Impacts of technology assisted science teaching on students learning outcome for 9th grade students in a private school in Dubai

الأثارالمترتبة للتكنولوجيا المستخدمة في تدريس مادة العلوم على نواتج تعلم طلاب الصف التاسع باحد مدارس دبي الخاصة

by

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Abstract

The search for learning and teaching methods has led to the exploration of various methods such as traditional and technology integrated. In addition to that, there has been controversies surrounding the use of technology in the classroom. This study is conducted to determine the effectiveness of integrating technology methods over the traditional teacher-centered way of teaching science classes. The aim of the study is test how effective integration of ICT is in the classroom. Key studies consulted in this study are the numerous literature synthesis that have been done by previous researchers on the use of technology in class rooms. In this study, a mixed method research design is applied, involving experimental design and the use of questionnaires. The experiential approach was used to make comparisons between the two methods, while surveys helped determine the attitudes of teacher, students and their parents towards the use of technology-assisted teaching methods in the class. Both the experiential and control groups with 15 students and had similar scores in the pre-test exams. They were then taught two science lessons with the same teacher, but using different methodologies. The test group learned using technology-assisted methods while the control group learned through the traditional methods. Both students and parents took part in the experiment that lasted for 12 weeks. After data analysis, the findings showed that integrating technology in the classroom is more effective than the traditional teacher-centered method for 9th-grade science classes in terms of academic achievement.

ABSTRACT

أجريت هذه الدراسة لتحديد مدى فعالية تطبيق الأساليب المدعومة بالتكنولوجيا على الطريقة التقليدية في التدريس التي تعتمد على المعلم في تدريس مادة العلوم. في هذه الدراسة ، يتم تطبيق تصميم أسلوب بحث مختلط ، يتضمن التصميم التجريبي واستخدام الاستبيانات. في تلك الدراسة تم استخدام النهج التجريبي لإجراء مقارنات بين الطريقتين ، في حين ساعدت الدراسات الاستقصائية في تحديد اتجاهات المعلمين والطلاب وأولياء أمورهم نحو استخدام أساليب التدريس المعتمدة على التكنولوجيا في الفصل، وقد كان لكل من المجموعات التجريبية والمجموعات الضابطة التي تضم 15 طالبًا نفس الميزات في بداية التجربة لتجنب أي تحيز. شارك قسم التدريس في المدرسة الأمريكية الخاصة في دبي وأولياء أمور الطلاب في البحث الذي استمر لمدة 12 أسبوعًا.

بعد تحليل الآختبار ، أظهرت النتائج أن استخدام طريقة التدريس بمساعدة التكنولوجيا هو أكثر فعالية من الطريقة التقليدية المتمحورة حول المعلم في تدريس مادة العلوم للصف التاسع من حيث التحصيل الدراسي.

Dedication

I dedicate my dissertation work to my family who have never left my side. A special feeling of gratitude to my loving parents, who taught me the value of hard work, their words of encouragement and push for tenacity ring in my ears. I also dedicate this dissertation to my best friend Mervat who has supported me throughout the process. I will always appreciate all what they have done for me.

First and foremost, I am dedicating this thesis to my young niece (Sara) how gave me full power during my learning journey. I also want to remember my “little” uncle Mohamed, I will make sure our memory lives on as long as I shall live. I love you all and miss you all beyond words.

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Acronym

Pre-test – This is a quasi-experiment where participants are studied before the experimental manipulation

Post-test – This is a quasi-experiment where participants are studied after the experimental manipulation

Quasi-experiment – This is a research where participants are not randomly assigned

Mean score – This is the average, or sum of all numbers divided by the number of values in the list

P-value – This refers to calculated probability, or the probability of finding observed results when the null hypothesis is true

T-test – This is a method that tests if two samples are statistically different from each other.

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CHAPTER 1: INTRODUCTION

1.1 Background and Motivation to the Study

The search for the most effective method of teaching science has led to an exploration of numerous teaching strategies, ranging from traditional class lectures to active learning techniques. The conventional approach is mostly centered on technical matters that are held formally, making it difficult for students to develop a connection to real-world issues. The traditional teacher/manager model of teaching has been in use throughout the world, where the teacher is the primary manager of instruction and assessment in a classroom. Despite its prevalence, the effectiveness of traditional teaching methods is limited by the fact that it is mostly theoretical and kind of boring.

In recent years, the world has witnessed several waves of technology innovation with each wave coming with greater changes. Rapid evolving technology has to provide convenience in every aspect of life while revolutionizing education. Several studies have suggested that technology helps teachers by helping teachers to instruct through student engagement, while increasing learning achievement when used appropriately (Hamari et al., 2016). This development in technology has come with calls to integrate it into the classroom and help the teacher in instructions. The potential role of technology in learning has been a matter of concern researchers and teachers combined and an important debate for researchers.

In recent years, there has been a widespread integration of education to transform learning. Technology changes the complexity of a science classroom by ensuring students are motivated to study and perform better in their academics. It has been viewed as the key to reforming the educational system by changing the teaching pedagogy and actively involving students. Today, technology has developed into an important tool for teaching that benefits both the teacher and student. The

development offers the potential to expand access to quality education by opening doors and alleviating frictions in teaching science concepts

Education systems have rapidly progressed simultaneously with technological development changing the dynamics of teaching approaches. There are many benefits connected with integrating technology into the classroom. Research has indicated that technology in the school provides opportunities for more relevant and stimulating experiences for learners. Use of educational technology has excellent potential for improving instruction in science including the potential to enhance overall grade levels.

Science teaching requires students to have positive behaviors related to technology. Studies have shown that students are unsuccessful to understand science concepts in science, which frightens them from attending science lessons (Zaragoza & Fraser, 2017). This problem can be solved by integrating technology in a science classroom. This teaching method entails implementing technology into the classroom to facilitate learning and create a better learning environment that combines theory and practice.

A successful lesson is one where the instructor addresses the learner's needs and increases their understanding of complex concepts. With the student and classroom changing significantly, the method of instruction must also be changed to adapt to the changing times. Traditionally, science can be annoying for some students when presented in the usual lecture model. Technology can increase the interest of students in learning science by creating some excitement to undertake any problem. The best example of integrating technology in teaching science is the Technology Assisted Integration (CIA), which utilizes technologies as individualized teaching tools to keep pace with technological

advances. Technology-assisted learning provides students with better decision-making skills and an elevated way of solving problems through technical applications.

1.2. Statement of the Problem

Science is an essential subject in school education, often considered complicated by some students like many other empirical sciences. It is considered to be a challenging subject that raises a negative attitude, contributing to lower performance in the course. Several policy makers have attributed this negative attitude to an overreliance on the traditional approach of teaching science as a factor that contributes to a lack of motivation among students during a science lesson (Uluyol & Şahin, 2016). The model of teaching science using recitation leads to an overload of student's memories, making them perform poorly.

Due to this factor, there is a necessity to integrate multimedia and technology technologies when teaching science to increase student's motivation. Technology has become an essential tool of edutainment due to its ability to provide visual fun and entertainment aspects during a science lesson. Its application can motivate students and change their attitudes towards the subject, that contributes to better test scores. Students are most likely to enjoy a science lesson when they engage with technological tools, whose applications can also bring out higher level thinking skills (Hamari et al., 2016).

A variety of technologies are currently used in the field of education. Studies have shown that about 60 percent of teachers have implemented technology into instruction and assessment in the core subjects. In essence, advances in technology and technology science allow teachers to use instructional multimedia programs to enhance the learning process during a science lesson. In particular, the science

classroom provides a perfect environment to integrate technology and develop the knowledge and skills needed to succeed in life (Sung, Chang, & Liu, 2016). Students need these tools to perform science experiments and understand different scientific concepts.

Several researchers have defined educational technology as the systematic process of integrating technology into a classroom to improve learning and teaching. The concept describes an application of modern teaching techniques that can improve the quality of education for students. In most cases, educational technology is described with the use of instructional materials and methods that integrate technology. The application of educational technology requires knowledge in the areas of pedagogy, technology sciences, psychology, didactics, and informatics.

Technology in the classroom is becoming more predominant as technology replace textbooks, and technology assists the instructor in relaying information. Its integration into the school has the potential to change how instructors teach and how students learn. In the last decade, technology access in classrooms has been steadily growing. However, despite the potential of technology in schools, teachers have been portrayed to resist its integration in classrooms as they prefer traditional methods of teaching. Reports have shown that relatively few teachers are willing to fully exploit technology in classrooms, which has reduced its effective integration. This reluctance by teachers to integrate technology in attributed to lack of knowledge on the benefits of technology in classrooms (Sung, Chang, & Liu, 2016). In this regard, this reluctance can be mitigated when teachers have pretty much experience and understand the importance of integrating technology in teaching science.

1.3 Purpose of the Study

Technology In educational settings is a tool for improving teaching and learning, but there are concerns over its effectiveness in a classroom setting. This study was conducted to determine the effectiveness of technology games and technology in enhancing learning and teaching of science compared to traditional methods. Its purpose was to analyze the effect of using technology and experimental methods for teaching science in 9th graders. The study focused on discovering and describing the use of technical assistance in 9th-grade science courses and its effectiveness compared to traditional teaching methods. This was done by making comparisons between traditional methods of instruction such as teacher-centered and technology assisted approaches to determine the best method that improves learning of science concepts. The finding of the study will be crucial for science teachers and schools at large, giving them insights into the results of using each teaching method.

In the bottom line, this research focuses on the importance of integrating technology in teaching by comparing its effectiveness of traditional methods. The effectiveness of the approach is measured by increasing the academic performance of students and their attitudes to attend the science lessons. The study looked to establish how integrating technology in teaching science improves student's outcome in the scientific tests. It also surveyed the effect of traditional methods and technical assistance on the problem-solving ability of 9th-grade students. Technology is a positive impact on student learning that improves their engagement and retaining information. It provides meaningful learning experiences to students, including hands-on learning opportunities (Hamari et al., 2016).

The study focuses on comparing the effectiveness of traditional teaching methods to the practical techniques of using technology assistance in teaching science classes. Research questions in this study focused on the achievement and attitude of students when technology is used in a science

classroom compared to the traditional teaching model. The central question to this study was: How does technology support science learning for 9th-grade students compared to conventional methods. As such, the study aimed to deal with traditional and modern teaching methods based on the performance of students.

1.4 Purpose and Objective of the Study

The purpose of this study was to determine the effectiveness of using technology in teaching.

Major objective includes:

- To describe the effects of using technological assistance compared to traditional methods in teaching science classes.

1.5 Main and Specific Research Questions

The research questions include:

1. Do technology assistance methods improve science scores among students in 9th grade compared to traditional teaching methods?
2. Are there any significant differences in the final test points of technology-assisted education and teacher-centered model?
3. Is there a significant difference between pre-test points and final test points between the experiment group and the control group?

1.6 Hypothesis

The hypothesis develops from this research. Based on this research question, the following are the null hypotheses:

- H1: There are no score differences between students taught using traditional learning methods, and those shown using experiential learning.
- H2: Technology assistance methods do not improve science scores among students in 9th grade.
- H3: There are no significant differences between pre-test and final test results between test and control groups. The study hypothesizes that integrating technology improves the academic performance in science subject compared to using traditional teaching methods

1.7 Rationale of the Study

While thousands of researches that have been carried out in the past to study the utmost effective science teaching methods have led to an understanding of the efficacy of methods such as traditional class lectures and active learning techniques, the scope has been limited for 9th grade classrooms. Alternatively, the impact of technology within the classroom setting continues to gain popularity. Researchers are aware of the potential of technology to change the processes of communication and tutoring. Although teachers have reluctant to accommodate the use of technology within their professions, it becomes important to help them realize the benefits of technology in classrooms by taking up a proactive role through the current study. Therefore, the practical implications of the research are to enable teachers achieve an understanding of ways in which technology can be manipulated to suit each classroom and student. Also, policymakers can use the paper for future policy implementation that will improve outcomes for 9th graders in Dubai.

