of 11H**	**Post-test scores of 11A**
11	7	14	21
20	9	18	31
17	17	22	38
12	4	18	22
13	2	26	22
2	13	11	19
9	17	17	25
3	2	21	20
4	2	10	20
9	9	11	22
10	14	14	26
12	5	25	22
16	2	30	26
2	17	16	19
18	18	34	31
8	4	12	20
10	13	20	33
6	3	24	14
8	11	23	20
2	5	5	20
9	11	14	27
12	15	22	16
4	5	15	20
7	9	13	16
10	3	22	15
13	10	15	20
2	19	14	26
16	18	21	30

APPENDIX I
OUTLIER POINTS

The following scores, are outlier points, from both the pre-test and post-test that were omitted from the t-tests and data analysis; as these would negatively alter the analysis and subsequently, produce inaccurate findings.

Results excluded from the Pre-test:

27; 45; 39; 28.

Results excluded from the Post-test:

42; 19; 25; 19.

APPENDIX J
RESULTS OF T-TESTS

t-Test between pre-test scores of the Comparison and Experiment Group

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	*Variable 2*
Mean	9,464285714	9,428571429
Variance	26,70238095	34,10582011
Observations	28	28
Hypothesized Mean Difference	0	
df	53	
t Stat	0,024234826	
P(T<=t) one-tail	0,490378158	
t Critical one-tail	1,674116237	
P(T<=t) two-tail	0,980756316	
t Critical two-tail	2,005745995	
sd for pre-test of 11H	5,167434659	
sd for pre-test of 11A	5,840018845	

t-Test between the pre-test and post-test scores of the experiment group

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	9,428571429	22,89285714
Variance	34,10582011	33,13624339
Observations	28	28
Pearson Correlation	0,493884334	
Hypothesized Mean Difference	0	
df	27	
t Stat	-12,21222789	
P(T<=t) one-tail	0,0000000000008299	
t Critical one-tail	1,703288446	
P(T<=t) two-tail	0,0000000000016599	
t Critical two-tail	2,051830516	
sd for pre-test of 11A	5,840018845	
sd for pre-test of 11H	5.7566408897	

t-Test between Pre-test and Post-test scores of Comparison group

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	9,464285714	18,10714286
Variance	26,70238095	41,58068783
Observations	28	28
Pearson Correlation	0,598670028	
Hypothesized Mean Difference	0	
df	27	
t Stat	-8,583855324	
P(T<=t) one-tail	0,000000001687	
t Critical one-tail	1,703288446	
P(T<=t) two-tail	0,000000003375	
t Critical two-tail	2,051830516	
sd pre-test	5,167434659	
sd post-test	6,448308912	

t-Test between post-test scores of the Comparison and Experiment Group

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	*Variable 2*
Mean	18,10714286	22,89285714
Variance	41,58068783	33,13624339
Observations	28	28
Hypothesized Mean Difference	0	
df	53	
t Stat	-2,929653579	
P(T<=t) one-tail	0,002497681	
t Critical one-tail	1,674116237	
P(T<=t) two-tail	0,004995362	
t Critical two-tail	2,005745995	
sd for postest 11H	6,448308912	
sd for post test 11A	5,756408897	

APPENDIX K
ANALYSIS OF MEANS

Learners from both classes (Comparison and Experiment group) performed similar in the pre-test. This was proven, by the statistical analysis of the first t-test in Table 4.1. The mean of the Experiment Group was, M=9,43 and the mean of the Comparison Group was, M=9,46. We then needed to determine if the difference between these two means were statistically significant. This means that we are asking was it similar by chance, or does it reflect a pattern, an alpha value of 0,05 was used to determine this. Because the p-value was, p=0,49 which is greater than 0,05; and the t-stat was, 0,02 which is less than the t-critical of 2,01; we understand that there is no statistically significant difference between the means. Therefore, we accept the null hypothesis, which states that there is no significant difference between the means and reject the alternate hypothesis, which states there is a significant difference between the means. This then means that, the groups were on par, before the intervention. They were similar in nature and performance and no one group had excessive prior knowledge on the topic that the intervention was meant to teach.

Learners from the Comparison group performed better in the post-test as compared to the pre-test. This was proven, by the statistical analysis of the second t-test in Table 4.2. The mean of the pre-test of the Comparison Group was, M=9,46 and the mean of the post-test of the Comparison Group was, M=18,11. We then needed to determine if the difference between these two means were statistically significant. This means that we are asking was it similar by chance, or does it reflect a pattern, an alpha value of 0,05 was used to determine this. Because the p-value was, p=0,0000000016 which is less than 0,05; and the t-stat was, -8,58 the absolute value of which is greater than the t-critical of 2,05; we understand that there is a statistically significant difference between the means. Therefore, we reject the null hypothesis, which states that there is no significant difference between the means and accept the alternate hypothesis, which states there is a significant difference between the means. This then means that, the learners in this group did learn something from the intervention that was administered to them, which was the

teaching of the content with a traditional teaching methods. The intervention did result in learning.

Learners from the Experiment group performed better in the post-test as compared to the pre-test. This was proven, by the statistical analysis of the third t-test in Table 4.3. The mean of the pre-test of the Experiment Group was, M=9,43 and the mean of the post-test of the Experiment Group was, M=20,90. We then needed to determine if the difference between these two means were statistically significant. This means that we are asking was it similar by chance, or does it reflect a pattern, an alpha value of 0,05 was used to determine this. Because the p-value was, p=0,00000000000082 which is less than 0,05; and the t-stat was, 12,21 which is greater than the t-critical of 2,05; we understand that there is a statistically significant difference between the means. Therefore, we reject the null hypothesis, which states that there is no significant difference between the means and accept the alternate hypothesis, which states there is a significant difference between the means. This then means that, the learners in this group did learn something from the intervention that was administered to them, which was the teaching of the content with tablet technology. The intervention did result in learning.

Learners from the Experiment group performed better in their post-test as compared to the performance of the Comparison group in the post-test. This was proven, by the statistical analysis of the fourth t-test in Table 4.4. The mean of the post-test of the Comparison Group was, M=18,11 and the mean of the post-test of the Experiment Group was, M=20,90. We then needed to determine if the difference between these two means were statistically significant. This means that we are asking was it similar by chance, or does it reflect a pattern, an alpha value of 0,05 was used to determine this. Because the p-value was, p=0,0049 which is less than 0,05; and the t-stat was, -2,93 the absolute value of which is greater than the t-critical of 2,01; we understand that there is a statistically significant difference between the means. Therefore, we reject the null hypothesis, which states that there is no significant difference between the means and accept the alternate hypothesis, which states there is a significant difference between the means. This then means that, the learners in the Experiment group performed better than learners in the Comparison group, on the post-tests after the interventions. Thus, the learners in the

experiment group learnt more from their intervention than the learners in the comparison group, learnt from their intervention. Meaning that tablet technology has led to increased learner performance in this grade and for this subject in this school. The analysis of the fourth t-test in Table 4 is of great importance. By looking at it, we determined that tablet technology has led to improved learner performance in accounting, grade 11.

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