

BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE EDUCATION
DEPARTMENT OF SCIENCE AND MATHEMATICS EDUCATION



**AN ASSESSMENT ON THE IMPACT OF USING TECHNOLOGY IN THE TEACHING
AND LEARNING OF PHYSICS: A CASE STUDY OF HIGHFIELD 2 HIGH SCHOOL,
HIGHGLEN DISTRICT IN HARARE ZIMBABWE**

BY
KATOMA DANWIN

B1852408

SUPERVISOR: MR MANYEREDZI

**A PROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE AND MATHEMATICS
EDUCATION, BINDURA UNIVERSITY OF SCIENCE EDUCATION, IN PARTIAL
FULLFILMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE
EDUCATION HONOURS (PHYSICS)**

JUNE 2024

APPROVAL FORM

The undersigned certify that they have read and recommended to the Bindura

University of Science Education

**AN ASSESSMENT ON THE IMPACT OF USING TECHNOLOGY IN THE
TEACHING AND LEARNING OF PHYSICS: A CASE STUDY OF
HIGHFIELD 2 HIGH SCHOOL, HIGHGLEN DISTRICT IN HARARE
ZIMBABWE,**

Submitted by

DANWIN KATOMA

in partial fulfillment of the requirements for the

BACHELOR OF SCIENCE EDUCATION EDUCATION



(Signature of Student)

29 JUNE 2024....

Date



(Signature of Supervisor)

.....

29 June 2024

Date



(Signature of Chairperson)

29 JUNE 2024

Date

BINDURA UNIVERSITY OF SCIENCE EDUCATION
RELEASE FORM

NAME OF AUTHOR: DANWIN KATOMA

**AN ASSESSMENT ON THE IMPACT OF USING TECHNOLOGY IN THE
TEACHING AND LEARNING OF PHYSICS: A CASE STUDY OF
HIGHFIELD 2 HIGH SCHOOL, HIGHGLEN DISTRICT IN HARARE
ZIMBABWE**

DEGREE TITLE: BACHELOR OF SCIENCE EDUCATION

YEAR GRANTED: 2024

SIGNED: 

PERMANENT ADDRESS: 12544 EYERE COURT phase 4 waterfalls

CELL NUMBER: 0771 318 396

Permission is hereby granted to the Bindura University of Science Education library to produce copies of this dissertation and to sell such copies for private, scholarly or scientific research purposes. The author neither reserves the right of other publication and neither the project nor extracts from it can be printed or otherwise reproduced without written permission.

DECLARATION

I, DanwinKatoma declare that all the work in this project for the Bachelor of Science Education of Bindura University of Science Education is my own work and has not been copied from other work without acknowledgement of the original source.

Signed:  29/06/2024

Supervisor

I, MANYEREDZI declare that I have supervised this research project and now hereby satisfy that it can be submitted to the Faculty of Science Education of Bindura University of Science Education.



(Signature of Supervisor)

.....06 2024.....

Date

DEDICATION

This dissertation is dedicated to my wife, Beular Ncube and my daughter, Shantel Katoma, for their usual unfailing love and support, and my parents for their continuous prayers and words of wisdom. Their inspiration kept me on track. I would also want to dedicate the dissertation to my sisters, brothers and colleagues who also stood by me throughout this project and encouraged me to work hard regardless of challenges faced.

ACKNOWLEDGEMENTS

I wish to acknowledge the assistance received from the following people who made it possible for this document to be put together. Firstly, I would like to thank God for making this dissertation a success. My sincere gratitude goes to Mr Manyeredzi ,who tirelessly guided me in the compilation of this dissertation. He immensely inspired me to work tirelessly, and his reviewing of my work ensured a methodical approach to the study and offered a very incisive critique, which made this dissertation a success. I would also want to express my gratitude to all the respondents from Highfield 2 high school, who answered my questionnaires and interviews. Their effort, time and willingness to share their knowledge were appreciated. My gratitude also goes to my friend Liphert Marwiro who assisted me on statistics.

ABSTRACT

The study sought to establish an assessment on the impacts of using technology in the teaching and learning of physics: a case study of Highfield 2 high school, Highglen district in Harare Zimbabwe district. A qualitative research design was used, which enabled the researcher to explore human behavior that cannot be quantified. It also enabled an understanding of the advantages and disadvantages (positive and negative impacts) of using technology in teaching and learning of physics from a holistic view point because it employed a wide variety of methods in its enquiry. Purposive sampling was used to select heads of departments and physics, and other science teachers, while stratified random sampling was used to select the students. Data was generated using semi-structured interviews, questionnaires, observation guides, as well as document analysis. The research study has revealed that the use of technology have many impacts, which include increasing understanding of physics concepts in schools, improve learner motivation and attitude, as well as promoting cheating in learner among other impacts. The study recommends in-service training of teachers to equip them with effective child-centered approaches of using and dealing with technology issues, teaching and learning using ICT and buying of more ICT tools in schools.

LIST OF ABBREVIATIONS

ICT	Information and communication technology
CDU	Curriculum Development Unit
COVID-19	Corona virus disease of 2019
STEM	Science, Technology, Engineering And Mathematics
ZIMSEC	Zimbabwe School Examinations Council

TABLE OF CONTENTS

Approval form.....	i
Release form.....	ii
Declaration.....	iii
Dedication.....	iv
Acknowledgements.....	vi
Abstract.....	vii
List of abbreviations.....	viii
List of Tables.....	xi
List of Figures.....	xii
CHAPTER ONE: INTRODUCTION	
1.1 Introduction.....	1
1.2 Background of the study.....	1
1.3 Statement of the problem.....	3
1.4 Purpose of the study.....	5
1.5. Research questions.....	5
1.6 Aim	5
1.7 Objectives.....	5
1.8 Significance of the study.....	6
1.9 Limitation.....	6
1.10 Delimitation of the study.....	6
1.11 Summary.....	7
CHAPTER 2: LITERATURE REVIEW	
2.1 Introduction.....	8
2.2 The Education System in Zimbabwe.....	8
2.3.1 ICT Policies in Zimbabwe	9
2.3.2 Role of teachers in the use of technology.....	9
2.4 Impact of technology.....	10
2.4.1 Active learning.....	10
2.4.2 Collaborative learning	11

2.4.3 Creative learning:	11
2.4.4 Judgmental learning.	11
2.4.5 Positive Impact on Student Learning.....	11
2.4.6 Makes teaching and learning easy and accessible.....	11
2.4.7 Improves cognitive skills.....	12
2.4.9 Observation and evaluation.....	12
2.4.8 Increase learner engagement and motivation.....	12
2.4.9 Observation and evaluation.....	12
2.5 Negative Impact on Student Learning.....	13
2.5.1 Negative Health Impact.....	13
2.5.2 Deteriorating writing ability.....	13
2.5.3 An increase in cheating incidents and plagiarism	14
2.5.4 Inability to concentrate.....	14
2.5.5 Negative on mental and physical health.....	15
2.5.6 Decreased learner pass rate.....	15
2.5.7 Student Learning Negatives.....	15
2.6 Summary.....	16
CHAPTER 3: RESEARCH METHODOLOGY	
3.0 Introduction.....	17
3.1 Research design.....	17
3.3 Research paradigm.....	17
3.3.4 Research methodology.....	18
3.5 Population and sampling.....	19
3.5.1 Sample size and sample techniques.	19
3.5.2 Selection of school.....	19
3.5.3 sampling of teachers.....	20
3.5.4 sampling of learners.....	20
3.6 Data collection instruments.....	20
3.6.1 Questionnaire.....	20
3.6.2 Interviews.....	21
3.7 Data presentation procedure.....	21

3.7.1 Data analysis.....	21
3.8 Reliability and validity.....	22
3.9 Ethical considerations.....	22
3.5 Summary.....	23
CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION	
4.1 Introduction.....	24
4.2 Respondents rate.....	24
4.3 Presentation and discussion of analyzed data.....	25
4.2.3 Teaching experience.....	27
4.2.4 Physics Teachers Trained on the use of technology.....	28
4.2.5 Form Three Physics Students.....	28
4.2.5.1 Form three physics students by gender.....	28
4.3 Students' Experience in using computers.....	29
4.3.2 Students' Experience in Using Internet	30
4.3.3 School Administration trained in use of technology.....	30
4.4 Availability of Technological facilities at the school	31
4.4.1 Extent of ICT use by teachers and learners.....	32
4.4.2 Typing of Science Schemes of Work.....	32
4.4.3 Impacts of technology in the teaching and learning of physics.....	33
4.5 Factors influencing the use of technology	36
4.6 Summary.....	36
CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	
5.0 Introduction.....	37
5.2 Summary and Implications of the Findings.....	37
5.2 Conclusions.....	39
5.4.1 Recommendations for Further Research.....	40
6.0 References	42
6.1 Appendices 1.....	46
6.2 Appendix 2	49

LIST OF TABLES

Table 3.1: Target population.....	19
Table 4:1 Response Rate.....	24
Table 4 1: Age Distribution of Participants.....	25
Table 4.1: Professional Qualification of Science Teachers.....	26
Table 4.3: Teaching Experience in Years.....	27
Table 4.3 Science Teachers“ Experience in using Computers.....	28
Table 4.4 Physics Students“ Experience in Using Computers.....	29
Table 4.5 Response from students who agreed and/or disagreed.....	32
Table 4.6: shows the number of teachers who agreed and who did not agree on both positive and negative statements from the questionnaire.....	33
Table4.6 shows challenges faced by both teachers and students in using technology.	35

LIST OF FIGURES

Figure 1.1: Graph showing Performance in percentage of students at ordinary level physics	16
Figure 4.1. Distribution of Science teachers by gender	26
Figure 4.2 Distribution of Form Three physics students by gender in percent.....	27
Figure 4.3. School administration staff trained in ICT	30
Figure 4.4 showing the technological tools available at the school.....	31

CHAPTER ONE: INTRODUCTION

1.1. INTRODUCTION

This chapter introduces the study on the impact of using technology in the teaching and learning of physics in secondary schools with a case study of Highfield 2 high school in Highglen District. It also sets up the problem, objectives, theoretical framework and conceptual model for the study, among others.

1.2. BACKGROUND OF THE STUDY

Science subjects play a key role in the scientific, technological and industrial development of the country and hence the achievement of the vision 2030. In order to improve the quality of teaching science and mathematics in both primary and secondary schools, the government of Zimbabwe has put in place several measures which include in-servicing of teachers through TCD programme, equipping of schools with laboratory apparatus, materials, and provision of ICT facilities in schools and community centers.

The availability and effective use of teaching and learning resources are key determinants of the quality of science and mathematics education in any country. It is against this background that the Government of Zimbabwe continues to invest in teaching and learning resources in these areas especially in secondary schools (MoEST, 2017). The government in partnership with development partners has equipped a number of schools with Information and Communication Technology (ICT) facilities such as computers, Television (TV), white board and interactive boards, 1sets, Digital Versatile Disk (DVD) players, Liquid Crystal Display (LCD) projectors, printer and radio among others (Siele, 2017).

Using technology in the teaching and learning process has become inevitable for improving efficiency of education in parallel to the developments experienced in information, communication and technology segments in the 21st century. Integrating technology into educational activities has never been this important and classrooms offer teaching and learning options to teachers and students through quick access to technologies and teaching materials. Teaching processes applied in classrooms has started to be technology-supported when technology infiltrated into education environments. Technologically enriched education includes interesting, interactive technological practices assuring student participation that might have positive effect on students' attitude towards the course.