1.8 Structure of Thesis

This essay will have several major chapters that includes introduction, background, literature review, design and methodology, data analysis, findings, discussion, conclusion and recommendation.

1.8.1 Chapter 1: Introduction

The first chapter of this dissertation is the introduction containing information about the topic. The section provides an overview of the main points in the research paper as it introduces the reader to the topic. The introduction contains a background and problem statement, purpose of the study, a discussion of the research question and a hypothesis. The background sets a foundation on the topic of technology in education and its benefits compared to traditional methods.

1.8.2 Chapter 2: Literature Review

This section evaluates previous research on the topic to show the gap in knowledge that the research attempts to fulfill. It describes the different teaching methods, such traditional, experimental and technology-assisted methods. The section also discusses the limitations of each topic and a choice of the best method. The section sets a foundation for the experiment that seeks to understand how technology is better than traditional teaching method in school.

1.8.3 Chapter 3: Methodology

This section discusses the method of data collection, sampling technique as well as participants of the research. It contains information about how the research was conducted, the choice of participants and the sampling method used. The methodology used is a mixed method of both qualitative and quantitative research. An experimental design is utilized for quantitative data while questionnaires are used for the qualitative data. Participants comprised of students and teachers, selected using convenient sampling method.

This section also contains the process of data analysis and how the results were tabulated. Some data analysis methods used include t-tests, mean scores as well as standard deviation.

1.8.4 Chapter 4: Results

This section presents the results of this study, which are accompanied by tables and graphs. The section characterizes the patterns and quality of results from the experiment. The section uses charts and tables together with a narrative describing the most relevant information

1.8.5 Chapter 5: Discussion and Conclusion

This section discusses the meaning of results and interpret their significance in solving the problem statement. It compares the results with theoretical expectations as shown in the hypothesis, determining whether the study confirms the null hypothesis or not. The discussion also contains themes in the study, ethical consideration and limitations of the study.

The conclusion reviews the result in relation to the original problem statement. It contains the most important findings and assesses the success of the study in light of the benefits discussed in the introduction. This section starts by mention the purpose of study, before discussing summarized data that is presented in the thesis. It also articulates the main points with clarity and re-sequencing the findings.

The section recommends directions for future work. It provides recommendations on how to implement technology integration into the classroom based on the findings from the research.

CHAPTER 2: LITERATURE REVIEW

2.1. Overview of the Chapter

The best method of teaching science is the one that best enables students to build and organize knowledge regarding testable elucidations and extrapolations about the world. The basis for rudimentary scientific study such as the one undertaken at a secondary school level is the world surrounding the students and also the world inside the students (Cheung, Slavin & Lake, 2017). The first obligation of a science teacher is to create an interest in science for the students (van Manen, 2016). After all, science is almost always a complicated and difficult subject with many twists and turns hence without students' interest, it might be hard to teach (Ward & Roden, 2016). The second obligation is to provide scientific knowledge (Saido et al., 2018). Whereas there may be a lot of practical elements in science, at the rudimentary level, there is still a lot of theoretical information to be gained (Daniels, 2016; Dogan, Pringle & Mesa, 2016). For example, in biology, it is necessary to learn the names of the body parts which is theoretical before learning what they do, which can be learned practically. The third obligation of a science teacher is to enable students to thinks like scientists (Saido et al., 2018). Thinking like a scientist means being able to internalize and apply the scientific method (van Manen, 2016). The components of the scientific method include systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses (Daniels, 2016). Based on the above, the best method for teaching science is the one that most elicits interest in the subject, enables a better understanding of actual content and also most enables the students to think like scientists.

The instant literature review will evaluate the three main methods of teaching science generally and more specifically in a secondary school classroom with a view of establishing which one of the

three is the best. The first method to be evaluated will be the traditional methods which combine lectures, class discussion, and peer-to-peer teaching. This is the method that has been used to teach science for as long as the formal study of science has existed. The second method to be canvassed is the experimental method of teaching science which is based on cause and effects. In the instant literature review, the experimental method of teaching science will include the hands-on approach, the use of research-based projects and also the use of case studies. The final method to be canvassed is the application of ICT in teaching science which will include all the advanced ways if teaching science that ICT has made possible. Being a comparison literature review, the final segment will discuss the three methods contemporaneously so as to come up with the best one, as they all have their strengths and weaknesses. Based on a careful evaluation of the three methods, it is evident that in a secondary school classroom which is normally filled with teenagers, the traditional and experimental methods are useful and indeed indispensable but the use of ICT is the best possible method.

2.2 The Science Pedagogic Methods

2.2.1 Traditional Method (lecture)

Traditional Pedagogy was primarily made up of lectures where the teacher orally and in writing presents information to the students. This traditional method is among the most commonly used the rudimentary level such as in the normal secondary school; hence traditional lecturing is an invaluable method inside classrooms. As outlined in Sadler & Sonnert (2016), the knowledge curve of students is to a large extent determined by how much the teacher knows. Traditional lecturing is an important component of teaching science and applies even in the process of using other methods of teaching including the practical ones. No matter how advanced the teaching process gets, lectures,

which entails simple vocal, active teaching cannot be alienated in the process of teaching science to students (Bektas, 2017).

According to Taştan et al., (2018), the learning of science under the modern highly advanced learning environment still depends in the traditional notions of who the teacher is and what the teacher does during class time. In the classroom, the teacher is thus an important source of both knowledge and the motivation to learn (Saido et al., 2018). The traditional lecture which entails passing knowledge directly to the student, as well as the passive lecture that forms an integral part of all the other methods outlined herein below, is thus critical to every science lesson (Bektas, 2017). Among the invaluable and indispensable areas of traditional lecturing are the question and answer lessons which are the hallmark of learning in science. A science lesson will be taught which applies to some part of the day to day life then students will have questions on how the lesson applies to that scenario. Science teachers must be knowledgeable and quick on their feet so as to be able to answer this question (Meguid & Collins, 2017).

2.2.2 Student Participation and Discussion Method

The encouragement of student participation and discussion component of the traditional method as it enables students to come to a realization of what they know and think about science even as it enables the teacher to come to a similar understanding of student knowledge. As argued in Elby, Macrander & Hammer (2016), epistemic cognition in students vary exponentially. Hencem different students have different presuppositions about scientific phenomena. For students to learn better, they need the means to discover what they believe or feel about specific scientific issues even as the teacher needs to learn how different students understand different issues. Discussions create an avenue for the

teacher to understand students, even as students understand themselves from the perspective of the science lesson they are undertaking. According to Lai & Hwang (2016), among the best approach class discussions between students and teachers as well as between the students themselves, is to eliminate rigidity in the process. Discussions do not have to come up at designated times but rather commenced as and when the situation arises. For example, if in the middle of a lecture, the teacher arrives at a point where the discussion would aid the students, the lecture can be stayed to allow for discussion when the interest of the students towards the particular topic has already been elicited. It is, however, important to avoid wasting too much time on discussion, as research has shown that discussion is the greatest source of time wastage in problem-based learning (Ruiz-Gallardo, González-Geraldo, & Castaño, 2016). Whereas most discussions are both interesting and productive, of students get carried away, a lot of time that would otherwise have been productively spent can be wasted. The teacher should thus carefully regulate the time that a discussion will take and curtail it if it begins to get derailed.

Over and above incorporating discussion into the lessons, it is also possible to have a discussion as the primary learning process through the concept of dialogic learning as outlined in Ruthven et al., (2017). Under this approach, teaching metamorphoses from the traditional lecture approach into a conversational one. For example, the students can study a subject in advance then class time can be used to talk about it with the other students and the teacher freely participating. Available research has shown dialogic teaching to be especially effective for science lessons as it eases the complexity of the content while contemporaneously making the lessons more interesting.

Student participation is also an integral element of the flipped classroom strategy as outlined in Schmidt & Ralph (2016). The name flipped classroom come about because a form of reversed roles

in learning is adopted. The normal study approach begins with the teacher who prepares the lesson. After preparation, the teacher will then teach the lesson to the class. Finally, the class will then do homework and revision at their own time, most probably at home. In the flipped classroom, the teacher is only involved in the revision and doing of homework. The student takes the lead in preparing lessons by reading or watching a documentary. Students also undertake the main learning through strategies such as discussion or peer-to-peer learning. Finally, the revision and homework parts are done together with the teacher. This flipped classroom places more onus for learning on the student that it does for the teacher. It can be especially suitable for a classroom where the students are struggling with varying units. Each student or set of students will spend private time on the areas that they are struggling with; then the entire classroom can revise together.

2.2.3 Peer-to-Peer Teaching Method

Peer-to-peer teaching strategies help to reduce the adverse effects of rote learning as when students teach one another, both sets of students not only have fun but also learn. Among the greatest threats to the formal learning of science at the rudimentary level is lack of interest in the subject, according to Hacieminoglu (2016). An important driver for diminished interest in science is rote learning where students have to memorize large amounts of scientific information. Peer-to-peer teaching provides an alternative form of learning that does not involve rote learning and thus plays an active role in mitigating a lack of interest in science by students. An important strategy towards peer-to-peer teaching is the concept of collaborative learning, which according to Savelsbergh et al., (2016) is an effective way to teach science. Under collaborative learning, the teacher sets the pace and indicates the content while the students do most of the legwork.

Whereas collaborative learning takes many forms, in the classroom, peer-to-peer teaching would be an effective means of teaching science. The teacher would indicate the lesson to be learned to the students who would then partner up and divide the work. Each student can then teach the other student the assigned work. Within this peer-to-peer teaching sessions, dialogic teaching can also be applied as outlined in Duran & Topping (2017). Under this hybrid approach, the student peer and the teaching peer can hold a conversation about the science lesson with the teaching peer taking the lead. To make the lesson more interesting, the teacher can quietly supervise the larger class without interrupting but take notes to ensure that mistake that arises during the peer-to-peer teaching lessons are revisited and corrected after the session (Wilkinson et al., 2017). Acting as teachers will elicit the interest of the teacher while the dialogic approach will keep the student or students being taught participating hence also augmenting their interest. The teacher ensures order and addresses errors at a delayed time hence making the classroom both interesting and effective at the same time (Marbach-Ad et al., 2016).

In a highly diverse classroom, there may be too much work for the teacher to even manage collaborative teaching making per tutoring the only option according to Theodor Poulos, Antoniou, & Lepouras (2016). Under peer tutoring, one student acts as an actual teacher to the other student and teaches with almost no supervision for the teacher. Whereas active participation of the teacher may not be necessary during peer tutoring, a lot of planning is needed to pair the right students together to enable learning with minimal supervision. For example, a highly talented student can be paired with struggling students or two average students can be paired, each to teach the other a section that they have excelled in respectively. During peer tutoring, the students will emulate their teacher for the duration of the lesson. Conversely, peer-to-peer teaching can also be done in groups under the concept of according Peer-Led Team Learning (PLTL) to Snyder, Sloane, Dunk & Wiles (2016). PLTL enables

a single gifted student to assist several students who are either behind on their studies or challenged in some way. For example, a resident student can be the PLTL leader of a group of immigrant students who may be struggling with the curriculum.

