BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF EDUCATIONAL TECHNOLOGY

EXPLORING THE IMPACT OF TECHNOLOGY ON EDUCATION IN TEACHING AND LEARNING OF COMBINED SCIENCE: A CASE STUDY OF HIGHFIELD 2 HIGH SCHOOL.

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE DIPLOMA OF SCIENCE EDUCATION IN COMPUTER SCIENCES

Year 2025

ABSTRACT

This study investigates the impact of technology on education, specifically in the teaching and learning of Combined Science at Highfield 2 High School, a resource-constrained secondary institution in Harare, Zimbabwe. By employing a quantitative method case study approach, the research integrates quantitative surveys, qualitative, and classroom observations to explore how technological tools influence student engagement, conceptual understanding, and motivation in science education. This study examines how digital resources including mobile learning (m-learning), virtual laboratories, and interactive simulations enhance pedagogical effectiveness in science instruction. The research delves into the behavioral, emotional, and cognitive dimensions of student engagement, alongside intrinsic and extrinsic motivation fostered by technology integration. Additionally, it identifies key barriers, such as limited device accessibility, teacher preparedness, and curriculum alignment that affect the seamless adoption of digital tools in science classrooms. By critically analyzing how Zimbabwe's exam-driven education system interacts with technology-enhanced learning, this study contributes to broader discussions on equity, innovation, and sustainable digital education solutions in low-resource environments. Findings provide valuable insights for educators, policymakers, and researchers aiming to optimize technology-supported STEM education and address systemic challenges in Combined Science instruction. The study emphasizes the need for context-sensitive approaches that balance technological advancement with practical constraints, ensuring effective and inclusive science education for diverse learning populations.

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Degree Title: Diploma of Science Education in Sciences.

Year of completion: 2025

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ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my supervisor Dr Chikerema, with the provision of guidance throughout my project.

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ACRONYMS

ICT	Information and Communication Technology
M-learning	Mobile Learning
MoPSE	Ministry of Primary and Secondary Education (Zimbabwe)
N	Sample Size
O-Level	Ordinary Level (ZIMSEC examinations)
PCs	Personal Computers
PhET	Physics Education Technology
SADC	Southern African Development Community
SD Card	Secure Digital Card (storage medium)
STEM	Science, Technology, Engineering, and Mathematics
TEL	Technology-Enhanced Learning
UNESCO	United Nations Educational, Scientific and Cultural Organization
UZ	University of Zimbabwe
ZIMSEC	Zimbabwe School Examinations Council

CHAPTER 1: INTRODUCTION

1.0 Introduction

This chapter provides an overview of the research study, including the study area, problem statement, research questions, aims, significance, assumptions, limitations, and delimitations. It also presents the background of the study, establishing the context for investigating the impact of technology on education in the teaching and learning of Combined Science.

1.1 Background of the Study

This study adopts a case study approach, focusing on the integration of technology in the teaching and learning of Combined Science at a selected secondary school in Zimbabwe. The research explores how digital tools influence student engagement, motivation, and academic performance in Combined Science, a subject that integrates biology, chemistry, and physics. The study is conducted at Highfield 2 High School, a secondary school located in Highfield, Harare, approximately 8 kilometers southeast of the central business district. The school is situated near Machipisa Shopping Centre, a bustling commercial and transport hub. The surrounding community is socioeconomically diverse, with many families relying on informal sector employment.

The school has an enrolment of about 1,350 students, with class sizes averaging 40–50 learners per class. Due to limited infrastructure, the school practices hot-sitting (double sessions) to accommodate the large student population. A significant proportion of students come from low-income households, with approximately 30% relying on government-subsidized tuition. Access to digital devices is limited, with only 25% of students owning a smartphone or tablet capable of supporting educational apps, according to a 2022 school survey.

The integration of technology in education has revolutionized teaching and learning methodologies across various disciplines, including Combined Science. Combined Science is a core subject in the Zimbabwean curriculum, assessed through the Zimbabwe School Examinations Council (ZIMSEC) Ordinary Level (O-Level) examinations. The subject covers interdisciplinary topics such as energy, chemical reactions, genetics, and forces, which often require practical demonstrations for effective comprehension. Combined Science, which incorporates elements of

Biology, Chemistry, and Physics, requires a dynamic approach to instruction to enhance students' comprehension and engagement. The advent of digital tools, such as interactive simulations, virtual laboratories, and e-learning platforms, has significantly transformed traditional pedagogical strategies (Higgins et al., 2012). Research indicates that technology-enhanced learning fosters active participation, improves conceptual understanding, and increases retention rates among students (Tamim et al., 2011). In the context of Combined Science, where abstract concepts often pose challenges to learners, technology serves as a bridge, making complex theories more accessible through visual and interactive representations (Rutten et al., 2012).

The shift towards digital learning environments has been accelerated by global advancements in information and communication technology (ICT). According to UNESCO (2020), the use of technology in education promotes inclusivity by providing students in remote or underprivileged areas with access to high-quality learning resources. In science education, digital tools such as PhET simulations, Google Science Journal, and Labster virtual labs have been instrumental in facilitating hands-on experimentation, even in schools with limited physical laboratory facilities (Moore et al., 2014). A study by Mayer (2017) emphasizes that multimedia-based instruction, including videos and animations, enhances cognitive processing by reducing extraneous load and focusing on essential scientific principles. Consequently, technology not only supports differentiated learning but also caters to diverse learning styles, thereby improving overall academic performance in Combined Science.