Despite the government's substantial investment in technology related teaching and learning

resources, the performance of students in ZIMZEC examinations in Physics over the years has been dismal mostly in rural schools. Therefore, it is useful to find out how well these resources are being used to cause a difference in Physics pass rate.

It is evident that the performance of students in physics at Highfield 2 high school is low and has been dropping consistently and had proved to be failing to increase for the past 10 years. The Performance of students in physics at highfield 2 high school is equally low as attested by the results in Figure 1.1:

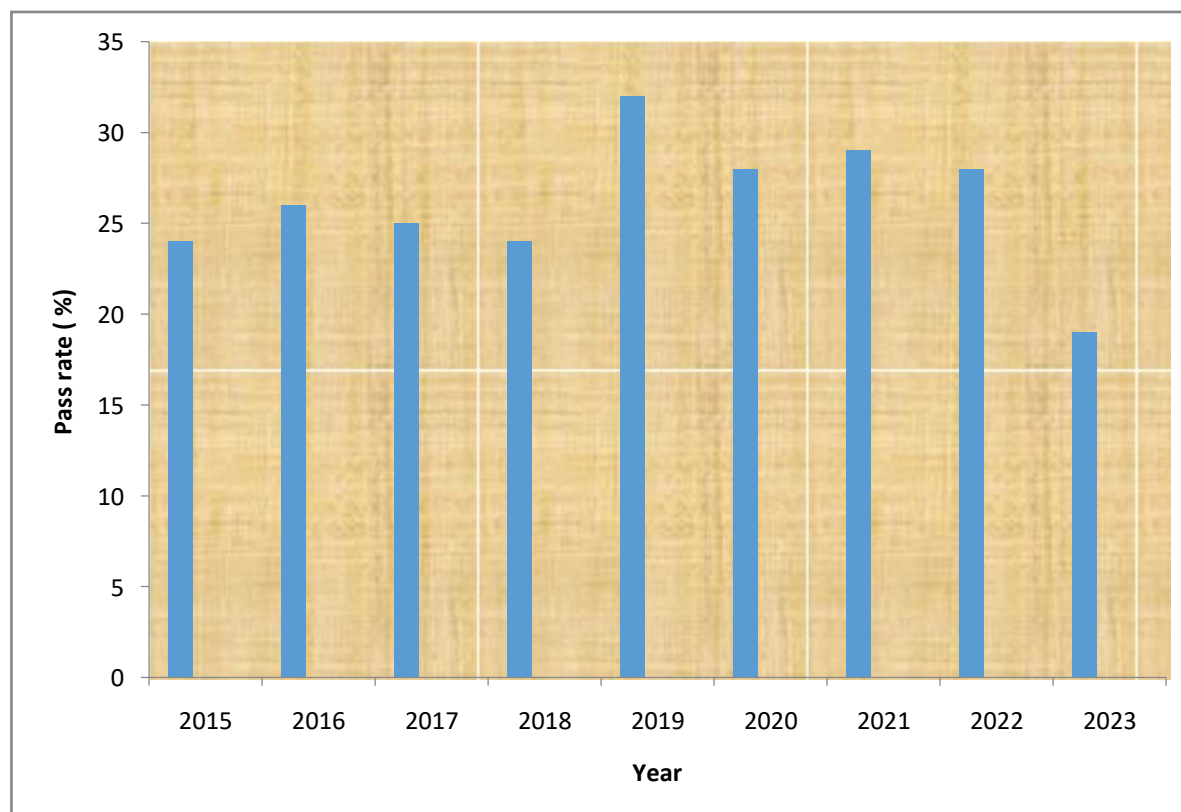


Figure 1.2: Graph showing Performance in percentage of students at ordinary level physics (School records).

The graph on fig 1.1 above shows that the school pass rate had been low for the past ten years with the highest pass rate being about 32% in 2019 while lowest pass being 18% in 2023. This clearly shows that the schools' physics pass rate is struggling to improve. The mean score in physics for the three years has been C. Physics being the bed rock of science and technology that is destined to play a more significant role in spurring technological development (Wang, 2011), ways and means should be found to improve performance of learners in the subject.

According to a survey done by STEM project, one of the causes of poor performance in science subjects and physics in particular is the theoretical approach to teaching and learning of concepts in these subjects, (Mattern and Schau 2019). Given that some of the concepts taught in physics are abstract, learners find it difficult to conceptualise when taught theoretically. This

has made learners to develop a negative attitude towards the subject leading to poor performance. It has led to fewer learners; often the bright ones, choosing to pursue physics which is an optional science subject at Form Three and Four level in quite a number of schools.

The use of Technology in teaching can be a relevant and functional way of providing education to learners that will equip them with skills and knowledge required to function in the 21st century. It is against this background that the Government of Zimbabwe in various policy documents has articulated the importance and the role technology could play in education particularly in science and mathematics education. Zimbabwe promulgated a National technology Policy in 2013 whose main aim was to improve the livelihoods of Zimbabweans by ensuring the availability of accessible, efficient, reliable and affordable technology services in their different communities. In the policy, the government committed itself to improving the quality of teaching and learning through the use of technology in schools, colleges, universities and other educational institutions (Wang, 2011). In order to achieve this, the government came up with several strategies.

It is therefore imperative that technology is integrated in the teaching and learning of physics. It was the intention of this study to find out both the positive and negative impacts of the use of technology in the teaching and learning of physics, the extent technology is being integrated in the teaching and learning of physics given the initiatives and strategies that have been put in place.

1.3. STATEMENT OF THE PROBLEM.

The breadth of technology's presence within the classroom begs us to also understand how this consistent presence impacts our students as learners. As I have both taught and observed within the classroom at the secondary level at Highfield 2 High school in Highglen district in Harare, it is evident through my eyes how technology can seem to have a controlling effect on students. Students are often distracted with the games and apps that are offered to them, and require additional monitoring due to off-task behavior. Even if students are participating in activities such as emailing their classmates or working on an assignment for another class, it continually takes their attention and focus away from the present circumstances.

The Ministry of Primary and Secondary education recognises the important role that ICT in education plays in enhancing access, equity, relevance and quality of education. The MOPSE through the national ICT policy has outlined the various strategies to accelerate ICT uptake in the Zimbabwean education sector. Further, the MOPSE policy on ICT as stated in NDS1 is to integrate ICT into

education and training institutions so as to prepare the learners for the envisaged knowledge based economy.

Despite all these efforts, there are concerns on the impacts of the introduced technology in the teaching and learning of physics at the school as it is the first research of this sort to be done at this school after the previous research tackled the successfulness of technology integration in teaching and learning of science at the same setting.

The concern arises after the researcher had learned through direct observation of students' social life and results analysis which shows that Physics pass rate for some years, had been a problem not only to the students and science teachers but to the school and nation. This problem can be directly inclined to the use of technology by learners as Students are often distracted with the games and apps that are offered to them, and require additional monitoring due to off-task behavior.

In research conducted by Fere, (2016) within the secondary classroom in Masvingo, the technology was found to be the most distracting feature of the included ICTs within the 10 classroom in Masvingo province. Attitudes towards technological discipline and its integration in the classroom have shifted and have been tested. Fere, (2016) noted the increase of plagiarism and focus distraction in the classroom due to the use of mobile devices and their unlimited access to information.

In Africa, Raja and Nagasubramani, (2018) from the researches conducted in twenty Nigerian schools, attested that technological developments like graphical calculators, high tech watches, mini cameras and similar equipment have become great sources to cheat in exams. It is easier for students to write formulas and notes on graphing calculators, with least chances of being caught, (Raja and Nagasubramani, 2018).

Globally, researches by Sarah Phinney, (2022), as the distance learning coordinator at Porterville Adult School in Central California, as well as in Indian schools shows that technology in physics learning have negatives which include limitations to students' creativity, increased distractions, and impaired reading and writing skills. Despite the fact that the delivery of countless information on the internet is a good getting to know device, it could kill creativity. Students normally replicate and paste the data in an effort to urge practical grades, (Alhumaid, 2019).

However, their researches did not go into the extent to which these impacts affects the learner pass rate hence this research is unique in that it will among other aspects, explore the impacts of technology on the learners' pass rate particularly Physics pass rate at Highfield 2 high school, as well as motivation,

and social life at school. The researcher would like to research on the impacts of technology in the teaching and learning of Physics at ordinary level, to see if the teaching and learning as well as Physics pass rate is being influenced by technology and how it is being influenced.

1.4. PURPOSE OF THE STUDY

This study aimed at determining the impacts of technology in the teaching and learning of physics in public secondary schools. The main interest was in urban school. Based on the findings, recommendations have been made that could inform future policies on the impacts of technology in teaching and learning of physics.

1.5. RESEARCH QUESTIONS

This study sought to answer the following questions:

- To what extent are teachers using ICT in teaching and learning of physics?
- To what extent is the use of technology influencing Physics pass rate at ordinary level?
- what are the positive and negative impacts of using technology in physics learning?
- What factors influence the use of ICT in teaching and learning of physics?

1.6.AIM

To determine the impacts of technology in the teaching and learning of physics in public secondary schools in order to come up with the ways of improving the use of technology in physics teaching and learning.

1.7. OBJECTIVES

The study is guided by the following three objectives-

1. To find out the impacts of technology in improving physics pass rate at ordinary level
2. To establish the base line knowledge on the importance of technology in teaching and learning of Physics.
3. To come up with recommendations that may reduce the negative impacts of technology in teaching and learning of physics.
4. To come up with factors that influence the use of ICT in teaching and learning of physics.

1.8 . SIGFICANCE OF THE STUDY

The researcher was triggered to carry out a research on the impacts of technology in teaching and learning of Physics after having observed that the students at the school are failing to attain a high level of academic achievement in science subjects particularly Physics when some students in the same province are doing quite well.

The findings of this study could be significant to various stakeholders in education. The findings could help physics teachers to re-evaluate themselves if they are adequately prepared to use technology in teaching and learning of physics and if not the kind of skills upgrading that would suit them as well as help schools to come up with policies that promote the use of technology in teaching and learning.

The results of the research are therefore, again significant in shedding light to both teachers and students at the school, on the negatives and positives of using technology so as to make more use of the positives and develop strategies to deal with the negative impacts of technology in physics teaching and learning.

It was found necessary to carry out this research as it might trigger other areas that need further research but in line with the working title.

1.9. LIMITATIONS

The language may compromise the quality of the research. Most of the learners at school have challenges in English; therefore, the researcher is going to use Shona when talking to some of the participants. The study was also limited to impacts of technology in teaching and learning of physics at Highfield 2 high school. Further, This study was limited to physics students at Highfield 2 high school, to overcome this, science teachers were also used as respondents. Self-reporting scales were used in the questionnaire to measure variables for analysis. This might have affected the result of the study since some of the respondents may not have been truthful.

1.10. DELIMITATION

The research is going to be conducted at Highfield 2 high School in the Highglen District of Harare metropolitan province of Zimbabwe without crossing any borders that lead to less costs of transport and less cholera travelling and interaction restrictions.