Similarly, a very talented student can be the team leader of a group consisting of average students. PLTL enables a classroom teacher to assist struggling students without leaving the other students feeling left out. As the struggling students catch up, the talented students are using the opportunity for revision or getting a better understanding of the material. PLTL can also be advanced into the concept of cooperative learning, another form of peer-education that is outlined in Chatila & Al Husseiny (2017). Cooperative learning is both a form of peer-learning and also a form of rewarding students. Under the strategy, the teacher will create groups that combine achievers with struggling students. A reward system will then be developed based on the group as opposed to individual students. The talented students will be motivated to assist the struggling students, even as the struggling students will endeavor to improve so as not to let their more talented colleagues down. The entire team will thus be motivated to work harder hence increasing the propensity for success.

2.2.4 Experimental Teaching (Hands-on Activities and Scientific Projects) Method

The utilization of hands-on activities and scientific projects not only provides an interesting way to learn science but also the means to develop the ability to think scientifically. From the perspective of developing the ability to think scientifically, Saido, Siraj, Nordin & Al-Amedy, (2018) focuses on an area of scientific thinking that it calls the high order thinking, based on a primary study carried out in Iraqi secondary school. The critical component of the research lies in the fact that activity-based pedagogy was the primary method applied to develop the high order thinking (Zaragoza

& Fraser, 2017). The researchers came to the conclusion that activity-based teaching was an effective method of developing high order thinking. Being able to actively participate in scientific activities and projects thus fosters the ability to think like a scientist.

It is also important to note that the hands-on activities that students engage in must be made as interesting as possible. Available research shows that if students enjoy the activities they participate in as part of their science lessons, they are more likely to understand the lesson itself better, according to Basheer, Hugerat, Kortam & Hofstein (2017). Further research also shows that participatory learning also affects the attitude of the students towards science, the motivation to study science and the actual conceptual understanding of the course contemporaneously (Cleveland, Olimpo & DeChenne-Peters, 2017). The combination of the three particulars has been seen to make a difference even for students who are struggling with sciences. Among the best strategies under this category is a merger of hands-on activities and scientific projects under a concept known as guided-inquiry laboratory experiments, according to Ural (2016). Under the said concept the lesson begins with an interesting phenomenon to be investigated, then a means to investigate the said phenomenon. The students will semi-independently use the methods provided to conduct experiments and investigate the phenomenon that comes to their conclusions about it (Cheung et al., 2017). These experiments not only elicit interest in studying science but also make the lesson memorable hence making it easier for the students to remember both the phenomena and its causation as revealed by the experiments.

The success of this experiments can be attributed to the fact that they are a combination of a challenge and support, which according to Shernoff et al., (2016) fosters a good learning environment for the sciences. A good science lesson requires a challenge to make it interesting for students. Presenting the students with a phenomenon that seems so complicated is a worthy challenge. However,

if the students are left to their own devices with the challenge, the complexity may make them lose interest. This is where support comes in with the teacher enabling the students to use experimentation to overcome the challenge (Cheung et al., 2017). Finding a challenge and a means to support students through the challenge is thus an effective way to establish a positive learning environment for science. A problem that needs to be solved can also be a focal point of hands-on based learning under the concept of problem-based learning according to De Witte & Rogge (2016). Under this approach, the teacher will provide the students with a problem and the means to solve it, but the means will not be evident. The problem can be based on a case study or such as symptoms of a disease that the students need to diagnose and treat in a biology class. The students will then study and discuss the problem so as to figure out its solution (Yaday et al., 2016). This approach also utilizes the strategy of combining pressure and support to create a conducive learning environment for science (Ulukök & Sari, 2016).

Finally, there is also the project work as outlined in Obialor, Osuafor, & Nnadi (2017) that to some extent varies from hands-on learning. Under project work, a level of autonomy is allowed to the student through the elimination of part of the support availed in hands-on learning. The teacher will give the students a problem singularly or severally and allow time for the students to solve it (Forsyth, 2016). The teacher may be available to provide assistance as and when the students need it, but the students are encouraged to solve problems on their own (Cheung et al., 2017). These projects go a long way in assisting students to think like scientists.

2.2.5 The Use of ICT Method

The use of ICT in teaching science may have developed as a subordinate element of teaching science through the traditional and experimental methods, but due to the proliferation of computers, it

has gradually grown into an actual teaching method by itself. The application of ICT in the teaching of science in the classroom not only enables a higher level of the interaction between students and also between students and their teachers but also assists in teaching disadvantaged students (Aslan & Zhu, 2017). From the perspective of disadvantaged students, the article McMahon, Cihak, Wright, & Bell, (2016) evaluates the process of using ICT to create inverted reality so as to teach scientific vocabulary to students who suffer from an intellectual disability. According to the article, inverted reality can connect events to vocabulary hence easing the learning process for challenged students. Inverted reality can also similarly ordinary students learn vocabulary in areas of science that they struggle in. The need for incorporation of ICT in education is augmented by the fact that ICT itself is also a part of the modern formal curriculum as per Broll et al., (2017). From the perspective of science, ICT has become what English was in traditional education as it is both a course to be learned and a tool for learning other courses. Another perspective of using ICT for science pedagogy more so for younger students is the gamification of science studies as outlined in Hamari et al., (2016) and Papadakis & Kalogiannakis (2017). Modern students show extreme interest in computer games and that interest has been harnessed for use as a science learning tool, and with great success. Carefully developed programs combine the experience of enjoying a computer game and learning science. The learning can be the introduction of new concepts or even actual teaching on substantive elements of scientific study.

ICT also plays a role in modern science learning through the concept of blended learning, an approach that introduces the use of technology in the day to day traditional learning process according to Lee, Lau & Yip (2016). Traditional teaching aid such as the blackboard and chalk are gradually becoming outdated due to technological advancement and proliferation. A good example of blended learning would be the students having a tablet which the teacher uses to take the class through a lecture

as outlined in Ho, Nakamori, Ho & Lim (2016). The students can then both listen to the teacher in real life and follow the lecture on the tablet. Blended learning can also play a critical role in the cases when some students are slower at learning than others. The gadgets can keep the faster students busy as the teacher assists, the slower one. However, according to Sung, Chang, & Liu (2016), care should be taken when preparing the lessons by the teacher due, inter alia, to the ICT knowledge gap between the ordinary teacher and the ordinary student. ICT evolves rapidly and regularly with students being able to keep up with technology changes as opposed to teachers. If the lesson preparation is based purely on the teachers understanding of modern technology, a lack of harmony between students and the teacher is possible. In the article Sung, Chang, & Liu (2016), it is suggested that the teacher bases the integrative blended lessons of available up to date research. The research can then be adjusted to suit the needs of the class, as opposed to the teacher developing lessons based on personal knowledge about available technology.

Over and above blended learning, ICT has also made it possible for learning to take place without having to actively include the teacher as presented in Pernanda, Zaus, Wulansari & Islami (2018). Among the techniques for learning without a teacher is an advancement of blended learning called CD learning. Under CD learning, the lesson is reduced into an animation of even pre-recorded lesson combined with colorful illustrations. The multimedia capabilities of CD learning not only make the learning process more interesting and captivating for the students but also makes learning easier due to the illustrations.

ICT can also be useful in the utilization of case studies and real-life situations to teach science according to Ward & Roden (2016). With computerized devices, case studies in multimedia content such as videos and pictures can be shared amongst students then used a learning tool (Siahan et al.,

2017). Computers and computerized gadgets can bring real-life scenarios to the classroom, which enables students to build complex knowledge from day to day knowledge they have already developed (Mtebe, Mbwilo & Kissaka, 2016). Among the examples of computer-enabled case study strategies, the Discovery-Inquiry (DI) Learning Model is one of the critical components of utilizing real-life scenarios as reflected in the research reported in Tompo, Ahmad & Muris, (2016). The said article focuses on the use of DI in Indonesia to assist students to overcome common misconceptions about scientific phenomena. Based on the results and discussion, DI is highly effective as a model for scientific study even in complicated areas of science. As in solving an algebraic equation, students develop fresh knowledge by building in what they already know. Computer simulation has also advanced the ability to study science using real or imagined case studies or even virtual experimentation (Suwono et al., 2017).

From a different perspective, the use of ICT has also been an invaluable tool for bringing the world and current issues to the modern classroom as they form an integral part of the science learning process. For example, climate change and global warming is not only an important issue but also a source of modern debate (Herman, Feldman & Vernaza-Hernandez, 2017). A teacher can use news and current events as case studies for science lessons. Conversely, the teacher can also use computer-generated case studies as a teaching tool (Lynch & Ghergulescu, 2017). Most of the lessons taught in science classes have an actual application in day to day living. Many of the gadgets in the physics class relate to machines used in day to day life while biology refers to human bodies or the bodies of other animals.

2.3 Limitations of Methods of Teaching Science

Each of the three methods addressed above has an elaborate pro and cons that also includes practical and material limitations. The traditional method, which combines lectures, peer-to-peer teaching, and student participation has a number of limitation that made it necessary to expand the teaching of science to include the other new ways (Sadler & Sonnert, 2016; Bektas, 2017). For a start, the traditional method is mainly limited to the acquisition of information as opposed to the development of knowledge. Under the traditional method, students learn a lot about science from a theoretical point of view based on verbal learning as well as the limited two-dimensional illustrations (Bektas, 2017). However, the development of knowledge in science requires some form of experience which the traditional method could not provide. Conversely, the traditional method has a handicap when dealing with differently talented students as the faster-learning students have to slow down so as to allow the slower students to catch up (Boyle, Rosen & Forchelli, 2016; Meguid & Collins, 2017). It is in part due to students being variously talented that peer-to-peer teaching is essential to the traditional method.

On the other hand, the primary limitations of the experimental method are cost and time constraints. The experimental method entails bringing the science to the classroom through practical application (de la Torre, Sánchez & Dormido, 2016). However, at the secondary school level, science lessons are quite advanced and would require relatively complicated experiments and illustrations. Such experiments would require a lot of paraphernalia, space and time to be done effectively, which resources are not available to most classrooms (Holman, 2017). A lot of training and skill is also necessary to enable the carrying out of several experiments in a safe manner (Balta & Sarac, 2016). In many cases, the student ends up being taught about the experiments, instead of getting to participate

in them (de la Torre, Sánchez & Dormido, 2016). Finally, the ICT method has fewer limitations safe for the monumental cost for acquisition and maintenance of hardware and software and also the cost of training. Information technology is one of the most dynamic industries in the world and sees a lot of change almost on an annual basis. Equipment and gadgets acquired would need regular upgrades and even replacements (McMahon, Cihak, Wright, & Bell, 2016). The upgrades and replacements would also need to come with training for the teacher who needs to use the gadgets in the classroom (Klentien & Wannasawade, 2016).

2.4 Why Science is Taught in Many Ways?

It is, inter alia, to counter the limitation above that science is taught in a variety of ways, or rather a combination of more than one way. Education planners and the classroom teacher will carefully evaluate the lessons that need to be taught and develop the most suitable way of teaching each one of them based both on the nature of the lesson and also on the availability of resources. Simple and straightforward lessons are taught using lectures (Bektas, 2017). Tricky lessons that may confuse students are taught using the experimentation lesson. However, the choice of experimental lessons is also determined by the ease and safety of the experiment as well as the availability of resources. In many cases, the traditional method will be combined with the experimental lesson so as to limit costs and ensure student safety (de la Torre, Sánchez & Dormido, 2016). ICT is the most recent teaching method and has created a way to mitigate the manifest limitation of traditional and experimental lessons. ICT enables the teacher to interact with different members of the class contemporaneously hence aiding the traditional method (Klentien & Wannasawade, 2016). Is also enables virtual experiments which mitigate both the dangers and cost implications of the experimental

method. It is based on the above that the teaching of science in a classroom takes a multiplicity of approaches.