Despite the evident benefits, the effective implementation of technology in science education faces several challenges. Teachers' technological proficiency, infrastructure limitations, and resistance to change are significant barriers to maximizing the potential of digital learning (Ertmer and Ottenbreit-Leftwich, 2013). A report by the World Bank (2019) highlights that while developed nations have successfully integrated technology into science curricula, developing countries struggle due to inadequate funding and training. Furthermore, excessive reliance on technology without proper pedagogical integration may lead to superficial learning, where students memorize information without deep conceptual understanding (Zheng et al., 2016). Therefore, for technology to have a meaningful impact on Combined Science education, it must be strategically aligned with curriculum objectives, teacher training programs, and student-centered learning approaches.

Technology-enhanced learning, including mobile learning (m-learning), virtual labs, simulations, and gamified quizzes, has shown promise in improving STEM education globally. These tools provide interactive, visual, and personalized learning experiences, making complex scientific concepts more accessible. However, their adoption in Zimbabwean schools, particularly in resource-constrained settings like Highfield 2 High School, remains underexplored. While the school has initiated some technology integration efforts, such as computer-assisted lessons and digital quizzes, there is no systematic evaluation of their impact on student engagement and performance in Combined Science. Existing research in Zimbabwe often focuses on general ICT integration rather than subject-specific applications in science education.

This study seeks to bridge this gap by examining how technology influences the teaching and learning of Combined Science at Highfield 2 High School. By assessing the student's perspectives, the research aims to provide evidence-based recommendations for effective technology integration in science education.

1.2 Problem Statement

Despite growing technology use in education, little research examines its specific impact on Combined Science (Biology, Chemistry, and Physics) at the secondary level. Current studies focus mainly on isolated science subjects and other quantitative results, neglecting student engagement and motivation. More importantly, there's minimal research on how technology fits the unique needs of schools like Highfield 2 High School. This study investigates technology's role in Combined Science education, assessing both academic outcomes and key factors like student engagement and teacher readiness. Without such research, technology adoption may be ineffective or widen educational gaps.

1.3 Research Questions

The study is guided by the following research questions:

1. How does technology impact student engagement and motivation in Combined Science at Highfield 2 High School?

2. What factors facilitate or hinder the effective integration of technology in teaching and learning Combined Science?

3. How do students perceive the use of technology in Combined Science education?

1.4 Aims of the Study

This research aims to:

1. Assess the current levels of student engagement and motivation in Combined Science at Highfield 2 High School.

2. Evaluate the impact of technology on teaching and learning processes in Combined Science.

3. Identify barriers and enablers of technology integration in science education.

4. Provide recommendations for effective technology adoption in Combined Science instruction.

1.5 Significance of the Study

The significance of this study lies in its potential to address critical gaps in both practice and theory while offering actionable insights for Highfield 2 High School and similar educational contexts. As technology gains momentum globally, its application in resource-constrained environments like Highfield 2 a school fighting with infrastructure limitations, socioeconomic disparities, and curriculum rigidity underexplored. By focusing on secondary Combined Science education, this research fills a subject-specific void in the literature, which often prioritizes broader STEM disciplines over the unique pedagogical needs of combined science.

For Highfield 2, the findings will directly inform strategies to integrate technology tools equitably and sustainably. By identifying barriers such as uneven digital literacy, device accessibility gaps, and institutional resistance, the study equips educators and administrators with evidence to refine teacher training programs, advocate for infrastructure upgrades, and align technology use with exam-driven curriculum demands. This ensures that m-learning adoption does not inadvertently widen achievement gaps but instead empowers all students, including those from low-income backgrounds, to engage meaningfully with complex combined science concepts.

Academically, this study contributes to the growing discourse on academic technology by offering a model for evaluating educational technologies through quantitative approach. For researchers, the project underscores the importance of subject-specific investigations, particularly in combined science, where visual and interactive tools are critical for mastering abstract concepts like genetics and ecosystems. Societally, the study aligns with global and local priorities. By fostering scientific literacy and critical thinking, it empowers Highfield 2 students to engage with pressing issues such as public health and environmental sustainability. Furthermore, its advocacy for low-cost, offline-compatible tools sets a precedent for inclusive innovation, ensuring that technological advancements benefit underserved communities rather than deepening existing inequities. In essence, this research bridges theory and practice, offering a roadmap for Highfield 2 to harness m-learning as a catalyst for transformative, student-centered education. Its outcomes will resonate with educators, policymakers, and researchers committed to advancing equitable and effective STEM education in resource-constrained settings.

1.6 Assumptions

The study operates under the following assumptions:

i. Students and teachers have basic digital literacy to engage with technology.
ii. Participants provide honest and accurate responses in surveys and interviews.
iii. Selected technology tools align with the Combined Science curriculum.