Only secondary school science teachers and science pupils were asked and interviewed giving true information to the researcher

1.11. MMARY

This chapter provided an overview of the study, as well as the impacts of technology in the teaching and learning of Physics. This investigation was performed at Highfield 2 high school in Highglen district. This chapter also outlined the background of the study, statement of the problem, objectives, research questions, as well as significance of the study. The chapter proceeded to highlight the delimitations of the study, limitations of the study, assumptions of the study and definition of key terms.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the literature review on the impacts of using technology in the teaching and learning of physics subject in secondary schools, the effects of the poor performance in that subject area and how the problem can be solved. The purpose of this literature review is to understand what previous researchers regard as the impacts of technology in physics subject in the world so as to identify gaps to be filled by this research, in order to suggest ways of improving the physics teaching and learning as well as pass rate.

2.2 The Education System in Zimbabwe

In the first two decades after Zimbabwe obtained independence in 1980, the country boasted one of the best education systems in the southern African region. During these years, the government focused on expanding education access by building schools in marginalized areas and disadvantaged urban centre, accelerating the training of teachers, and providing teaching and learning materials to schools. Double shifts were introduced to manage increasing enrolment, untrained teachers were hired to help with the teaching load, and low-cost teacher training schemes were introduced where only two terms of the four-year course were spent in college and the remaining two years were spent training in schools, (Strom, 2021).

Currently, primary education is compulsory, commencing at age six and running a seven- year cycle to Grade 7. Secondary education commences at age of 13 with Form 1 (Grade 8). Parents can choose either expensive private, church-affiliated, or government boarding schools or the cheaper day schools. Secondary education comprises a four-year O-level cycle and a two-year A-level cycle, (Mabasa 2022).

Both primary and secondary education is run by the Ministry of Education, Sport and Culture, while tertiary education is managed by a separate Ministry of Higher Education. Tertiary education incorporates all universities, technical colleges, polytechnic colleges, teacher-training colleges, and other vocational skills training centres.

2.3.1 ICT Policies in Zimbabwe

The Zimbabwean government adopted a national ICT policy in 2005 that was informed both by a Harvard University-guided e-readiness survey, which suggested the country was not uniformly e-ready, and by a host of preceding general and sectoral policies including Vision 2020, the national science

and technology policy adopted in 2002, and the Nziramasanga Education Commission Report which in 1999 recommended the promotion of the educational use of computers for teaching and learning in educational institutions, (Strom, 2021).

The policy's vision is to transform Zimbabwe into a knowledge-based society by 2020, while its mission is to accelerate the development and application of ICTs in support of economic growth and development. The policy's objectives are to promote the development of ICT infrastructure, provide education and training programmes to produce knowledge workers and qualified human resources, to establish relevant structures and institutional mechanisms to promote ICTs, and to encourage equitable access to ICTs across genders and to youth, the elderly, and people with disabilities, (Mabasa 2022).

It also has a separate section on human resource development where it promotes skills training and capacity-building at all levels in the private and public sectors and in all training centres and institutions of learning.

2.3.2 Role of teachers in the use of technology in science teaching and learning

Teachers are expected to utilize technology in the classroom. They are often encouraged to become facilitators and abandon traditional methods like lecture-driven teaching. Some teachers are hesitant and aren't as accepting of the request. When asked what some of the biggest problems were with technology implementation, some teachers shared that they feel more technology training would be beneficial for their students and themselves, (Carstens et al., 2021).

Despite the fact that lots of funding is used for technological advancement within schools some of the teachers feel that they are not adequately prepared. Although there are many new helpful programs available to assist struggling students, Kelli (2019) found that educators may not be using these intervention tools correctly therefore causing them to be ineffective. Without the proper training, teachers often use these types of tools as a "break" from teaching, while the student continues to work independently on the reading intervention program. Unfortunately, schools continue to rely on interventions that fail to address the needs of adolescent struggling readers, (Kelli, 2019). In order to make these tools effective, educators need training on how and when to appropriately incorporate these tools into their lessons in order to increase student learning, (Strom, 2021).

Teachers must know how to appropriately use technology before they are able to produce high quality education for their students. A study conducted by Morris and Loran (2014) found that posting on

discussion boards and participating in conversation with classmates through an online learning management system had a negative impact on student engagement, (Strom, 2021). Educators first need to be taught how to use and implement new tools before they are able to teach their students. Since many educators are not given enough professional development opportunities to keep up with the quickly changing world of technology, they are unfamiliar with or intimidated by technology, (Strom, 2021). Without the proper training of teachers the use of technology in the classroom is not serving its intended purpose thus further skewing data in regards to whether or not programs are successful.

The use of technological devices, programs and aids in the classroom should improve students' assessment performance, level of engagement, and academic success. However, these results depend directly on the self-efficacy, and continuous training of classroom teachers. When teachers are properly trained, and that training is conducted continuously, students do, in fact, benefit from the use of video technology in the classroom making class content more motivating and engaging, (Unser, 2017)

Teachers cannot focus on the technology alone when attempting to improve their lessons to enhance student engagement. The reality is, teachers are having a hard time keeping up with all of the drastic changes with educational technology tools (Strom, 2021).

2.4 Impact of technology

Technology has the ability to expand access to education while also increasing its relevance and quality. Wakil, (2008) argued that technology has a profound effect on education in terms of knowledge acquisition and absorption for both instructors and students by promoting active and collaborative learning

2.4.1 Active learning

Informational technologies facilitate the computing and interpretation of test data, as well as student performance reports, which are all digitized and easily accessible for inquiry. In compared to memorization- or rote-based learning, Information technology increases reading comprehension by allowing pupils to choose what they want to study at their own pace and concentrate on real-world problems, (Unser, 2017).

2.4.2 Collaborative learning

Technology promotes contact and collaboration between students and teachers regardless of their geographical location. Additionally, it allows students to interact with individuals from many cultures and work in groups, which helps students develop their conversational skills and

global awareness. According to researchers, the use of technology often results in increased collaboration among learners both inside and outside of school, as well as a more interactive contact between students and teachers. Teamwork is an interpersonal ideology and individual way of life in which leader takes ownership of their actions, which includes becoming aware of and recognizing their counterparts' skills and recognizing their accomplishments, (Unser, 2017)

2.4.3 Creative learning:

Information Technology supports the alteration of pre-existing data and the creation of one's own knowledge in order to generate a concrete product or to accomplish a specific educational goal. Holistic learning, In contrast to the conventional classroom, where the focus is on a single aspect, information technology promotes an integrative approach to teaching and learning by reducing the synthetic boundary between theory and practice, (Bulman and Fairlie, 2016).

2.4.4 Judgmental learning.

The educational application of information technology is student- centered and provides meaningful feedback through a range of interactive features. Instead of regurgitation and rote learning, information technology helps students to investigate and learn in innovative ways that are supported by postmodern theories of learning, (Bulman and Fairlie, 2016).

2.4.5 Positive Impact on Student Learning

Although technology is moving at a rapid pace and sometimes proves to be difficult for teachers there are several positives to student learning. Technology use in schools have been shown to yield results such as self paced learning that is usually difficult in whole groups and individualized instruction to aid with strengths and support weaknesses, (Bulman and Fairlie, 2016).

2.4.6 Makes teaching and learning easy and accessible

It additionally allows for faster remarks and stepped forward cooperative efforts among large groups of people. Category blogs and wikis widen the street for discussion and offer students an opportunity to participate outside of the room. Interactive whiteboards make teaching less difficult, giving students better visible aids and academics a better time in presenting lessons; whereas cell gadgets allow lecturers to supply data to college students in an extraordinarily lightning-fast manner, (Simuforosa, 2013).

2.4.7 Improves cognitive skills

Subrahmanyam et al (2000) posits that cognitive researchers suggest that for example, playing computer games can be an important building block in enhancing children's ability to read and visualize images. Playing specific computer and video games have been found to have immediate positive effects on specific cognitive skills. They may improve problem solving skills. Word processing and e-mail promote communication skills, database and spreadsheet programs promote organizational skills, and modeling software promotes understanding of science and Mathematics skills, (Simuforosa, 2013).

Technological advancements such as digital cameras, projectors, mind training software, laptops, Power point presentations, and 3D visualization tools have all become valuable tools for instructors in assisting pupils in quickly grasping a topic, (Strom, 2021).

2.4.8 Increase learner engagement and motivation

Another study found that integrating technology and peer-led discussions of literature can produce increased student engagement and motivation. This type of technology is an accessible and motivational way to expose students to other ideas and cultures. These online literature discussions have the ability to create a sense of community and foster positive social interaction, (Coffey, 2012).

2.4.9 Observation and evaluation

Computer based literacy programs have proven valuable in the observation and evaluation of ELLs in elementary and secondary classroom settings, offering many more accommodations than made previously available by the traditional "pencil and paper assessment" and assessment aids listed above. The most successful example citable is the accommodation provided by the use of computer programming, in conjunction with some of the aids listed above (i.e. bilingual dictionaries, pop-up glossaries, read-aloud options,) The use of the computer with these accommodations is effective because it provides the students with the help they need to be on the same level as their peers, in an accessible, user-friendly manner, (Unser, 2017)..

It must be realized that visual explanations of topics engage pupils and make learning more interesting. They are able to participate more actively in class, and professors have the opportunity to make their lessons more dynamic and engaging, (Costley, 2014).

When kids attend school in various regions of the state, they can virtually "meet" their peers without exiting the learning space. Certain websites, like www.udemy.com, assist students in learning foreign

languages online by matching them with a tutor from another nation.

Mostly with emergence of online lessons and programs, students are no longer required to be physically present in class. Numerous overseas institutions have begun providing students the option of enrolling in online programs. In the current day, distance education and online education have become a vital part of the educational system, (Costley, 2014).

2.5 Negative Impact on Student Learning

Even though there are excellent positives from implementing technology into the education curriculum it is not without its drawbacks. Some of which even pose health risks. Negative impacts of technology include, deteriorating writing ability, increase in cheating incidents and plagiarism, and harms mental and physical health among others.

2.5.1 Negative Health Impact

According to the social learning theory, adolescents learn by observing and imitating what they see on the screen. The super-peer theory states that the media are like powerful best friends in sometimes making risky behavior seem like normal behavior. All this interferes with learning. Time flies while they are absorbed in the joy and curiosity produced by these websites and no time is left to conduct school tasks. This significant use of technology decreases students' academic achievement. Absorption distracts from the main task of studying or homework preparation and impedes students' concentration on assignments, (Simuforosa, 2013).

2.5.2 Deteriorating writing ability

As a result of extensive use of internet chatting and shortcuts, the writing abilities of today's students have deteriorated significantly. Nowadays, learners rely so much on digital communication that they have completely forgotten how to improve their writing abilities. They lack knowledge of good word spelling, good grammatical usage, and cursive writing, (Costley, 2014).

2.5.3 An increase in cheating incidents and plagiarism

Technological advancements such as graphical calculators, high-tech watches, small cameras, and similar equipment have become excellent tools for test cheating. It is less risky for children to write calculations and notes on graphing calculators.

Comment by Sarah Phinney, the distance learning coordinator at Porterville Adult School in Central

California, shows the results of this digital divide as follows: In my seven years' experience working with this population [at Porterville Adult School], I have found that a great number of the students we serve, especially those who speak English as a second language, are computer illiterate and thus are on the lean side of the divide (Steele-Carlin, 2017). Even cheating has arisen as a threat with all of the advancements. Increasing Incidents of Cheating: Technological developments like graphical calculators, high tech watches, mini cameras and similar equipment have become great sources to cheat in exams. It is easier for students to write formulas and notes on graphing calculators, with least chances of being caught (Raja and Nagasubramani, 2018).