2.5 Suitable Environment for Teaching Science

Of the four learning environments, the most suitable for teaching science is the community-centered learning environment that focuses on learning the needs of the community. Science is not about getting an education so as to acquire certification but rather gaining knowledge that will be useful to the student and the community in the future (Kim et al., 2018). The community-centred learning method begins with an evaluation of the community and assessment of what the community needs currently and in the future. Science lessons will then be calibrated based on these needs (Colomer, Serra, Cañabate & Serra, 2018; Kim et al., 2018). The learning of science has been going on for millennia, but applicable science has been changing from generation to generation. It is on this basis that the community method is most suitable to enable the teaching of the most relevant aspects of science in a secondary classroom.

2.6 Teaching Science in Past and Present

A lot has changed between the traditional and modern approaches of teaching science both in process and teaching environment (Müller et al., 2016). For a start, ICT has become an invaluable part of teaching modern science while in the traditional classroom, ICT did not even exist. From the perspective of the teaching environment, science was traditionally taught in a didactic manner (Sadovaya, Korshunova, & Nauruzbay, 2016). The teacher was in charge of the class and determined exactly what was to be learned in each session and even how the learning was to take place. Teachers

were also extremely patronizing as they were expected to know it all and to be the source of knowledge for students (Sadovaya, et al., 2016). The students on their part would look up to the teacher and only speak when spoken to. However, the modern teaching of science takes an entirely different approach based on the student-oriented learning environment approach. In the new approach, the teacher is still in charge of the class, but there is a lot of feedback from the student with the teacher adjusting the class to meet student needs (Müller et al., 2016).

2.7 Skills gained Using Traditional Ways and ICT

The traditional way of teaching science work hand in hand in a modern classroom but if they were to be considered separately, it could be said that the traditional way enables teaching about science while the ICT method brings science to the students (Santoso et al., 2018). The learning of science requires a combination of theoretical and practical knowledge. The traditional way would mainly provide students with information about science. The students would then have to do a lot of learning by themselves including observation outside the classroom in their way (Cheung et al., 2017). Such an approach would teach children how to improvise and be innovative. For example, students to glean science from games, toys or nature walks. ICT, on the other hand, brings all science to the classroom through its multimedia capabilities (Santoso et al., 2018). Students are able to get almost all information, theoretical and practical at one sitting, inside the classroom (Lynch & Ghergulescu, 2017). The students will thus gain a lot of skill in almost every area of science. However, ICT students will be limited when it comes to improvisation and innovation as they are constantly spoon-fed with readily available information.

2.8 The Best Method

Each of the three methods outlined above has an elaborate pro et contra generally and also from the perspective of teaching the classroom at the high school level. On the other hand, each of the three methods is invaluable in itself as it presents an important aspect of teaching science to students. Indeed, each of the three methods plays a definitive in the teaching process so that the study of science cannot be complete without it. It is the very need for each of the three methods that enable a determination of which of the three is the best method. Indeed, only one of the three can bring all three methods to the classroom, and that is the ICT method (Zhang et al., 2016; O'Callaghan et al., 2017). The modern classroom has a collection of different students who are facing a variety of challenges in different areas of scientific study or even instructional language being used. The teacher, therefore, to pay attention to all the students and each of the student or student groups contemporaneously. ICT will enable the teacher to give traditional lectures through computerized gadgets and seem to be in all places at the same time (Zhang et al., 2016; Maharaj-Sharma & Sharma, 2017). It will also enable students to undertake virtual experiments at the comfort of the science class that may not have access to the necessary amenities necessary for real-life experimentation (Ghavifekr et al., 2016; Heradio et al., 2016). Conversely, ICT will also make the teacher seemingly omnipresent during peer-to-peer teaching so as to play supervisory and assisting roles (Dubey, Sangwan & Hansen, 2017). Contemporaneously, ICT also bring advantages that both the traditional method and the experimental method lacks when it comes to eliciting the interest of the students (Uluyol & Sahin, 2016; Lindberg, Olofsson & Fransson, 2017). Indeed, ICT has the ability to bring play to the classroom and also take the classroom to play time such as in the use of gamification to study science. It is on this basis that the use of ICT in teaching science in a secondary school science classroom is not only the best possible method when compared with the traditional and experimental methods (Lynch & Ghergulescu, 2017).

ICT is clearly also the future of scientific study at the rudimentary level as hardware and software technology for science pedagogy continues to advance (Lindberg, Olofsson & Fransson, 2016; Kumar & Sharma, 2017).

Chapter 3: RESEARCH METHODOLOGY

3.1 Research Approach

This study used a mixed methodology approach to examine the impact of using technology in teaching science. Mixed method refers to using both qualitative and quantitative approaches to conduct research. It entails using quantitative methods such as experiments and qualitative methods such as interviews and surveys. The methodology is used when the researcher wants to get a better understanding of the research problem as it offsets any limitation that may be associated with a single approach. This design allows the researcher to triangulate by using several methods and data sources to examine the same phenomenon. It helps to approach the research problem from different vantage points and get the most accurate data for analysis. The mixed method research design was used in this paper as it allowed to capture data from two sides.

Quantitative research methods were utilized to collect numerical data that would help in making comparisons and conclusions. Quantitative research is a design that focuses on producing realistic and specific data on a subject or topic. The research design focuses on collecting numerical data that is later analyzed with the help of statistical tools. In this study, quantitative research was used to compare the effectiveness of the two teaching methods for science classes at a private school. An experimental research design was used for a quantitative approach to compare the effectiveness of technical assistance and experiential learning method compared to traditional learning methods for teaching science to 9th-grade students.

The study adopted an experimental research design to examine the significance of integrating technology and contemporary techniques for teaching science. A semi-experimental plan was the most appropriate methodology for this research since there was no possibility of random student selection.

The most common way of designing an experiment is to divide participants into two groups, with one acting as a control group and another as the test group. Technology is introduced in the experimental group and not the control group that was subjected to the traditional methods of teaching science.

On the other hand, qualitative data was conducted and analyzed to determine and interpretive nature of the data and form a conclusion. A descriptive study with a qualitative approach was also used when collecting data for this research, through the use of a survey. The preliminary qualitative research focused on getting opinions and attitudes of students towards the teaching approaches implemented in class using questionnaires (Hacieminoglu, 2016). A standard awareness questionnaire was used in this study, requiring students to choose the multiple answer questions. The survey was distributed to students in the class, allowing them to give opinions regarding the effectiveness of technology in the classroom. At the same time, the students were presented with a screening question that determines whether they have learned through technical assistance in class. They questionnaire collected crucial information needed to determine the attitudes of students regarding technology-assisted learning in the classroom.

3.2 Data Collection

This study used data from parents, teachers, and students involved in learning science concepts. The teachers and parents in this study participated in the survey by responding to the questionnaires. The survey focused on the perception of teachers and parents regarding the use of ICT in teaching science lessons, and whether they participate in helping students.

The study used two forms of data collection to collect both qualitative and quantitative data. A quasi-experimental design was used with the pre-test and post-test control group in collecting

quantitative data from students. The participants were 9th-grade science students in the institution who were divided into two groups; one acting as a control group and the other as a test group. A sample population of 30 students was used in the experiment. The students were then tested to determine the effect of technology in science learning measured by scores in the post-test.

Questionnaires were then used when collecting qualitative data and determine the interpretive nature of the data. The survey focused on getting the opinions and attitudes of students, teachers, and parents towards the science teaching approaches. A standard questionnaire was used where participants were required to select from the multiple answer questions. The sampling technique used in the qualitative data was a convenience sampling method, where those who were in a position to answer to the surveys were given the opportunity

3.2.1 Qualitative Data

Data gathering methods for the qualitative part of the paper were carried out using questionnaires and an online survey to determine the opinions and attitudes of students towards their approach of teaching. The study used pre-structured and validated questionnaires distributed to students, teachers and parents to assess their perspective on using technology in science teaching. The use of standard awareness questionnaire was applied in evaluating the student's perception regarding the topic and create a foundation for conducting the tests. A 30-item survey was prepared to determine the views of students regarding the use of technology in the classroom. The questionnaire measured the attitudes of students learning science through education assistance with the help of "Altitude towards science scale. The questionnaire contained questions that required participants to agree or

disagree with the statement in measuring their attitude regarding use of technology in the classroom (Hacieminoglu, 2016).

A survey was created and distributed to students, parents and teachers; allowing them to provide their opinions on the integration of technology into the classroom. For example, the questions asked whether science teachers use a traditional teacher-centered method or integrate technology assistance in teaching. Additionally, the questionnaires were used in this research to measure learning motivation and self-efficacy in students who have experienced science teaching through traditional and use of technology (Uluyol & Şahin, 2016). It also allowed students to provide their opinions regarding the effectiveness of technology in learning and understanding science concepts.

3.2.2 Quantitative Data

On the other hand, quantitative data were collected using an experimental design to compare achievement test between test and control groups. The method helped in getting the necessary data that will help assess and evaluate the effectiveness of technical assistance in teaching sciences compared to traditional teaching methods. The experimental study was carried out in two classes (A-B), each class consisting of 15 students which have the same academic levels in order to ensure a fair and correct study. The two groups were evaluated as test and control groups varied by the teaching method applied.

In this study, two exams were done for each group, a pre-test and a post-test. A pre-test was conducted to ensure all participants are at the same level of basic knowledge before taking part in the experiment. It was done to assess students and ensure they had the same level of baseline knowledge about the science concept. Therefore, a similar written exam was provided to all the two groups of

students containing ten questions at baseline, assessing their understanding of the science concept. The students were given ten minutes to answer the basic knowledge questions to ensure they are matched in terms of their baseline information regarding the topic. This served as the pre-test examination that also helped in comparing score results.

After the pre-test, the students were divided into two classes of 15 in the control group, and another 15 in the experimental group. In the first week of the study, both groups were taught new science concepts (the structure and function of immune system) using the traditional method of lecturing with the same teacher. After two weeks, the teacher changed the lesson and taught the same students the second science concept (T- cell mediated immunity) which is related to the previous lesson. The teacher implemented the technology assistance method with the experimental group in the second lesson including use of presentations and other technological tools and programs like Edmodo and Kahoot, while the traditional methods of teaching was implemented with the other group, the control group.

The students in the experimental and control groups had the same level and academic achievement before they took part in the study to ensure uniformity. A single teacher was used to conduct the test in both lessons using different teaching methods. The students were grouped and taught with different techniques in the second lesson while dealing with the same science concept. The essence of teaching both groups within the same time frame by the same teacher was to ensure consistency. As a result, both students stood to benefit from the same teaching and got an increase in skills and knowledge.

In the first lesson (the structure and function of immune system) , the teacher used a teacher-centered learning approach suitable to the science course learning for both groups, which involved the

teacher familiarizing students with materials and instruments and lecturing them on the topic following the science course curriculum. In the second lesson, the teacher integrated technology to the science teaching applications in the experimental group. The process of learning in this method was supervised by the instructor, who ensured all students have access to a personal technology in class and watch related content throughout the sessions. The technology assistance entailed full use of communication elements with visual representation, graphics, video clips, and animation. The teacher also used several technologies allowing students to search for information from the web in the middle of a lesson.

After undergoing weeks of learning with the teacher, the students were subjected to a post-test based on the first and second lesson to determine their understanding of the concept and measure any differences in performance. The achievement test was given to examine performance and make comparisons between the experiment and control groups and determine the most effective teaching method. The use of scientific tests to measure the literacy of students has been justified in education and was implemented in this experiment. During the tests, students were engaged in tasks that require them to use their knowledge and analytical skills to solve a problem. The test required them to apply several lessons learned during the lessons and apply them in answering the questions.

The mixed method design in this study was mainly used to validate the findings and present a concrete case. It allowed the researcher to consider different angles to a research question and corroborate any unexpected results from the study or any contradictions. At the same time, the mixed method approach helped to develop a theory about the topic and then test it. It started by conducting an online survey to determine whether modern teaching techniques of integrating technology in the science classroom is more efficient compared to traditional teaching models. The results from this

theory were then tested through the experimental design. The experiential approach helped to get accurate data and deal with the risk of obtaining biased interpretations from the questionnaires.

3.3 Population Sample, Site and Context

Before conducting an interview, there is a requirement to determine participants who form the sample population, the site and context of the study. In the experimental research of this study, a sample population of 30 students was used, comprising of 9th graders learning science in a private American school in Dubai. Participants in this study consist of 9th-grade students who were taking a science class in the institution. The sample was equally divided into two sections of science class using convenience sampling and taught with the same teacher.

3.4 Sampling Techniques

Convenience sampling was also used in distributing questionnaires to respondents when conducting the qualitative data. The research investigated the attitude of students, teachers and parents towards the use of technical assistance in science classes by developing a questionnaire consisting of 10 items and distributing to all students taking the course. The online survey reached many students in the school who could access it and not only grade 9, which elicited many responses regarding the use of technology in the classroom. It was also distributed to teachers, requiring their opinion on the use of technology in teaching science. Interviews were used for teachers who did not take part in the questionnaires.

3.5 Questionnaires

Multiple-choice questionnaires were used in data collection, allowing respondents to select one option from a list of answers. These questions helped in producing data that is easy to analyze while improving he survey-taking experience for all participants. These multiple-choice questionnaires were supported with a Likert scale where respondents would agree or disagree with the question. Likert scale questions give participants a range of options to determine the opinion or attitude of respondents in a survey. Lastly, the questionnaires had demographic questions to gather information about respondent's age, gender and other background issues. The survey focused on getting the opinions and attitudes of students, teachers, and parents towards the science teaching approaches.

3.6 Ethical Considerations

The paper followed ethical principles and guidelines that ensure it does not violate the rights of any person. The ethical consideration applied in data collection methods and sampling procedures. The students were informed of the research purpose and the need to take part in the tests. They were not forced into taking part in any study that could violate their rights. Secondly, the study ensured that it adheres to its aims and objectives without exaggerating anything or manipulating students into taking part in the survey. Another ethical consideration was ensuring the experiment does not discriminate against anyone during sampling and grouping of students. A convenience sampling technique was used to avoid any bias or discrimination of students based on their ability in class.

CHAPTER 4: RESULTS DISCUSSION AND ANALYSIS

4.1 Overview of the Chapter

Result from the survey was recorded and stored for analysis and tabulation. The test scores were used as a data to present and compare the effectiveness of a particular technique when teaching science, while findings from the survey was also analysed to determine the opinion of parents, teachers and students. Results from the study shows that students in the test and control groups are similar and equal in sense of the achievement level. The science achievements related to science concepts are also similar for both groups. In the final test after the experiment, it is noted that the achievement scores of students in the test group increase more than the achievement of those in the control group. The increase in science course achievement is also higher in the test group than it is in the control group. This is because students in the test group were taught by using technology in the classroom while those in the control group were taught using the traditional methods. The study shows that integrating technology in science teaching is effective in improving the science course achievement scores of students in the 9th grade. The technology creates interesting, interactive, participatory and visual aspects that increase the attention of students as well as their cognitive and compression skills. The technology also motivates students to learn better.

4.2: Data analysis

The data was collected by issuing tests to both groups after they had several weeks of teaching them science concepts. The test scores were used as data to present and compare the effectiveness of a particular technique when teaching science. Several data analysis tools were employed in this

research to tabulate collected data and make meaning out of it. The data analysis tools interpreted findings from both the survey and experimental research that were conducted during the investigation. In this study, students in the experimental and control groups with different teaching methods sat for the same exam. The results of these tests were collected and analyzed to see whether integrating technology has any positive impacts on science learning for 9th grades.

Quantitative data in this research was done in the form of a close-ended survey to measure attitudes such as rating scales and performance instruments. The analysis of quantitative data in this study consisted of statistical analyzing scores collected on the questionnaire to answer questions of attitudes from students, parents and teachers. Results from the online survey were tabulated and presented in percentages showing the views and opinions of students regarding the use of technology. A Pearson correlation coefficient was also used to test the relationship between student's attitudes towards traditional teaching models and the technology assistance methodology. In this research, the Pearson correlation coefficient was calculated as 0.177, showing a low level of a significant positive relationship. This means students who have a positive attitude for traditional methods could also have a positive attitude towards the use of technical assistance in science class (Hacieminoglu, 2016).

On the other hand, qualitative data consisted of extensive information that was collected through experimental design. The findings were examined and evaluated to determine whether the evidence shows the normal distribution and compared after tabulation that involved checking for significant value. Quantitative data analysis was done using Microsoft excel 2010 electronic tablet program and SPSS 22 statistical analysis program. The report also used descriptive analytical techniques to determine the general distribution of answers given by students to examine whether quantitative data shows normal distribution. Comparisons were made between experimental and

control groups in performance in the tests to identify any notable differences that can demonstrate the effectiveness or superiority of one method over another.

The research used an academic achievement test to determine the acquisitions in science concepts in 9th-grade science teaching. The questions on the academic achievement test applied to science concepts as learned from the class. They were prepared by using the science course book touching on areas that the teacher had taught in class. Descriptive analysis of the results was conducted to determine statistical techniques that could be used in analyzing data from the achievement test. The data collected from the study were analyzed to determine the effect of technology-assisted teaching methods. The results were compared with each other to test the lower problem from final t-test analysis. When these results are presented, there is a clear difference between the experimental group and the control group. The average point values demonstrate the difference in favor of the experiment group, showing that technology-assisted education is effective than traditional teaching methods.

The study revealed several conclusions regarding the effectiveness of using technology assistance in teaching science. The results were obtained from the survey and experimental test applied to the students. The first part of the analysis involved collecting data of student's performance in the science achievement test and calculate the descriptive statistics such as mean, median, variance, and standard deviation. The overall results of the pre-test for both groups are short in the table below.

	N	Mean	Standard deviation	t-value	Significant value
Experimental group	15	6.32	0.92	0.0	0.1

Control group	15	6.32	1.32	0.0	0.1

The t-test analysis results of the pre-test score of both control and experimental group are shown below. A t-test is conducted to determine if there is any significant differences between the means of two groups, the test and control groups. The outcome of the t-test produces a t-value, which measures the size of the difference relative to the variation in a sample data.

	N	Mean	Standard deviation	Standard error	t- value	Significant value
Experimental group	15	.5667	3.3185	.6069	0.0	.357
Control group	15	.5667	3.3185	.6059	0.0	.357

As seen in the table above, the difference in mean between the experimental group and the control group before they took part in the experimental research was zero. This shows that there were no significant differences between the control group and the test group, and therefore, they are equal at the beginning of the research. These results help determine the changes that occur after students have gone through the training and sat for an achievement test. The mean of both the test group and experimental group tests was 6.32 with a significant value of 0.1. It was calculated by adding all the scores together and dividing by the total number of values in the set. This validated the identical nature

of the participants before going into the experiment. The findings were analyzed using a t-test to make comparisons between the two groups

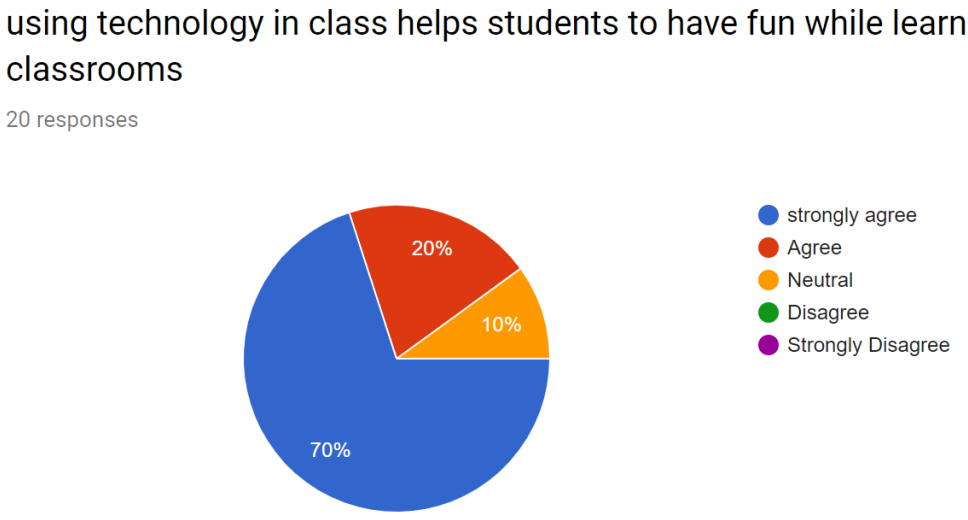
At the end of the research, the results showed that achievement levels for the experimental group were more than the scores recorded in the control group. At the same time, students performed better in the second lesson test compared to the first lesson test. The mean score of 27.8 for the control group and 30.3 for the experimental group with a significant value of .002 during the achievement test. This means the test group has a different identity in scores compared to the control group, indicating a positive difference in the ratings. On average, the mean scores of the control group are less than 2.5 units than that of the test group that involves technology assistance; showing a high statistical significance that is less than 0.05.

	N	Mean	Standard deviation	Standard error
Experiment group	15	30.3	3.4	0.62
Control Group	15	27.8	3.23	0.59

There is a difference between the average of pre-test and final-test points of the experimental group as analyzed by the t-test. This is related to the efficiency of the approach when used to teach science in 9th grade. The research showed an increase in the final points for both the experimental and control groups in the second lesson test, but this increase is significantly lower in the control group.

Furthermore, the findings showed that using technology assistance to teach science is effective and produces a more positive outcome compared to the use of traditional teaching methods. The research addressed achievement scores of the control and experimental group to determine any differences in scores and attitudes.

Findings from the study suggest that integrating technology in teaching science correlated with self-efficacy and better academic performance. As seen in from the data, the point average of the experimental group was higher than the control group, confirming that using technology-based instruction method in teaching science increased student achievement. The practice develops a student's attention, interest, and motivation to participate in the subject and perform better compared to traditional methods of teaching (Uluyol & Şahin, 2016). According to the results, there were differences in performance between the two groups of students due to differences in teaching methods. The results favored the experimental group that was taught through technology-assisted methods as students appeared motivated and in great attitudes as this pie-chart shown.



The findings show that the arithmetic average of both the experimental and control group are close to each other. They show that the achievement test between control and experiment groups in this research had a normal distribution. At the same time, the findings show that the level of significance in the results of the achievement test is higher than O.5. The mean score of the experiment and the control group showed a significant difference between the results of each group. This validates that using technology assistance in teaching science is an effective way of improving student achievement compared to traditional teaching models. On average, the mean scores of students in the control group was less than the mean score of the test group. T-tests of the performance in the two groups showed that the experimental group has a significantly superior performance in science test compared to the control group.

Furthermore, the results of the survey showed that students have positive attitudes towards integrating technology in teaching science subjects. These results are supported by various national and international research undertaken in different fields and levels (Zaragoza & Fraser, 2017). Students were also asked to evaluate the entire educational experience during the study. A majority of the correspondents from the survey stated that the educational experience of using technology in classroom is pleasant or excellent, with less than ten percent of the population terming the experience as fair. Furthermore, a majority of the respondents believe technology increases their chance of participating in class activity, such as making presentations since it makes learning more fun.