2.5.4 Inability to concentrate

SMS, or text messaging, has become a popular activity for many students. Students can be observed all day and night playing with their cell phones, iPhones, or while driving, and quite frequently even in between lectures. Constant connectivity to the internet world has contributed to a loss of attention and concentration in academics and, to a lesser extent, sports and extracurricular activities, (Alhumaid, 2019).

When adolescents are exposed to computer games, television or other technological devices, this detracts from the quality of sleep adolescents experience and will lead to poor academic performance as day functioning will be affected. These findings seem to be congruent with Zavodny (2006) who asserts adolescents' increased use of modern technology has been accompanied by a decrease in amount of sleep and increase in attention difficulties and poorer academic achievement. Delmher cites a study by Wolfson and Carskadon (2008), who examined the effects of high school students regarding their sleeping habits.

The results indicated that students who earned C's, D's and F's reported less sleep on school nights than students who earned A's and B's, (Simuforsa, 2013). With the 1:1 initiative comes an increased amount of screen time. Now that the majority of students have their own technology device, they now have the ability to use the device whenever they want and for as long as they want. This new sense of freedom is frequently abused. According to the Canadian Sedentary Behavior Guidelines, children are recommended to spend less than 2 hours per day watching a screened device (Faught, Ekwari, Gleddie, Storey, Asbridge and Veugelers, 2017). Unfortunately, students usually spend over 2 hours per day staring at a device, and that is just to complete their school work, (Scarpellini, et al., 2021).

2.5.5 Negative on mental and physical health

With schools transitioning to 1:1 within the classroom, they are increasing the amount of blue light exposure and indirectly harming student health. A study conducted in the Spring of 2021, by Scarpellini, et al. (2021), surveyed over 1500 mothers, and their children in elementary and middle school. The survey was created to determine what types of impact virtual schooling had on student learning. Results revealed that middle school students were spending several hours each day in front of a screen watching educational videos, playing interactive modules, and typing their assignments. In 2% of the students surveyed, there was an abuse of media use, with 8 -12 hours of screen time. Because of the COVID-19 pandemic, students were, and continue to be, spending more than the recommended time in front of a screened device. These habits can result in severe mental health, physical health and learning struggles in developing children. The amount of screen time students are experiencing per day has a direct correlation to their emotions, behaviors and mental health, (Strom, 2021).

2.5.6 Decreased learner pass rate

General health affects multiple aspects of students' lives, such as their academic achievement. This direct correlation between health and the ability to learn shows that technology use can be the "starting point" that allows students to spiral down a path of negative health choices, which will then affect their academic performance. When a student is low on sleep due to a technology addiction, it is much harder for them to comprehend what is being taught. The ability to learn requires focus from the entire body and brain. If a student is experiencing any distractions (tiredness, hunger, CVS, emotional stress, anxiety, depression, etc.), it is quite challenging for them to engage and understand the material being taught, (Strom, 2021).

2.5.7 Student Learning Negatives

In addition to potential health risks associated with misuse of technology, there are also negative impacts in regard to student learning. Some of the negatives include limitations to students' creativity, increased distractions, and impaired reading and writing skills. Despite the fact that the delivery of countless information on the internet is a good getting to know device, it could kill creativity. Students normally replicate and paste the data in an effort to urge practical grades. This could be one in each of the saddest bad effects of generation on students, (Carstens et al., 2021).

Handwriting and reading are impaired by typing and Information Technology (IT) brings about shallow processing of information. That is why students do not learn a lot from Google Books in the

same fashion they do from printed books and magazines. Similarly, Carr (2011) accuses technology of causing our minds to be “shallow” and asserts that students who read linear texts have better understanding and a stronger memory than those who read via the internet ,(Alhumaid, 2019).

Another example of the negative effect of technological devices such as smartphones, tablets, PCs and laptops on students’ performance is brought to us by Strain-Moritz (2016), an experienced teacher who ascertains that texting has negatively impacted students’ ability to write full sentences, with no fragmentation or awkward punctuation. Alhusban (2016) also stipulates that classroom technologies drastically affect students’ ability to write, notably when it comes to spelling and punctuation, grammatical accuracy, spelling, proofreading, critical thinking, respect of coherence and linearity, (Alhumaid, 2019).

Some additional of the negative consequences that can be raised with modern technologies include security, privacy, cost of education, loss of data by the students due to computer malfunctioning and other technical problems and so on, (Vipin, 2021).

2.6 Summary

The literature review highlighted several negative and positive impacts of technology science teaching and learning subject in secondary schools. An increase in cheating incidents and plagiarism, deteriorating writing ability, decreased learner pass rate and Inability to concentrate, makes teaching and learning easy and accessible, good on observation and evaluation and improving cognitive skills are some of the impacts discussed. The researcher also highlighted the effects of poor academic performance in physics resulting from use of technology.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the researcher discusses and justifies the methods of data collection, the methods of data analysis, research design, the sampling method, research tools, and ethical considerations. The research methods and the research design were used to answer the research question: what are the positive and negative impacts of using technology in physics learning?

3.2 Research design

It included the making of orderly and systematic decisions on how the data and information collected to guide and generated answers to research questions. The mixed methods research design was considered relevant for this study. A mixed methods design integrates qualitative and quantitative data collection and analysis in a single study.

The researcher chose the mixed method design because this method of collecting data, both qualitatively and quantitatively, increases the validity of results. On qualitative method, interviews, observations and questionnaire were adopted.

3.3 Research paradigm

The study assumes that the world being investigated is a world richly endowed with people who have their own perceptions and thoughts and interpretations regarding the impacts of technology in the teaching and learning of physics.

This research paradigm is grounded in constructivist learning theory, which emphasizes the active construction of knowledge through hands-on experiences, collaboration, and reflection. According to constructivist principles, students learn best when they are actively involved in the learning process, making connections between new information and their existing knowledge. Technology can serve as a powerful tool to facilitate this process by providing interactive and immersive learning experiences that promote exploration, experimentation, and critical thinking in physics education

From a sociocultural perspective, technology can also play a key role in supporting collaborative learning in physics. Online discussion forums, videoconferencing tools, and collaborative document editing platforms can help students to engage with their peers and instructors in meaningful ways, allowing them to co-construct knowledge through interaction with others. By participating in online communities of physics learners, students can benefit from the diverse perspectives and expertise of their peers, and develop a deeper and more nuanced understanding of the subject.

Overall, the impacts of technology on learning physics can be seen as largely positive from an epistemological perspective. By providing students with new ways to interact with the subject matter, technology can support the active construction of knowledge and facilitate collaboration among learners. However, it is important to consider the potential drawbacks of technology in learning physics, such as the risk of over-reliance on simulations and virtual environments, which may limit students' ability to transfer their knowledge to real-world contexts. Ultimately, the effective integration of technology into physics education requires careful consideration of how it can be used to support and enhance students' learning experiences

3.4 Research methodology

In carrying out the research, mixed method was used. The approach and strategy combined both quantitative and qualitative methods. Observations and questionnaires were used to provide a more comprehensive understanding of the impacts of technology in the teaching and learning of Physics.

Both qualitative and quantitative research provided crucial mixture of the understanding the researcher was looking for. Combining these two enabled the researcher to compare and contrast results and to gain deeper insights. It must be noted that the use of a combination of qualitative and quantitative approach helped in ensuring that the limitations of one method was balanced by the strengths of another method. Ultimately, the integration of the two enhanced understanding. Also, mixed method helps when evaluating as most evaluations collect both quantitative data and qualitative data.

Furthermore, using a multiple methods (triangulation), the ability to cross-check and verify the findings was enabled, resulting in a more reliable understanding of the impacts of technology in the teaching and learning of Physics. Mixed methods enabled the researcher to easily validate the findings by using different methods to triangulate the data. The Triangulation enabled collection of quantitative data which can be used to assess the impacts of technology in the teaching and learning of Physics on schools pass rate as it helps in easing the process of teaching and learning.

To triangulate the data, research questions and were identified first and data a decision on data collection methods to use was decided. Quantitative and qualitative data collection instruments (questionnaires and interviews) were developed. Quantitative data collection using the questionnaires, interviews and focus groups were conducted

3.5 Population and sampling

The target population in this research are the Physics students with a population of about 80 learners and 10 science teachers at Highfield high school in Highglen district in Harare province.

Table 3.1: Target population

GROUP	POPULATION
Form 3	25
Form 4	30
Form 5	10
Form 6	13
Science teachers	10

From the table 3.1, 25 were form 3, 30 were for 4, 10 were form 5 and 13 were form 6. Only physics learners at the school were chosen, This helped in improving quality of the data collected as the research was focusing on impacts of using technology in physics.

3.5.1 Sample size and sample techniques

The researcher used probability sampling as well as non-probability sampling. The following non-probability sampling techniques were used, which are purposive sampling and convenient sampling. Purposive sampling was adopted because it allowed the selection of Physics students and science teachers at the school that is key informants were identified.

A sample size was established with the rule of thumb, which states that a sample should be 5 to 10% of the larger population. The questions, which were being asked, the data gathered, and the analysis and resources, which were available to support the study, guided the number of participants in a sample.

Random sampling was also used by the researcher to choose or select Physics students who were finally included in the sample population

3.5.2 Selection of school

In Highglen District, there are about 25 secondary schools. In this study, the researcher only selected 1 secondary school. The school was selected using the convenient sampling technique. The selection of schools was affected by the tightly packed school time table, which did not allow the researcher to travel from one school to the other during the duty hours. As a consequence, the researcher managed to select and chose only one secondary school in the Highglen District.

3.5.3 Sampling of teachers

The researcher firstly asked for the permission from the school administrators to select the teachers, that is, respondents. This was done through the letter from the Ministry of Primary and Secondary Education. The permission was granted and the researcher selected only 30 teachers from the same school, since the research was being held at that same school. The selection of teachers in that school was done through the use of probability random sampling technique. The card picking system was used. The cards were labeled red and black. Those who picked red automatically became the study respondents.

3.5.4 Sampling of learners

The researchers firstly requested for the permission to sample the learners. The Ministry of Primary and Secondary Education granted the permission. 80 learners were selected from form 3 up to form 4 at that school. 20 respondents represented each level. The card picking system was also used. The cards were labeled red and black. Those who picked red cards were automatically the respondents in this study.

3.6 Data collection instruments

In this study, the following instruments were used, that is, closed-ended questionnaires, which were given to 10 teachers and 80 physics students, structured interviews, as well as observations. Data collection instruments are the important tools that are used by the researcher to gather information from the population to answer the problem under the study, (Dawson, 2019).

3.6.1 Questionnaire

A structured closed-ended questionnaire was adopted in the research to gather information as it had advantages which include being cheap, quick and easier to gather correct information from a large group of people, closed-ended questionnaire is easy to understand, it is also easy to analyze the results, and it is easy to report the results. It also gathered correct information from the respondents. The researcher used face-to-face delivery of questionnaires to the identified respondents. This method was chosen so that the researcher can clarify the information on the questionnaires to the respondents.

It had two sections. The first section covered the questions that need statistical values and the second section consisted of questions that need only explanations and descriptions. Questionnaires can consist of closed-ended, open-ended or both.