4.3: Students' Questionnaire

The results of the students' questionnaires showed that a majority of students have positive attitudes towards integrating technology in teaching science. The questionnaire was done through online surveys to reach as many students a possible.

	Agree	Disagree
Gender	77.6% female	22.2% male
Spend more than one hour in the science lab per week	77.3%	22.7%, do not spend time in the science lab
Science lesson is excellent when ICT is applied	97%	3%
Science lessons taught with traditional method was poor	53.6%	46.4%
The institution emphasizes on academic	55%	45%. The institution has little emphasis on academics
Students have 1 science project in a trimester	47%	53%, have more than one science project in a trimester
ICT helps students in science projects	65%	35%, they use labs and equipment

The teacher uses a projector during science lessons	94%	6%, use whiteboard and marker
Students makes a class presentation in a science lesson often	71.4%	28.6%
the entire education experience is excellent	92.5%	7.5%

The analysis of this data shows that students have positive attitudes towards use of technology in teaching science lessons. An evaluation off their education experience with the use of science in teaching showed that it makes learning fun and more interesting. A majority of students believe ICT helps them in the science project more than books and the laboratory.

4.4: Teachers' Questionnaire

The teachers' questionnaire focused on their perception regarding the use of technology in teaching science for 9th-grade students. The survey required teachers to answer questions regarding their experience with integrating science in teaching science in the classroom.

	Agree	Disagree
Gender	55% female	45% male

Students were more active in science lessons taught using ICT while	55%	45%, students are active in the lab
Science class holds ICT lessons	90%	10%
The class has good scores in science	95%	5%
Teachers use computerized science lessons in class	84.2%	15.8%
Using technology in class helps students have fun while learning through interaction	95%	5%
The atmosphere in class while using ICT is admirable with a good student's reaction	95%	5%
Amount of workload when using ICT in the classroom is lighter	35%	30% workload is about the same 35% workload is heavier

Using technology in class helps students understand better	100%	0%
Classroom management is better while using ICT in learning	95%	5%

Secondly, most teachers were inclined towards integrating technology in the classroom as it improved students' attention and performance. Teachers believe technology fosters group cooperation among students while providing a modern view of learning that is crucial for science lessons. In this regard, technology is a useful tool in teaching science for students in 9th grade.

On the question of the exact scores that teachers experience when dealing with science, 85% of the teachers involved in the study indicated that the scores can only be categorized as being good with a further 10% indicating that the scores can be categorized as being excellent. The remaining 5% of the teachers categorized the scores as being poor. From these scores, what is clear is that teachers often experience a challenge in trying to build on the overall capacity of their students in working towards improving their scores. The fact that a significant number of the teacher can only categorize their students' scores as being good indicates that the teaching approaches utilized do not have the expected levels of effectiveness as part of the teaching process for science.

When asked whether they would agree with the position that use of ICT helps in better management of classrooms, 50% of the teachers indicated that they would strongly agree with this position with 45% agreeing while the remaining 5% disagree. That builds on the understanding that it

would be essential for schools to embrace the idea of using ICT tools as part of management processes in classrooms with the sole focus being towards improving the ways through which teachers are able to manage their students. The expectation is that this will bring out positive results with regard to an improvement in the capacity for students to build on their performance outcomes.

On the other hand, 45% of the teachers interviewed strongly agree with the statement that interaction and discussion is awesome when using ICT with a further 50% agreeing while 5% disagree. From this position, it is clear that the idea to shift towards the use of ICT as part of the classroom environment plays a critical role for the students, as it provides them with a platform through which to interact and discuss with their peers. That serves as a reflection of the fact that it would be essential for schools' managements to focus more on adopting ICT tools in building overall capacities for their students.

Lastly, the focus was on trying to understand when students are most active during science lessons. From the results gathered, it was clear that a significant percentage of the time (55%) when students are active involves the idea of using ICT with the laboratory taking up 45%. That serves as a clear indication of the fact that the idea of embracing ICT not only seeks to enhance capacity for students to build on their overall capacities to perform but reflects on the fact that the students would be more actively involved in the science lessons, which can be based on the responses given from the survey.

4.5: Parents' Questionnaire

The parent's questionnaire was also used to determine the opinions and attitudes of parents regarding the use of technology in science teaching. Parents are in contact with their children and can

provide their perspective on whether technology is helping their academic performance. The survey also inquired whether parents help their children with science concepts using technology.

	Agree	Disagree
Gender	77.6% female	22.2% male
Parents said they help children with their homework	55.6%	43.9%, children use the internet and books
Their children like the internet in science lessons	61.1%	38.9%
Parents give a lot of support to their children in their science projects	55.6%	44.4%
Parents participate in science activities with their children	83.3%	16.7%
Parents notice that their child likes science	94.4%	5.6%
Using laptops and tablets in science lessons is better than using books	66.6%	22.2%

Parents said some science activities that are difficult for them to handle	72.2%	27.8%
Parents follow their child's homework using electronic devices	83.4%	16.7%
Using ICT is a good way to follow their child's progress	66.7%	33.3%

A majority of parents support the inclusion of ICT in teaching science lessons because of its benefits to students. The study shows that ICT improves the overall performance of student when compared to the traditional teaching method. Students who learned with technology had good grades and overall better performance academically, due to its ability to create an excellent learning experience.

4.6 Summary of the Quantitative Results

The results showed that achievement levels for the experimental group were more than the scores recorded in the control group. The mean score of 27.8 for the control group and 30.3 for the experimental group with a significant value of .002 during the achievement test. The research showed an increase in the final points for both the experimental and control groups in the second lesson test, but this increase is significantly lower in the control group. There were differences in performance

between the two groups of students due to differences in teaching methods. The findings show that the level of significance in the results of the achievement test is higher than 0.5.

4.7 Summary of the Qualitative Results

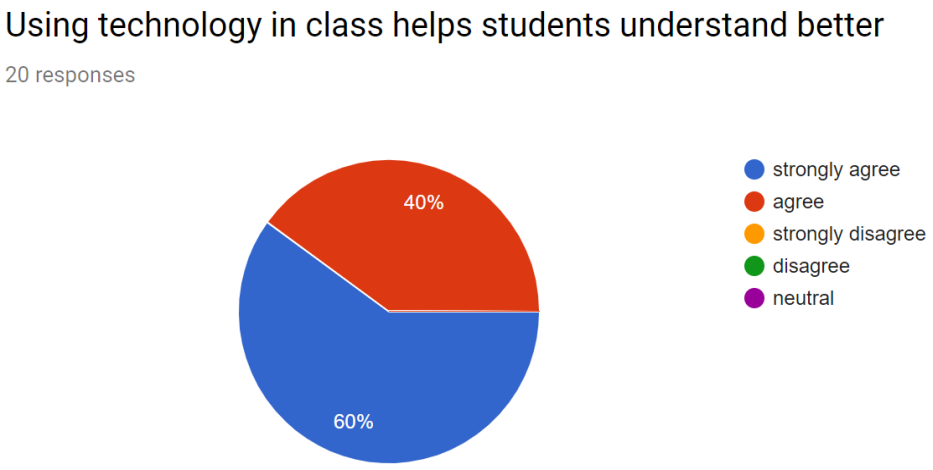
Showed that a majority of students have positive attitudes towards integrating technology in teaching science. Teachers believe technology fosters group cooperation among students while providing a modern view of learning that is crucial for science lessons. It would be essential for schools to embrace the idea of using ICT tools as part of management processes in classrooms with the sole focus being towards improving the ways through which teachers are able to manage their students. It is clear that the idea to shift towards the use of ICT as part of the classroom environment plays a critical role for the students, as it provides them with a platform through which to interact and discuss with their peers. Embracing ICT not only seeks to enhance capacity for students to build on their overall capacities to perform but reflects on the fact that the students would be more actively involved in the science lessons.

4.8 Themes from the study

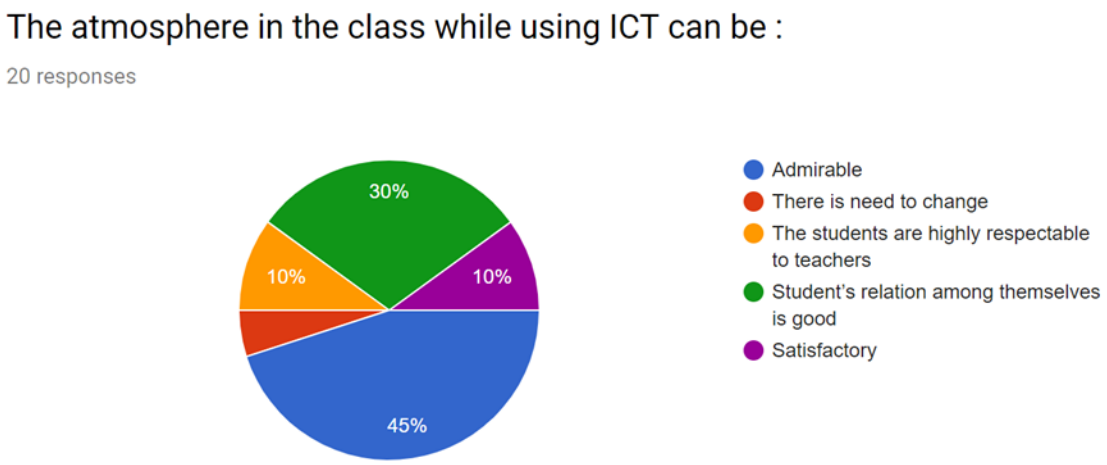
These findings present a variety of themes representing the benefits of integrating technology into the classroom. The first theme is that technology assistance fosters group cooperation among students, thus influencing their involvement in learning science. The technology assisted teaching model provides a more modern view of learning that is crucial for science lessons. This model creates active learning where students engage in the learning process by participating in discussions. This makes technology a useful tool in teaching science as it increases student engagement and cooperation (Hamari et al., 2016). The results from the survey showed that most students had a positive attitude

towards technology assistance in the classroom. Sixty-four percent of students who took part in the study believed ICT helps them in the science project more than the traditional method of using books and equipment.

Secondly, the study showed that integrating technology in the classroom improves the academic performance of students. The findings showed that the technique improves the overall performance of students compared to traditional teaching methods. Technology assistance approach advances student achievement, whereby they had better scores and overall performance compared to the conventional teaching method. According to researchers, modern teaching techniques that entailed using technological assistance facilitates and improves academic achievement by encouraging students to engage more in the learning process. Technology assistance and experiential learning create better learning experiences that increase the ability to perform better in the tests. The teaching methods allow students to engage with each other while inspiring them with the help of activities based on science (Hamari et al., 2016). Some technology technologies can be integrated into the science classroom to help students perform better in classes.



Thirdly, the study showed that integrating technologies and video games in teaching science motivates students to study the subject that is sometimes considered difficult. Technology assistance learning is the new dynamic model of education that elicits motivation and provides the experience of engagement during a science lesson. The motivation is created by the fact that integrating technology assistance is fun and enjoyable to learn. Technology generates interest in students by stimulating an ideal learning environment that motivates students to enjoy the lessons and perform better. The traditional teaching and learning methods do not adequately incorporate modern approaches of teaching that can motivate students to perform better. In this regard, it is safe to say that technology enriched science teaching is more effective than the traditional teaching model in improving science achievement level of 9th-grade students.



Furthermore, the study showed that integrating technology improves the problem-solving ability of students in the 9th grade. It provides ongoing learning opportunities and reinforces concepts

during a science lesson that benefits the student and helps them to understand the scientific terms that are difficult for students to imagine, assimilate and link to their life.

Integrating technology for science education can also promotes the application of 21st century skills such as leadership, teamwork, and cooperation. It was also noted that using of E-learning allows the students to develop many other skills like research skills and practices, interrogative questioning, creativity, artistry, curiosity, imagination, innovation, personal expression.

In addition it affords more opportunities for students to engage in meaningful learning. It facilitates communication and collaboration with peers, allowing them to engage and share ideas as opposed to traditional methods where the teacher provides the overall instruction. The study showed that traditional methods of education that emphasize memorization do not lead to effective teaching-learning processes. The control group who were trained using traditional methods scored less in the test scores, which indicates that they learned less compared to the experiment group. The conventional way of teaching is mostly theoretical and fails to engage students, which is a disadvantage. The results obtained from this study can lead to conclusions regarding the efficacy of science teaching using technology assistance.

CHAPTER 5: CONCLUSION

5.1 Summary of the Study

This study aimed to investigate the effect of using technology rather than traditional teaching methods in teaching science to 9th-grade students. The purpose was to keep students away from memorization techniques and making the subjects easier to comprehend. The students were grouped into two groups; one taught using traditional teaching method and another guided using technology assistance. At the beginning of the research, the students in 9th grade in both the experimental and control groups had are similar in their achievement level before taking the science course. This was crucial since the research aimed to compare the effect of technology integration on the science achievement of students.

It is noted that the achievement scores of students in the test group increase more than the achievement of those in the control group. Technology creates interesting, interactive, participatory and visual aspects that increase the attention of students as well as their cognitive and compression skills. At the end of the research, the results showed that achievement levels for the experimental group were more than the scores recorded in the control group.

5.2 Key Findings

The science course achievement score increased for both the experimental and control after they had been taught, though the experimental group achieved higher scores compared to the control group. These differences can be explained by the teaching method in the control group compared to the model applied in the experimental group. Based on these findings, it is clear that science teaching enriched with technological practices is effective in improving the performance of 9th-grade students.

Several authors have emphasized that classrooms do not get enough experience of the practical application of science concepts due to the traditional teaching methods (Hacieminoglu, 2016). The findings in this study showed how technology helps students to understand science concepts better compared to traditional methods easily, which improves their attitude towards science. The results show a meaningful attitude towards science between experimental and control groups. Furthermore, technology changes the nature of tasks in which student engage, which improves their attitudes and motivation to learn (Hamari et al., 2016). Respondents also stated that technology provides a representation of ideas and problems that may seem difficult or impossible to present. This is an essential aspect for any teacher whose purpose is to ensure students understand even the most complex concepts in a subject. For example In this study, it was easy to integrate the students' understanding of the term "immune response" and how this process occurs within the our body compared to understanding it in the traditional way that it is difficult for the student to imagine how it occurs in the body and how to eliminate anything strange that enters the body.

5.3: Implications of the Current Study

Teachers tend to have a conservative attitude towards technology that has hindered its effective integration in classrooms. The findings from this study show the importance of using technology in teaching science to convince teachers to integrate it into the school. In this regard, the study will help in changing the negative mentality that teachers have towards using technology assistance in teaching, thus making it easier to implement. There are several implications from this study for teachers, administrators, and schools that are considering to implement educational technology. Implementing this teaching approach requires the teacher to commit to using technology assistance. It is essential for

teachers to understand how they can achieve the result in students based on the teaching method used. Given the effectiveness of integrating technology in the classroom as proved by this study, it can create a foundation for ensuring all teachers integrate technology in the school to improve the performance of students (Sung, Chang, & Liu, 2016).

Furthermore, this research could lead to studies on an exploration of online teaching strategies due to the proven benefits of using technology assistance in the classroom. Future research should focus on increasing the duration of training before testing students to obtain more complete results. It should also use large samples and more comprehensive studies that can be implemented in different class levels. A focus on different subjects apart from science can sustain the importance of technology in teaching and influence teachers' attitudes. At the same time, future research on this topic should focus on how technology devices should be implemented in a class context (Duran & Topping 2017).

5.4: Recommendations

This research paper can be a valuable component for advocating towards technology use in science lessons. Most teachers are yet to implement technological education because they perceive it as merely an alternative rather than an enhancement to teaching science. Some teachers are skeptical of integrating technology in teaching science due to concerns that it may act as a distraction. For example, studies have shown that technology tools can affect the academic performance of students by causing a disturbance, where students focus more on the applications than the teacher (Duran & Topping 2017). There are also concerns that students may shift attention from the goal of the lesson and focus on playing with technological tools.

The findings show how teachers can enhance the learning and teaching process by integrating technology into the classroom. As seen from the research, the use of technology-assisted education method is efficient than traditional teacher-centered education method when teaching science classes. The approach increases academic performance and permanence in science education. Teaching science lessons cannot be reduced to using a lecture as the sole mode of instruction. Instead, learning can be more effective when the teacher combines active learning activities with technological assistance to provide a feasible model of teaching the 9th grade.

This study also recommends schools to provide smart boards and internet connections in the education system, providing students with opportunities to learn through technology. The technology-assisted learning may successfully replace, supplement, or complement traditional learning methods due to its advantage in improving academic performance. Several studies have shown been conducted showing the benefits of technology assisted learning, showing how it can be an additional resource for students (Duran & Topping 2017). The approach can help students in developing skills more efficiently as well as have an impact on the academic performance of students.

The qualitative part of this research revealed that a higher percentage of students prefer technologically assisted learning compared to traditional learning methods and have a positive perception towards it. The responses on a survey filled by students showed that a majority have positive attitudes towards the integration of technology in classrooms as it provides an extra motivation to engage and understand science concepts. However, some students preferred the use of traditional teaching methods as opposed to technology assistance. This can be because the traditional lecture entails passing knowledge directly to the student that improves understanding. Among the invaluable and indispensable areas of traditional lecturing are the question and answer lessons, which

are the hallmark of learning in science. A science lesson will be taught, which applies to some part of the day to day life then students will have questions on how the experience refers to that scenario (Meguid & Collins, 2017). The study hopefully helps in supplying evidence to support the modern teaching approach of integrating experiential and technical assistance in schools (Meguid & Collins, 2017). The findings from this study show the appropriate method for science teachers to achieve success with their students.

The effectiveness of technology in teaching science is to ensure teachers provide guidance when using technology in the classroom. They should be present and available to ensure students are not distracted. In this regard, this information can benefit teachers in schools since they are at the center of learning and experiences in schools. The teacher should have technology proficiency before applying technology-assisted education. The teaching of science requires a combination of theoretical and practical knowledge. The traditional way would mainly provide students with information about science. The students would then have to do a lot of learning by themselves, including observation outside the classroom in their way (Cheung et al., 2017).

The teaching of science in school can be done in several ways; such as traditional method, using technology and teaching through experimentation in laboratories. In this sense, the science teacher needs to choose an appropriate method to teach based on the topic of the lesson. Teachers need to carefully evaluate the topic and develop the most suitable way of teaching based both on the nature of the lesson and the availability of resources. There are science topics where applying traditional teaching method is more effective that using technology, while others prefer use of technology and experimentation. Simple and straightforward lessons are taught using traditional methods such as lectures (Bektas, 2017). Tricky lessons that may confuse students are taught using the experimentation

lesson. The choice of experimental experiences is determined by its safety and the availability of resources. In many cases, the traditional method will be combined with the introductory lesson to limit costs and ensure student safety (de la Torre, Sánchez & Dormido, 2016).

5.5: Limitations

Despite the honest efforts to perform the study according to the rules, this study has faced several problems that limited its effectiveness. The first limitation is that the review is that it is performed on 9th-grade students in a private school. As such, the findings cannot be generalized to other grades or subjects. Furthermore, conducting the study in a private school does not prove whether the results can be applied to other schools. Another limitation can be seen from the giving questionnaires supplied to students to examine their attitudes towards the use of technology in the classroom. The weakness can be in the form of working and the type of questions asked. The wording of questionnaires can determine how students will answer and respond to the questions.

Similarly, the use of close-ended questions in this research may have limited respondents from giving their opinion regarding the use of technology in teaching science. At the same time, there were difficulties faced with participant's cooperation during this research, especially when adapting to learn with technology. Some students were not familiar with technological tools due to being familiar with the traditional learning methods and took time before adjusting.

In addition, many administrations of educational institutions faced several obstacles in applying the E-learning method within classroom and changing the traditional education style, such as the difficulty of integrating a group of teachers into this method of education, in addition to the

material cost required for tools and devices, internet networks and teacher training workshops on how to use electronic programs in classroom.

5.6: Conclusion

This study was conducted to explore whether experiential learning using technology assistance method is more effective in the traditional learning method when teaching science. The main objective of this study was to determine the effectiveness of integrating technology in teaching science to 9th-grade students. The data analysis and findings prove that experiential learning through technology assistance improves the academic performance of 9th-grade students. The technique enhances the teaching of science concepts by increasing student engagement and motivation (Hamari et al., 2016).

Results from the study showed that integrating technology is more effective in teaching science as it increases student engagement and improves their motivation (Uluyol & Şahin, 2016). Successful implementation of technology into the teaching of science can improve the outcomes of students in a science test and their attitudes towards school. Therefore, technology is essential to the science classroom to help students engage in learning. It allows instructors to install love and in-depth knowledge of science while assisting students in performing better and succeeding throughout the school. Technology-assistance learning is exciting and interactive, making it possible for students to join actively in class. There are many positives of integrating technology in science lessons for 9th-grade students to enrich the learning-teaching process (Zaragoza & Fraser, 2017).

Science learning can be challenging for 9th-grade students, and technology can significantly improve learning and academic performance. The use of ICT method brings science to the students and enhances the learning experience. Technology can also be used to engage and instruct students

with learning or cognitive disabilities. Studies on the use of technical assistance in class have shown that tactile and visual learns can benefit from the use of interactive technology-based lessons (Duran & Topping 2017). For example, auditory learners can benefit from recorded materials or voice dictation software. Students today are ready to work with the new technologies and find the motivation to work harder when they possess them. This study has revealed the importance of technology in teaching science concepts, helping 9th-grade students to acquire various cognitive knowledge. Applying educational technology enhances skills and cognitive characteristics of students that creates an explosion of learning.

Studies in this field are centered on the positive effects of integrating technology in education. Contemporary research findings have shown that students are motivated to learn science when it is presented in more practical ways. The use of educational technology has a vast potential for improving instruction in science and increases grades levels when used for practice, stimulation, and learning content (Zaragoza & Fraser, 2017). Another benefit of using technology assistance in teaching science is the fact that it improves student attention and concentration of students compared to traditional teaching methods. The study determined the effectiveness of technical support by showing that it improves the awareness, speed, consistency, and learning the ability of science students.