Questionnaires can also be standardized which allows for easier comparison and analysis of data. In

the questionnaires, questions on negative and positive impacts of technology in teaching and learning Physics, types of technology used in teaching and problems that are affecting the use of technology and health impacts were administered.

3.6.2 Interviews

An interaction between two or more people for purposes of exchanging information through a series of questions and answers. It can be structured, semi-structured or unstructured.

Structured interviews were used and the researcher prepared questions beforehand, and they were arranged and asked in a particular order. Identical questions were asked for each individual, and the researcher did not probe the participants, but only simplified instructions.

in semi-structured interviews, the researcher compared and contrasted specific information with information that was gained by means of other interviews. The interview used an interview schedule with topics or questions to be discussed. However, the order in which the questions were asked was not fixed but determined by the conversation between the researcher and the participant, this type of interview made use of flexible questions.

Structured interviews were selected for this research because they make it easier to replicate discussions and to get standardized views on the topic. It was easy to simplify the findings. The interviews were recorded and the recorded information seemed to be more reliable and it allowed the researcher to properly analyze it.

Only a small number of individuals were interviewed about the same topic so as to get more viewpoints about the questions that needed further explanation. The researcher conducted interviews with teachers and learners. Interviews were conducted in English in a classroom in the school, and the teachers and learners were interviewed separately. After each interview, the researcher listened to the tape recording and transcribed the whole interview, which was then typed and stored in the computer for long-term storage and accessibility.

3.7 Data presentation procedure

After the researcher used the above instruments, the collected data was analyzed using statistical descriptive data analysis methods. The type of data was content analyzed. According to Dawson, (2019), content analysis procedure is a systematic and comprehension summary of data. Various data presentations were used. These included the use of graphs, charts and tables, which ensure the easy understanding of analyzed data, (Labaree, 2020).

3.7.1 Data analysis

Descriptive statistics was mainly used for data analysis. The data obtained was summarized and described using graphs, tables and statistical measures to describe patterns and relationships. This method was chosen because descriptive statistics are generally easy to understand and interpret thus making them useful for communicating findings to a wide range of audiences. The method also helps in the identification of patterns and trends in the data. Through summarizing and describing all the data, descriptive statistics provide a comprehensive overview of the topic. Mixed method analysis was used as there was quantitative and qualitative data combined to provide a more complete understanding of the topic.

Data from questionnaires and interviews was organized and coded to identify common themes and categories. The coded data was then summarized and simplified to highlight the most relevant information and patterns. The data was then interpreted and discussed in relation to the research questions, the literature on the impacts of technology in teaching and learning of Physics. Triangulation was also done so as to increase the validity and reliability of data by cross checking. Member checking was also carried out, that is discussion of data with a few participants to verify their accuracy and ensure they reflect the impacts of technology in the teaching and learning of Physics at Highfield 2 high school.

3.8 Reliability and validity

The purposive sampling used ensured that information was obtained from those who have close knowledge of issues in question was thorough and accurate. Snowball sampling enabled reference of researcher to those with adequate information. The methods ensured that the participants were representative of the target population as each group was represented, questionnaires and so on. The research instruments like interviews were designed so clearly for easy understanding and probing was done for accurate results. The mixed approach used enabled gathering of broad overview of the impacts of technology in the teaching and learning of Physics, it also enabled cross validation of findings, thus increasing reliability and validity.

3.9 Ethical considerations

It is very important to abide by the research ethics, credible research was done with the permission of all the relevant participants, and it protected the participants, adhered to the privacy and confidentiality of the participants, and also took care of the well-being of participants. Ethical consideration was

ensured by obtaining permission from the Department of Education and the District.

The researcher was humble and honest during this study. He was respectful to the teachers, head of school, as well as the learners during the data collecting process. The researcher also used our common language, which is English during data collecting process so that it was easy for the respondents to respond. The researcher also observed the following:

- The researcher ensured accountability to the public.
- The researcher considered the participants' right to confidentiality.
- The researcher ensured that all the participants were protected from danger, harm and deception.
- The researcher also ensured responsible reporting by avoiding plagiarism of the research findings

3.10 Summary

This chapter explained much on research design, population of the study, sampling of respondents, data collection instruments and ethical considerations. The research respondents were 40 students and 30 teachers. They all responded using questionnaires and interviews. The researcher also used observations. These were the most powerful tools used by the researcher. The gathered data was presented in graphs, tables and charts. The researcher observed ethical issues, such as confidentiality, accountability and avoiding plagiarism.

CHAPTER 4 DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

Data collected using research instruments was analyzed and the summary presented in this chapter. The analyzed data was interpreted, discussed and presented in this chapter. The variables as isolated from instruments were: the impacts of technology in teaching and learning of physics, extent of technology use in teaching and learning of physics, teachers' and students' attitude towards use of technology in teaching and learning of physics, access to technology facilities, technical and management's support, teaching experience, teachers' technology competence and school policy on use of technology.

This study sought to assess the impacts of technology in teaching and learning of physics, establish the attitude of physics teachers and students towards the use of technology in teaching and learning of physics, investigate the extent of management and technical support given to physics teachers in use of technology, establish physics teachers' technology competence in integrating technology in instruction and identify factors influencing use of technology in the teaching and learning of physics.

4.2 Respondents rate

After questionnaire distribution, the researcher got the following response rate

Table 4:1 Response Rate

Questionnaires	Number
Distributed	90
Returned	81
Response Rate	90 %

The study had a 90% response rate for the questionnaires, with 81 out of 90 distributed questionnaires being returned. A response rate of around 90% is considered acceptable and satisfactory for research in sciences, as supported by Fowler (2020). While higher response rates are preferable to minimize non-response bias, a 90% rate suggests the majority of participants responded, providing a decent sample size for analysis and drawing conclusions from the data collected.

Age of participants were also recorded to get information reliable information from responsible age as shown in table 2 below

Table 4 2: Age Distribution of Participants

Age Range	Number of Participants
14-15	25
16-17	40
18-19	15
25-55	10

The data presented in Table 4.2 provides valuable insights into the demographic distribution of participants in the research on the impacts of using technology at Highfield 2 high school. This information is crucial as it allows for an understanding of which age groups are most interested or likely to be affected by the impacts of using technology.

Firstly, the largest number of participants falls within the age range of 16-17, with a total of 40 individuals. This could suggest that teenage individuals are more inclined towards the use of technology. This trend could be attributed to several factors, such as increasing use of modern technology in education as well as in day-to-day communication.

Secondly, there is a significant number of participants aged between 14 -15. This age group may also be motivated by similar reasons as those in the older age group but could potentially have different priorities or constraints. For instance, younger teenagers might be more concerned about traditional learning methods as some of them cannot afford to buy technological tools .

Lastly, there is a relatively small number of participants aged between 25-55. This is because most of them are science teachers whose number at a school is determined by the number of students at the station

4.3 Presentation and discussion of analyzed data

The analyzed data was presented using tables, pie charts and bar graphs. The presentation and interpretation of the analyzed data was done under the following headings: background information, extent of technology use in teaching and learning of physics, Teachers' and students' attitudes towards use of technology in teaching and learning of physics, School management's and Technical support, negative impacts of technology in teaching and learning of

physics, positive impacts of technology in teaching and learning of physics, teachers' competence in technology and factors influencing technology use in teaching and learning physics.

4.2.1 Background Information

The background information regarding the physics teachers and students as well as the principals of the sample school is presented in this section.

4.2.1.1 Gender of Teachers

The results indicated that 13% and 87% of the science teachers at the school were females and males respectively (see figure 4.1). This skewed ratio is a reflection of the low population of girls pursuing physics to higher levels of education.

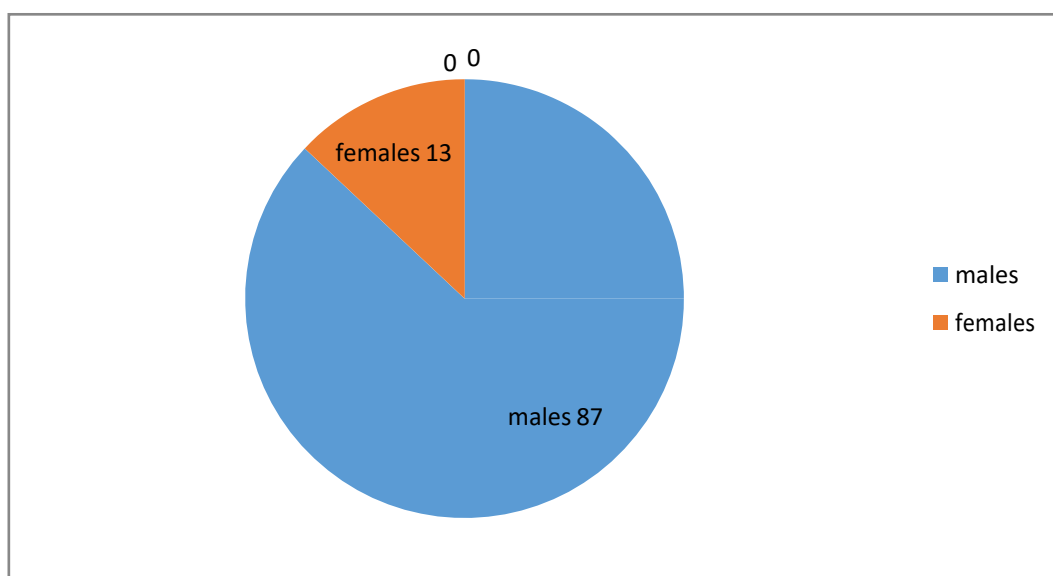


Figure 4.1. Distribution of Science teachers by gender.

4.2.2 Professional qualification

Information on Science teachers' professional qualification was obtained through the questionnaire or teachers.

Table 4.1: Professional Qualification of Science Teachers

Qualification	Frequency	Percentage %
Diploma	3	20
Bachelor's degree	5	50
Masters	2	20

This study showed that all Science teachers at the school are professionally qualified with 50% and 20% having Bachelors and Masters Degrees respectively. This is an important aspect since according to Allison (2007), skilled and knowledgeable workforce is closely linked with successful implementation of technology.

4.2.3 Teaching experience

Teachers' teaching experience was considered in a range of five years. This information was obtained using a questionnaire. Table 4.2 shows a summary of the findings.

Table 4.3: Teaching Experience in Years

Teaching experience	Frequency	%
Below 5 years	3	30
Between 5-9	4	40
Between 10- 14	2	20
15 and above	1	10
Total	10	100

The results on table 4.3 showed that the majority of the teachers have a working experience of more than five years. Long experience of teaching a particular subject is important because it could contribute to good content mastery as well as proper use of technological materials by the teacher.

Teachers were asked to indicate their experience in handling computers in one form or another. The findings are summarized in table 4.3.

Table 4.3 Science Teachers' Experience in using Computers

Experience in using computers	Frequency	%
Below 5 years	1	10
Between 5-9	6	60
Between 10- 14	3	20
15 and above	0	0
Total	10	100

The study showed that only 10% of the teachers in the study have interacted with computers for between one and four years while 90% have computer experience of more than five years as on Table 6. However very few teachers with an experience of above 10 years are experienced in the use of technology as they were trained to be teachers at a time when technology was yet to be fully introduced into the teaching and learning arena.

4.2.4 Physics Teachers Trained on the use of technology

The main interest was training specifically in technology integration. Such training is said to be effective if teachers are able to use ICT in teaching physics in the classroom.