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Appendices

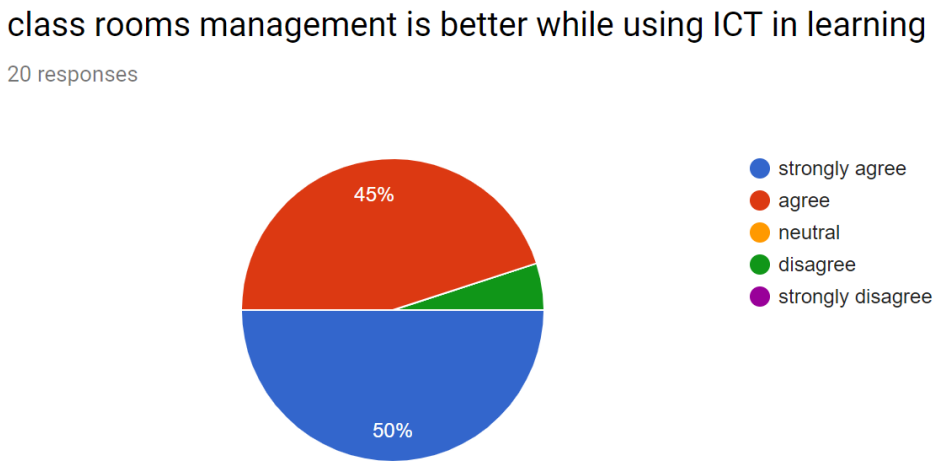

Fig.1. The diagram above indicates percentages of responses in regards to the use of ICT in class rooms management

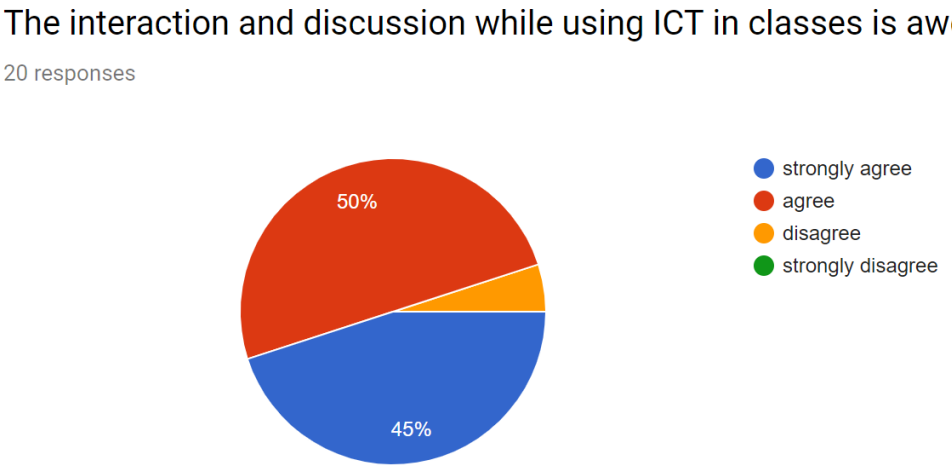

Fig 2. The diagram above indicates responses in context to interaction and discussion in class room with the use of ICT

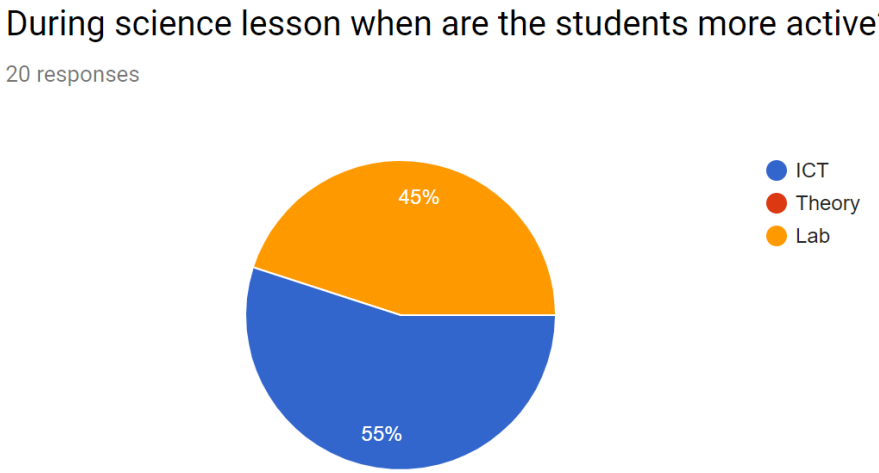

Fig.3. The above figure reveals that during science lesson students are more active when ICT is integrated in the lesson

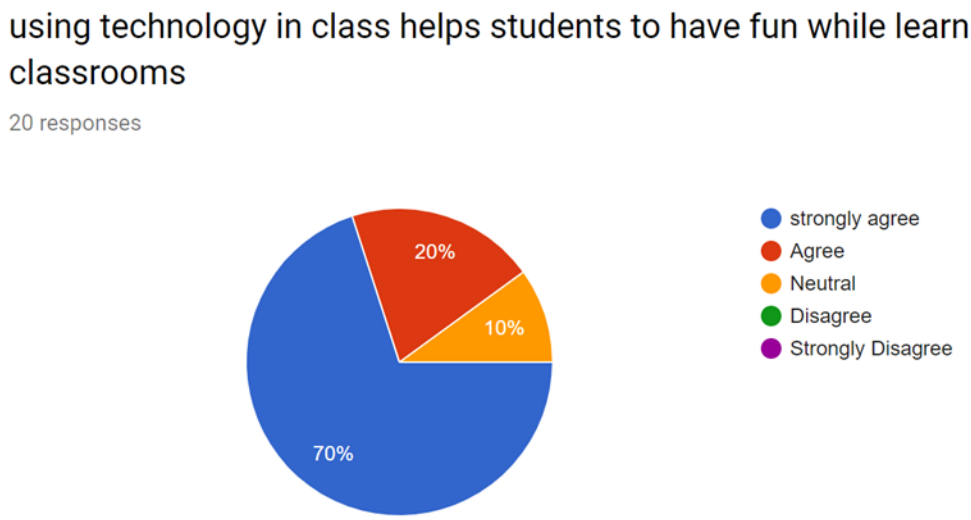

Fig 4: The above diagram represents the percentage of respondents who agree tht integration of ICT in classrooms helps students heve fun while learning

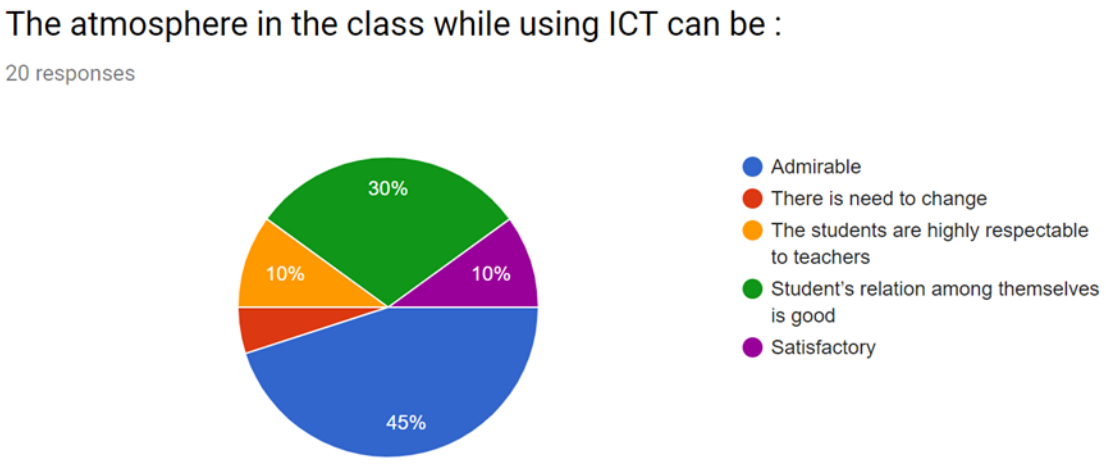

Fig 5. The Figure above reveals that while using ICT the atmosphere in class is admirable

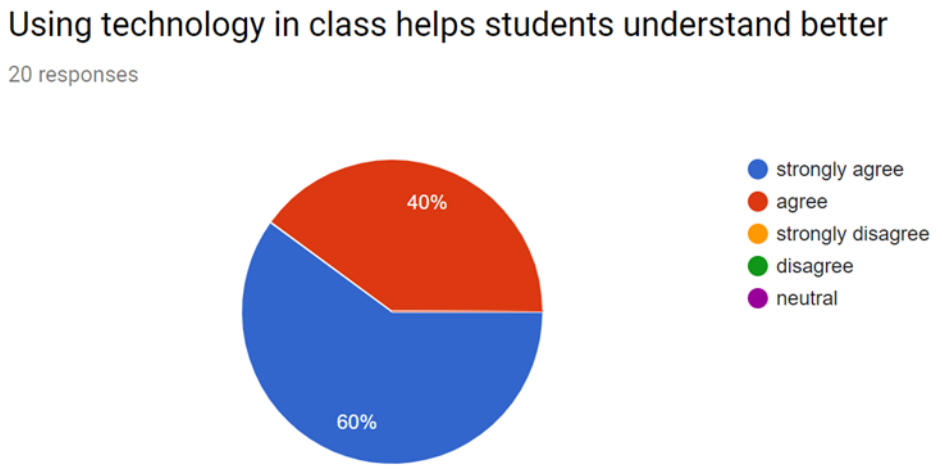

Fig.6 above reveals that a high percentage of respondents agree that the use of technology in class helps student understand better.

Questionnaire: The Best Way to Teach Science

This questionnaire will help in a study to understand the best approach to teach science in schools.

Please tick and fill out the questionnaire where appropriate.

Students

Student name:

Age:

Gender: Male Female

Subject:

Teacher name: …….

1. How many science books do you have?

A. 1 to 4

B. 2 to 5

C. None

2. When you are given homework in science, how much time do you spend on one assignment?

A. 30 mins

B. 1 hour

C. More than one hour

3. How much time do you spend in the science lab per week?

A. 1 hour

B. 45 minutes

C. 30 minutes

4. How would you evaluate your science lesson when ICT applied?

A. Excellent

B. Good

C. Fair

D. Poor

5. How would you evaluate your science lesson when it is traditional lesson?

A. Excellent

B. Good

C. Fair

D. Poor

6. To what extent does your institution emphasis on academic?

A. Very much

B. A little bit

C. Some

D. Very little

7. How many science projects do you have in trimester?

A. 1

B. 2

C. 5 and more

D. None

8. what helps you in this project?

A. books

B. ICT

C. equipment's

9. What does your teacher use during the class lessons?

A. Marker

B. White board

C. Projector

10. How do you evaluate your entire education experience?

A. Excellent

B. Good

C. Fair

D. Poor

11. In the current year, how many times do you make a class presentation in a science lesson?

A. Very often

B. Often

C. Rarely

D. Never

Add comment:

Questionnaire: The Best Way to Teach Science

This questionnaire will help in a study to understand the best approach to teach science in schools. Please tick and fill out the questionnaire where appropriate.

Teachers

Teacher name:

Age:

Gender: Male Female

Subject:

1. During science lesson when are the students more active?

A. ICT

B. Theory

C. Lab

2. How many times in a month do your science class hold ICT lessons?

A. Often

B. Never

C. Very little

3. As a teacher what scores do your class have in science?

A. Excellent

B. Fair

C. Good

D. Poor

4. How many computerized science lessons do your class have in a week?

A. Often

B. Little

C. Never

5. Interactions and discussion

A. Commendable

B. The students are active

C. There is participation in class

D. Awesome

6. The atmosphere in the class

A. Admirable

B. There is need to change

C. The students are highly respectable to teachers

D. Student's relation among themselves is good

E. Satisfactory

7. Is the amount of work load heavy?

A. Much lighter

B. About the same

C. Lighter

D. Heavier

Add comment:

Questionnaire: The Best Way to Teach Science

This questionnaire will help in a study to understand the best approach to teach science in schools.

Please tick and fill out the questionnaire where appropriate.

Parents/Guardians

Name:

Age:

Gender: Male Female

1. Who helps your child with homework?

A. Internet

B. Books

C. Parent

2. How much support do you give your child in his or her science projects?

A. A lot

B. A bit

C. Never

3. Are there science activities that are difficult for you to handle?

A. Yes

B. No

C. Sometimes

4. What does your child like?

A. Projects

B. Internet

C. Theory

5. Are there any activities concerning science do you participate with your child at home?

A. Yes

B. No

C. Sometimes

Add comment:

Samples of Questionnaires

https://docs.google.com/forms/u/0/?tgif=d