The study showed that 100% of the physics teachers in the sample schools have been trained on how to integrate technology in the teaching and learning of physics. However, different institutions with varying training contents have offered the trainings. Some of the teachers indicated that they were trained through Higher life sponsorship and others through teacher capacitating program.

4.2.5 Form Three Physics Students

As indicated earlier, the main focus of this study was the students. This formed a total of 80 students from Highfield 2 High school.

4.2.5.1 Form three physics students by gender

A total of 25 Form three students responded to Questionnaire. Figure 4 shows their distribution by gender.

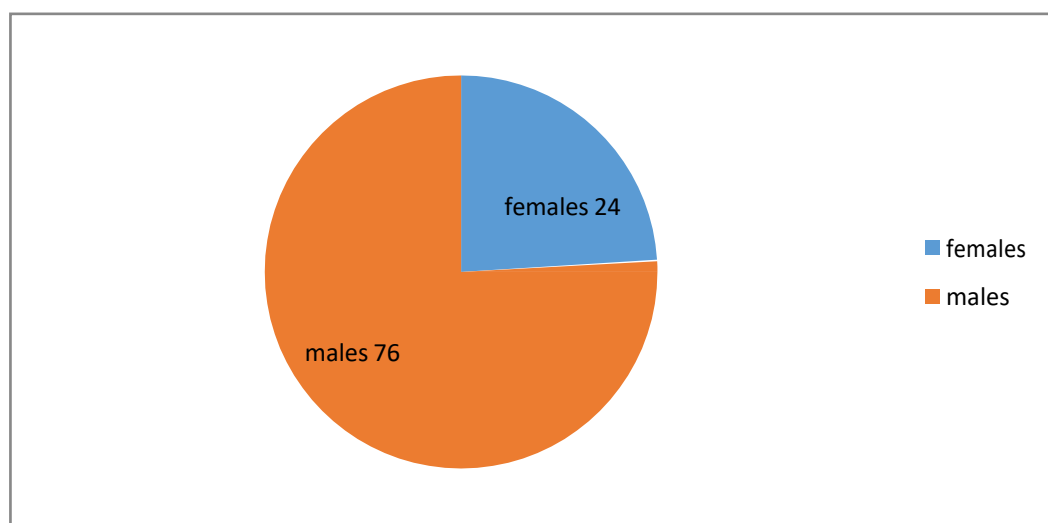


Figure 4.2 Distribution of Form Three physics students by gender in percent.

This ratio, which reflects the population of physics students by gender at the school, suggests that there is still a disparity among students pursuing physics to higher levels. Physics has been perceived for a

long time as a male domain.

4.3 Students' Experience in using computers

The focus was on the length of time a student has used computers for whichever purpose. This information was sought using the Questionnaire and Table 9 shows the results.

Table 4.4 Physics Students' Experience in Using Computers

Students Experience in using computers	Frequency	%
None	10	12.5
Below 1 year	22	27.5
Between 1-2	25	31.25
Between 3-5	15	18.75
5 and above	8	10
Total	80	100

The study showed that 87.5% of the physics students at the school have interacted with computers as compared to only 12, 5% that have never. This means that most students have an opportunity to access a computer at home or at school either for those who can afford, or at school. The fact that some of the students have never handled computers could mean lack of proper policies in some schools that would ensure that every student can access computers.

4.3.2 Students' Experience in Using Internet

Internet is an important ICT tool for communication, conducting research and entertainment. The students were required to indicate how long they have been using Internet for whatever purpose.

The study showed that 100% of the students have used Internet. This proportion is higher compared to those who have interacted with computers (87.5%). This could mean that the students access Internet using other ICT tools such as mobile phones and Ipads among others. However, the students indicated that they also use internet for other entertainment purposes like gaming, social media interactions and watching videos.

4.3.3 School Administration trained in use of technology

The administration team was required to state whether they have attended any formal training in

computer use. This is considered important because a school management who are computer literate could easily use knowledge and skills gained to guide other teachers and learners on the same. Six out of 9 administration staff has been trained. Figure 6 shows the results by percentage.

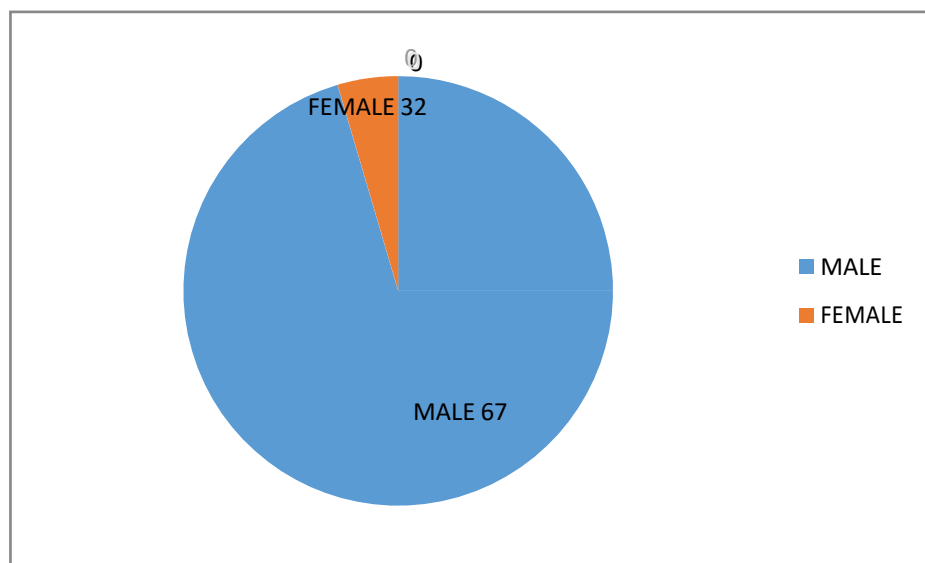


Figure 4.3. School administration staff trained in ICT

The findings showed that 66.7% have been trained on computer use. The others (33.3%) have learned how to use computers on their own.

4.4 Availability of Technological facilities at the school

The study also established the availability and adequacy of other ICT tools through document analysis and interviews.

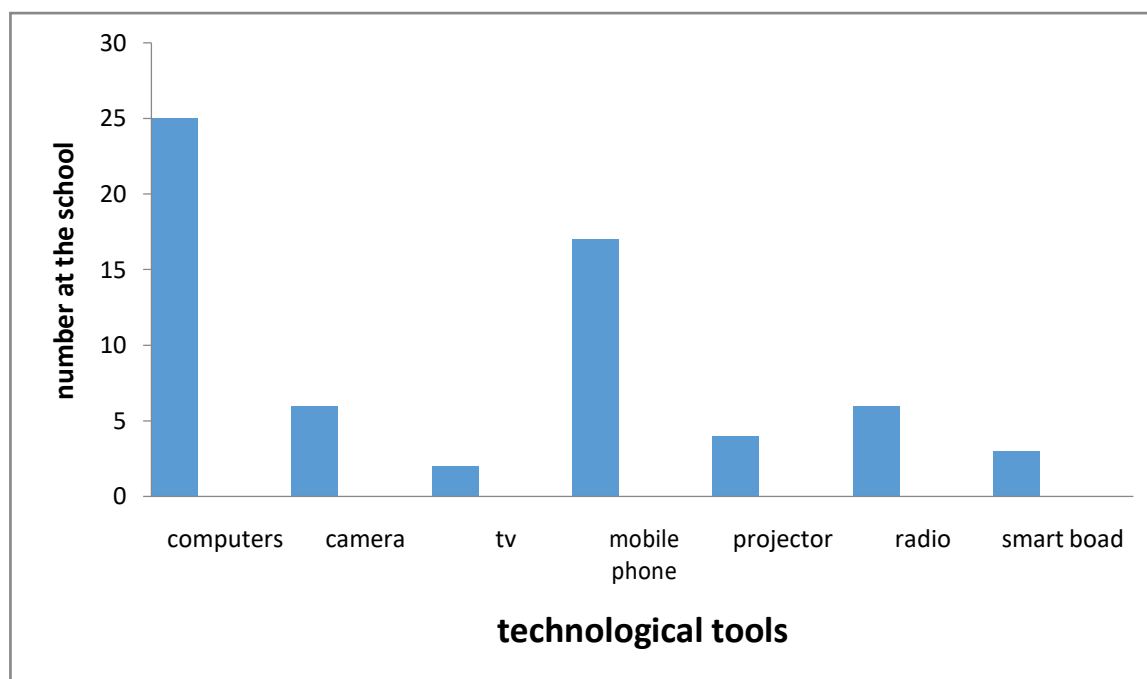


Figure 4.4 showing the technological tools available at the school

From Figure 4.4, the school had at least a good number of computers. In addition, the school had mobile phones, few projector, camera and TV and smart board, despite the fact that these are essential technological tools that could be useful in preparing technology-integrated lessons. The reason could be that they are expensive to buy. An interview with school administration revealed that the technology facilities not adequate and cited the shortage of funds by the school.

4.4.1 Extent of ICT use by teachers and learners

Use of ICT tools such as digital camera and radio were rated as low; mean rating of 46% and 35% respectively. The rest of the ICT tools were moderately used. Generally, the use of ICT in teaching and learning of physics is moderate rating of above 60% for teachers and students. A total of 11 physics lessons were observed in Form Three. The topics that were taught included: Waves, The gas laws, Current electricity, Heating effect of electric current and Quantity of heat. Information and communication technology was integrated in only two of the 11 lessons observed despite the fact that nearly all the observed lessons at the school had digital content in form of a flash on the topics that were taught.

In one of the technology integrated lessons, a computer together with LCD projector was used to display information on the wall. The teacher explained the concept of waves and asked learners to copy notes. The lesson was largely teacher centered.

In the other lesson, virtual lab was used to demonstrate experiments on the topic gas laws. Students did

demonstrations and the teacher paused carefully selected questions that engaged the learners. The lesson was lively as evidenced by active learner participation. The lesson was more learner-centered. From the foregoing discussion, one would argue that it is not a question of merely using technology but how the impacts in teaching and learning are much more important. From document analysis of the schemes of work, it turned out that physics teachers at the school type their schemes of work by themselves, while the others done by the secretary.

4.4.2 Typing of Science Schemes of Work

School Secretary typed only 6 out of 10 physics schemes of work. Only two ICT tools were mentioned in the schemes of work that is computer and LCD projector. This indicates that the Science teachers rarely make deliberate effort to plan with technology facilities in mind. Generally, the use of technology in teaching and learning of physics is moderate; mainly during preparation of schemes of work and analysis of students' test scores and not much in lesson delivery.

4.4.3 Impacts of technology in the teaching and learning of physics

At the school, most of the pupils when interviewed indicated that the use of technology has some positive impacts which helps in improving the understanding of the subject as well as pass rate of the subject.

The science teachers at the school confirmed what the pupils had said during an interview. One science teacher said: *"Use of technology in science lessons is very imperative as it increases the interest of students towards physics as well as increasing their understanding of the subject."*

Strom, (2021) who said technological advancements such as digital cameras, projectors, mind training software, laptops, Power point presentations, supported this and 3D visualization tools have all become valuable tools for instructors in assisting pupils in quickly grasping a topic.

Table 4.5 Response from students who agreed and/or disagreed on impacts of technology.

Impacts	Agreed %	Disagreed %
Use of ICT enables me understand physics concepts better	80	20
Use of ICT makes learning more enjoyable	65	35
Social media makes communication among students easier	70	30
Technology increases academic cheating	90	10
ICT supported learning makes learning more effective	63	37
Use of technology may slow down syllabus coverage	46	54

Use of technology in learning physics is time consuming	43	57
I can still learn physics better without the computer	52	48
The computer is not conducive for learning	65	35
A computer is a valuable tool for learning physics	55	45
Technology helps explain physics concepts better than my teacher	75	25
Use of ICT may speed up syllabus coverage	49	51

Table 4.5 on the impacts of technology use in physics teaching and learning, shows that majority of the learners concur with what the science teachers said on the importance and impacts of technology in the teaching and learning of physics. This was also supported by Bransford et al., (2000) who said there are several roles that technology can play in the teaching and learning process as it has a great potential to enhance learner achievement, make the learners to become knowledgeable, reduce the amount of direct instruction given to them and provide a learning environment where teachers can assist learners with special needs. In addition, use of new technology motivate the learners as it makes complex ideas simple and hence promote a favorable attitude towards science subjects by learners.

The table also shows that the students value the using technology in teaching and learning of physics. They were also aware that ICT tools such as TV, computer and radio are not only for entertainment but can also be useful in learning physics. However, their response to the statement „I can still learn physics better without the computer“ was surprising. Most of the students seemed to agree with the statement. This means that although learners appreciate that using technology would make teaching and learning of physics better, they are yet to see the value of a computer as a technological tool in doing the same.

Table 4.6: shows the number of teachers who agreed and who did not agree on both positive and negative statements from the questionnaire

Teachers attitude	agreed	Do not agree
Use of ICT makes me more effective as a teacher	9	1
Use of ICT increases the interest of students towards physics	7	3
Use of computers in teaching and learning of physics is time consuming	5	5
Use of ICT enables students to understand physics concepts better	6	4
Lesson planning using ICT is time consuming	7	3
Use of ICT may slow down syllabus coverage in physics	4	6
Use of ICT may in the long run replace the teacher	8	2
I can do what a computer can do equally well	7	3
I think that using ICT makes it easier to source for teaching/learning materials	8	2

However, this positive attitude towards use of technology in teaching and learning physics is not reflected in actual use of technology especially in lesson delivery. This revelation is inconsistent with other findings, which have reported that teachers' actual technology use is related to their perceptions, (Yigit, 2009). This finding, on the other hand, is in confirmation with Eugene (2006), who explored the effect of teachers' beliefs and attitudes towards the use of ICT in classrooms. The study revealed that there was inconsistency between teachers' beliefs and their actual use of technology in classroom. Teachers' beliefs and teaching practices were found not to match. The inconsistency between teachers' actual use of technology and perception can be attributed to inadequate supply of ICT resources, lack of access to the right kinds of technology, inadequate ICT pedagogical training and insufficient administrative support.

Teachers and Students were also asked to indicate the challenges they experience in the use of technology in learning physics.

Table 4.6 shows challenges faced by both teachers and students in using technology

Challenges faced by teachers	Challenges faced by students
Lack of clear plan to access computers in the school	Lack of clear plan to access computers in the school
Slow Internet	Inadequate time to use computers in class
Inadequate time to use computers in class	Inadequate number of ICT tools
Frequent power failure	Break down of ICT tools
Inadequate number of ICT tools	Frequent power failure
Break down of ICT tools	Slow and old computers
Slow and old computers	Lack of technical support
Lack of technical support	

The study showed that management and technical support as reported by teachers is moderate. One of the major challenges being experienced is inadequate technology facilities. Most of them seem to be less skilled in the use of essential ICT tools such as digital and video cameras, and LCD projectors, which could be used together with a computer when integrating ICT in teaching and learning of physics. Most of the teachers rated themselves as „very good“ in using Internet which is an important ICT tool. Using Internet, teachers can access up to date information on various concepts in physics and ways of teaching some concepts perceived to be challenging by both teachers and students. Internet can facilitate collaboration among physics teachers and hence creating a platform where they share ideas on how to teach physics better. Generally, the physics teachers at the school are competent in the use of various technological tools.

4.5 Factors influencing the use of technology in teaching and learning of physics

The main factors which came out as responsible for influencing teachers and learners in the use of technology in teaching and learning were: perception, competency, teaching experience, access to ICT facilities and experience in computer use and frequent power failure.

4.6 Summary of the chapter

From the foregoing presented data, interpretation and discussion, Science teachers at the school were in a good position to use technology in teaching and learning physics. The teachers were among other things: well qualified professionally, had long teaching experience, had positive attitude towards use of

technology, were competent in use of certain ICT tools, teaching load was within the limit. Physics students too had positive attitude towards use of technology in learning physics. The study revealed that the number of students taking physics up to Form four is low as compared to other science subjects. Use of technology in teaching physics would help to persuade the students to have a more favorable attitude towards the subject.

It emerged from the discussions that although most the school had the basic technology facilities, the teachers were not utilizing them to the fullest. In addition, use of technology was more evident during the lesson preparation than in actual lesson implementation. Technology will have greater impact if it is made use of during lesson planning, lesson implementation and for assessment. The support given to teachers and students in integrating technology in teaching and learning was limited to provision of resources. The training of teachers on technology integration in teaching was not a priority in most of the schools.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This study sought to investigate the impacts of using technology in teaching and learning of physics. A number of issues were investigated. The issues included are the extent of technology use in teaching and learning of physics and the factors influencing the use of technology in teaching and learning of physics. This chapter comprises of summary of the findings, conclusions as well as recommendations.

5.2 Summary and Implications of the Findings

The educational application of information technology is student- centered and provides meaningful feedback through a range of interactive features. Instead of regurgitation and rote learning, information technology helps students to investigate and learn in innovative ways that are supported by postmodern theories of learning.

The study find out that technology additionally allows for faster remarks and stepped forward cooperative efforts among large groups of people. Category blogs and wikis widen the street for discussion and offer students an opportunity to participate outside of the room. Interactive whiteboards make teaching less difficult, giving students better visible aids and academics a better time in presenting lessons

It also reviewed that technology improve problem solving skills. Word processing and e-mail promote communication skills, database and spreadsheet programs promote organizational skills, and modeling software promotes understanding of science and Mathematics skills. Technological advancements such as digital cameras, projectors, mind training software, laptops, Power point presentations, and 3D visualization tools have all become valuable tools for instructors in assisting pupils in quickly grasping a topic.

The study found that integrating technology and peer-led discussions of literature can produce increased student engagement and motivation. This type of technology is an accessible and motivational way to expose students to other ideas and cultures.

The research also find out that Computer based literacy programs have proven valuable in the observation and evaluation of elementary and secondary classroom settings, offering many more accommodations than made previously available by the traditional “pencil and paper assessment” and assessment aids listed above.

However, besides the positive impacts, the study also found that observing and imitating what they see

on the screen. The super-peer theory states that the media are like powerful best friends in sometimes making risky behavior seem like normal behavior. All this interferes with learning. Time flies while they are absorbed in the joy and curiosity produced by these websites and no time is left to conduct school tasks. This significant use of technology decreases students' academic achievement.

Because of extensive use of internet chatting and shortcuts, the writing abilities of today's students have deteriorated significantly. Nowadays, learners rely so much on digital communication that they have completely forgotten how to improve their writing abilities.

The study also found that technological advancements such as graphical calculators, high-tech watches, small cameras, and similar equipment have become excellent tools for test cheating. It is less risky for children to write calculations and notes on graphing calculators.

SMS, or text messaging, has become a popular activity for many students. Students can be observed all day and night playing with their mobile phones, and quite frequently even in between lessons. Constant connectivity to the internet world has contributed to a loss of attention and concentration in academics and, to a lesser extent, sports and extracurricular activities.

The study revealed that middle school students were spending several hours each day in front of a screen watching educational videos, playing interactive modules, and typing their assignments. These habits can result in severe mental health, physical health and learning struggles in developing children. Technology has general health effects that affect multiple aspects of students' lives, such as their academic achievement. This direct correlation between health and the ability to learn shows that technology use can be the starting point that allows students to spiral down a path of negative health choices, which will then affect their academic performance.

In addition to potential health risks associated with misuse of technology, there are also negative impacts in regard to student learning. Some of the negatives include limitations to students' creativity, increased distractions, and impaired reading and writing skills. Despite the fact that the delivery of countless information on the internet is a good getting to know device, it could kill creativity. Students normally replicate and paste the data in an effort to urge practical grades.

Additionally, the study also found some other findings on top of the impacts, for instance students' attitudes towards use of technology in learning physics. The attitudes of students towards the use of technology in teaching and learning of physics were found to be positive. They were upbeat that indeed technology not only makes learning more enjoyable but also enhances understanding of

concepts that are abstract.

The results of this study revealed that teachers were in a good position to use technology in teaching and learning of physics. The teachers were professionally qualified, experienced, fairly competent in technology, had manageable work load and positive attitude towards use of technology in teaching and learning of physics.

Physics teachers at the school were found to be competent in technology especially use of hardware such as computer and software such as Microsoft word processing, Internet and Microsoft excel. However, the teachers at the same school were less skilled in the use of digital and video cameras, which could be useful in preparation of technology-integrated lessons. The study showed that there is positive correlation between physics teachers' technology competency and use.

5.3 Conclusions

This study investigated the impacts of technology in the teaching and learning of physics and established a number of both positive and negative impacts of technology in teaching and learning of physics at Highfield 2 high school in Highglen District in Harare province. On the extent of technology integration in teaching and learning of physics, this study revealed that technology was mainly used at the planning stage of the lessons especially typing of lesson plans and schemes of work. Teachers also use computers to analyze students' test scores.

However, technology use during lesson delivery was minimal despite the fact that most of the science teachers at the school had been trained to use computers. Technology will have positive impacts to both the learners and teachers if it is used during lesson planning, lesson delivery and in assessment. For this to be realized, all the factors identified should be taken into account, especially provision of relevant training on how to integrate technology in lesson delivery. The following factors were identified to influence technology integration in the teaching and learning of physics at Highfield 2 high school:

First, the possession of the necessary skills and knowledge in use of technology is an important consideration that determines the impacts of technology in teaching and learning of physics. Although a good proportion of the physics and science teachers at the school rated themselves as „good“ in the use of ICT tools, they moderately employed technology in the teaching and learning process; mainly at the planning stage of a lesson. This could mean that physics teachers lack the skills to integrate technology in actual lesson delivery.

Secondly, the attitudes of both teachers and students towards use of technology in teaching and learning of physics influence technology use in teaching and learning physics. Physics teachers and students were found to have positive attitudes towards use of technology in teaching and learning of physics although this was not reflected in actual use. The mismatch between the actual use of technology by science teachers and students positive attitudes could be due to other barriers such as lack of inadequate technology facilities, lack of time, inadequate skills as well as failure to deal with the negative impacts of technology

.Thirdly, technical and administrative support encourages teachers to successfully use technology in classrooms. Yee (2020) believes that a leader who implements technology plans and also shares a common vision with the teachers stimulate them to use technology in their lessons. This study revealed that management and technical support to science teachers at the school is moderate. This support is expected to motivate teachers and students to utilise technology.

Lastly, the study revealed the inverse relationship between teaching experience and technology use. This implies that the older the teacher, then the less they are likely to integrate technology in their lessons. The study further established the inverse relationship between teaching experience and competence. This means that the older teachers are less competent in use of technology and therefore they use less of it in their lessons resulting in the teacher being affected much by the impacts of technology, as learners will be much into technology than the teacher.

5.4 Recommendations

Just like other researches, a number of recommendations were made in this study. Some of the recommendations are for action by stakeholders in education while others are for further research.

5.4.1 Recommendations for Further Research

- ✓ Research could be carried out to determine how various ICT software and hardware are made use of in the teaching and learning process to reduce or monitor learner use of technology to reduce the negative impacts of technology. This study focused more on impacts and not ways to curb them.
- ✓ A similar study could also be carried out in other regions of the republic of Zimbabwe to determine whether findings established by this study also apply. This will serve to strengthen the findings of this study.

- ✓ A study could be carried out to investigate technology use in other science subjects. This study focused on use of technology in the teaching and learning of physics.

6.1 REFERENCES

- Albirini, A. (2016). Teachers' attitude towards use of Information and communication Technologies. *Journal of computer and Education*.
- Alsop S., & Hicks K. (2010): *Teaching Science. A Handbook for Primary and Secondary School teaching*. Bell & Bain Ltd.Glasgow.
- Altun, T., Alev, N., & Yigit, N. (2019). An investigation of pre-service science teachers' views about their technical and pedagogical skills in the use of ICT. *Proceedings of the 9th International Educational Technology Conference*. Ankara: Hacettepe University.
- Balanskat, A., Blamire, R., and Kefala, S. (2020). A review of studies of ICT impact on Schools in Europe. *European Schoolnet in the framework of European Commission's ICT cluster*, Brussels, Belgium.
- Balbin, C. (2010). *ICT integration examples*. Unpublished manuscript, University of the Philippines, Diliman-Quezon City.
- Barta, Z.B., Telem, M., and Gev, Y.(2000). *Information Technology in Educational Management*. Chapman and Hall. London. Glasgow. Newyork.
- Bentillo, E.(2014). *Microcomputer Based Laboratory Teaching and learning of physics*. Unpublished manuscript, University of the Philippines, Diliman- Quezon City.
- Buabeng, A. C. (2012). *An Exploration of Teachers' Skills, Perceptions and Practices of ICT in Teaching and Learning in the Ghanaian Second- Cycle Schools: Contemporary Educational Technology*, 2012. Pentecost University College, Ghana.
- Cox, M. (2005). *Using information and communication technologies (ICT) for pupil's learning*, in *Learning to Teach*, ed. G. Nicholas, London.
- Dawson, C. and Rakes, G. C. (2003). The influence of principals' technology training on the integration of technology into schools. *Journal of Research on Technology in Education*.
- Drent, M., and Meelissen, M. (2007). Which factors obstruct or stimulate teacher educators to use ICT innovatively? *Journal of computers and Education*.
- Empirica. (2006). *Benchmarking access and use of ICT in European schools 2006: Final report from Head-teacher and Classroom Teacher surveys in 27 European countries*. Germany: European Commission.
- Eugene, J. (2016). *How teachers integrate technology and their beliefs about learning: Is there a*

connection? *Journal of Technology and Teacher Education*, 14(3), 581-597.

Gomes, C. (2005). *Integration of ICT in Science Teaching: A study performed on Azores, Portugal. Recent Research Development in Learning Technologies.*

GoK. (2007). *Vision 2030.* Retrieved on 24th may 2024 from <http://www.vision2030.go.ke>

Inan, F. A. and Lowther, D. L. (2010). *Factors affecting technology integration in K-12 classrooms: A path model.* *Educational Technology Research & Development.*

Jegede, P. O., Odusola, O. D, Ilori, M. O. (2007). *Relationships between ICT competence and attitude among Nigerian tertiary institution Lecturers.* *Educational Research and Review.*

Johnson, B. and Christensen L. (2020). *Educational Research: Quantitative and Qualitative approaches;* Boston; Allyn & Bacon.

Kavagi, L. (2010). *Computers in Schools.* Jomo Kenyatta Foundation. Nairobi. Keengwe, J. and Onchwari, G. (2008). *Computer technology integration and student learning: Barriers and promise,* *Journal of Science Education and Technology*, 24, 560–565.

Keiyoro, P., Verlag, V., and Mullar, A. (2010). *Factors influencing integration of ICT in teaching science curriculum: A case of Cyber and NEPAD e- schools in Kenya.* Doctorate desertation. VDM publishing House Limited, Meldrum Court 17, Beau Bassin, Mauritius.

Knelleher, P. (2010). *A review of the recent developments in the use of communication technologies (ICT) in Science Classrooms.* *Australian Science Journal.*

Koohang, A. (2019). *A Study of Attitudes Toward Computers: Anxiety, Confidence, Linking, and Perception of Usefulness,* *Journal of research on computing in education.*

Koul, L. (2004). *Methodology of Educational Research.* Vikas Publishing House Pvt Ltd. New Delhi.

Kozma, R., McGhee, R., Quellmalz, E., and Zalles, D. (2004). *Closing the digital divide: evaluation of the World Links Program.* *International Journal of Educational Development.*

Lau, C. T. and Sim, C. H. (2008). *Exploring the extent of ICT adoption among secondary teachers in Malaysia.* *International Journal of Computing and IT research.*

Lewis, S. (2003). *Enhancing Teaching and Learning of Science through use of ICT: Methods and Materials.* *School Science Review.*

Maithya, R. and Ndebu, S. (2011). *Factors Influencing effective use of ICT in teacher Education: A case of Kenya Technical Teachers College; a paper presented to the international conference on education at Kenyatta University.* Unpublished.

- Miles, B. (2010). Teaching and Learning science: The state of the Art and New Directions: University of New Zealand, Paper presented during A Mathematics and science teachers' workshop.
- MOE, Singapore (2008). Information Communication Technology In Education: Singapore's ICT master plans 1997-2008. Fuisland Offset Printing (S) Pte Ltd. Singapore.
- Mugenda, O. M. and Mugenda, A. G. (2009). Research methods: Quantitative and Qualitative Approaches. Acts Press, Nairobi.
- Newhouse, P. (2002). Literature review: The impact of ICT on teaching and learning, Perth, Western Australia: Department of Education.
- Newton, L. (2003). ICT for Managing Student learning: Kluwer Academic Publishers, 101 Philip Drive, Assinippi Park, Norwell, Massachusetts.
- Niran, C. (2003). Multimedia Interactive Physics Magic: National Institute For science and Mathematics Education Development-University of the Philippines, Diliman, Quezon.
- Pelgrum, W. J., (2001). Obstacles to integration of ICT in Education: Results from worldwide Educational Assessment. Computers and Education.
- Petrogiannis, K. (2010). The relationship between perceived preparedness for computer use and other psychological constructs among kindergarten teachers with and without computer experience in Greece. Journal of Information Technology Impact.
- Plomp, T., Brummelhis, A.C.A., & Rapmund, R. (2016). Teaching and Learning for the Future. Report of the Committee on MultiMedia in Teacher Training (COMMITT). The Hague, The Netherlands: SDU.
- Roberts, S. K., Hutchinson, C. J. and Little, M. (2003). Making the Invisible Visible and Back Again: Highlighting technology in an integrated curriculum for pre-service teachers. Journal of Computing in Teacher Education.
- Rosenfeld, B. & Martinez-Pons, M. (2005). Promoting classroom technology use. The Quarterly Review of Distance Education.
- Rogers E.M. (2015). Diffusion of Innovations 6th edition. NY Press, New York.
- Samah, A., Afshari, A., B., Su Luan, and Fooi, S. (2009). Factors affecting teachers' use of Information and Communication Technology. International Journal of Instruction.
- Saunders, m., Lewis P., and Thornhill, A. (2017). Research methods for business

students. 4th edition: Prentice Hall, England.

Sicilia, C. (2005). The Challenges and Benefits to Teachers' Practices in Constructivist Learning Environments Supported by Technology. Unpublished Master's Thesis, McGill University, Montreal.

Steve, A. and Keith, H. (201). Teaching science: Stylus Publishing Inc., Quicksilver Drive Sterling, USA.

APPENDICES

Appendix 1 Questionnaire

My name is DANWIN KATOMA, a student at BINDURA UNIVERSITY OF SCIENCE EDUCATION, studying BACHELOR OF SCIENCE EDUCATION, MAJORING IN PHYSICS. I am carrying out a research on **the impact of using technology in the teaching and learning of physics: a case study of highfield 2 high school, highglen district in harare zimbabwe**. The research is done in partial fulfillment of the requirements of the program being studied. You are therefore requested to answer the following questions in honesty. Your responses will be treated in confidentiality and will be used in this study only

INSTRUCTIONS: Kindly answer all questions. Do not discuss with anyone. Please respond to items below by putting a yes or no in the provided space and elaborate when requested to do so.

SECTION A

(1) As a science student, are you interested in the use of technology in physics learning?

--	--

(2) Do you think your school has enough resources for the use of technology in teaching and learning of physics?

--	--

(3) Are the teaching media being used by physics teachers effective in teaching and learning of physics?

--	--

SECTION B

Answer all questions

(1) What are the negative effects of technology in teaching and learning of physics at Highfield 2 high School?

.....

.....
.....
.....
.....
.....
.....
.....

(2) What are the positive effects of technology in teaching and learning o physics at Highfield 2 high School?

.....
.....
.....
.....
.....
.....

(3) What do you think can be done to improve the use of technology in physics lessons at the school?

.....
.....
.....
.....
.....

4) What do you use technology for in physics teaching and learning

.....
.....
.....
.....
.....

5) list any technological materials that you use in physics lessons

(6) Briefly describe what do recommend to the physics teachers so that they can improve the use of

pass rate in physics?

.....

.....

.....

.....

PARENTAL CONCENT FORM

Purpose of this Research: ACADEMIC RESEARCH

Your permission is being sought to have your child participate in this research study. The purpose of this study is to help us determine whether the use of technology by physics learners have some impacts on their learning of physics. During research, your child will be interviewed and given some questionnaire to complete.

Risks or discomforts: The risks in this study are no greater than those ordinarily encountered in daily life or the performance of routine physical or psychological examinations or tests. There are no foreseeable discomforts or dangers to your child in participating in this study

Benefits: There are no direct benefits to your child. The results of this study, however, will increase our knowledge on the importance and impacts of technology in physics learning by physics students

Confidentiality of records: All records are kept confidential and will be available only to professional researchers and staff. If the result of this study is published, the data will be presented in group form and individual children will not be identified. Information collected as part of this research will not be used or distributed for future research studies

Contact: If you have any questions or would like additional information about this study, please contact DANWIN KATOMA 0771398396 or via email danwinkatoma@gmail.com

Voluntary Participation: Your child's participation in this study is completely voluntary. We ask that you read this information to your child to ensure that he/she understands that participation is voluntary. He/she may stop or withdraw from the study at any time. Should your child wish to discontinue the research at any time; no information collected will be used

CONSENT. Your signature below verifies that your child is under the age of 18, has a sixth grade reading level and permits your child to participate in the study without your presence. Please return this form at your earliest convenience. If you do not sign and return this form, the researchers will understand that you do not wish to allow your child to participate

Name _____ of _____ Participating
Child.....
.....

Signature _____ of _____ Parent _____ or
GuardianDate:.....

...

Print Name of Parent or
Guardian.....

.....