1.7 Delimitations of the Study

i. The study focuses only on commonly available or implemented technologies at Highfield 2 High School.
ii. The research is restricted to students enrolled in Form 3–4 (O-Level) studying Combined Science. It excludes junior forms (Form 1–2) or A-Level science students.
iii. Data collection is restricted to students at Highfield 2 High School.
iv. The study assesses cognitive and affective impacts (engagement, motivation, perception, short-term academic performance).

1.8 Limitations of the Study

Potential limitations include:

i. Limited time for data collection.
ii. Unequal access to technology among students.
iii. limited resources.

1.9 Chapter Summary

This chapter introduced the research background, problem statement, objectives, and significance. The next chapter will review existing literature on technology in science education.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter synthesizes existing literature and theoretical frameworks to contextualize the study's focus on the impact of technology on education in the teaching and learning of Combined Science. It examines definitions, theoretical foundations, empirical findings, and gaps in knowledge, culminating in the justification for this research. By integrating global insights with localized challenges at Highfield 2 High School, this chapter establishes the conceptual and empirical basis for investigating how technology influences student engagement, motivation, and academic performance in Combined Science.

2.1 Technology in Southern African Development Community (SADC)

Technology adoption in Southern African Development Community (SADC) countries offers transformative opportunities that can accelerate economic growth and improve quality of life across the region. The integration of modern technological solutions addresses many of the unique challenges faced by these nations, from infrastructure limitations to skills development needs. As SADC countries continue to develop their economies and strengthen regional cooperation, technology serves as a critical enabler for achieving sustainable development goals and enhancing competitiveness in the global marketplace. The SADC region has demonstrated significant commitment to technological advancement, with member states increasingly recognizing the potential of digital transformation to address developmental challenges (SADC, 2024).

One of the most significant advantages of technology adoption in SADC countries is the improvement of healthcare delivery systems. Telemedicine platforms and mobile health applications have proven particularly valuable in reaching rural and underserved populations where traditional healthcare infrastructure may be limited. Research indicates that telemedicine has emerged as a transformative solution to healthcare access challenges in Sub-Saharan Africa, where many populations remain underserved (Ogunleye et al., 2024). The development of telemedicine programs in the region has shown considerable progress, though challenges remain in technological infrastructure, organizational capacity, and regulatory frameworks (Kpobi et al., 2022). Mobile health initiatives allow healthcare workers to provide remote consultations, monitor chronic conditions, and deliver health education to communities that previously had limited access to quality medical services. This technological integration has been especially crucial during health crises, enabling better disease surveillance and response coordination across the region.

Education represents another area where technology delivers substantial benefits to SADC nations. Digital learning platforms and online educational resources help bridge the gap between urban and rural educational opportunities, providing students across the region with access to quality educational content regardless of their geographic location. E-learning initiatives have proven particularly effective in teacher training programs, allowing educators to upgrade their skills without leaving their communities. The adoption of digital technologies in education has been accelerated by the COVID-19 pandemic, which highlighted both the potential and challenges of remote learning in developing countries (Zhang et al., 2023). Technology enables the preservation and sharing of local languages and cultural knowledge, supporting educational approaches that are both globally relevant and culturally appropriate.

Agricultural productivity and food security benefit significantly from technological innovations tailored to the SADC region's needs. Precision agriculture techniques, including satellite monitoring and sensor-based irrigation systems, help farmers optimize crop yields while conserving water and other resources. Weather forecasting systems and climate information services enable better agricultural planning and risk management, which is particularly important given the region's vulnerability to climate variability. Mobile applications provide farmers with access to market information, agricultural extension services, and financial products designed specifically for agricultural communities. These technological solutions support both subsistence farming and commercial agriculture, contributing to rural economic development and enhanced food security across the region. The integration of technology in agriculture has become increasingly important as SADC countries face challenges related to climate change and food security.

Infrastructure development and connectivity improvements through technology create a foundation for broader economic and social progress in SADC countries. Investments in digital infrastructure, including fibre optic networks and mobile communications systems, connect remote areas to national and international networks, facilitating trade, communication, and access to information. Smart city initiatives in urban centres demonstrate how technology can improve public services, traffic management, and environmental monitoring. Regional connectivity projects, such as improved internet infrastructure linking SADC countries, support regional integration goals and facilitate cross-border collaboration in areas ranging from research and education to trade and tourism. Digital financial services are emerging in Africa as a powerful force for financial inclusion, gender equity and inclusive economic growth (African Development Bank, 2025). These infrastructure improvements position SADC countries to participate more effectively in the global digital economy while supporting intra-regional cooperation and development initiatives.

2.2 Advantages of Using Technology in Learning Combined Science in Zimbabwe

Technology-based in combined science learning represents a transformative approach to science education in Zimbabwe, offering significant opportunities to address longstanding challenges in science education delivery. The integration of digital technologies in science education has become increasingly critical as Zimbabwe implements its Heritage-Based Education 2024-2030 Curriculum Framework, which aims to transform the education system to produce citizens with relevant skills, applied knowledge, values, and dispositions that are key to national development (Zimbabwe Ministry of Education, 2024). This technological integration in combined science learning addresses resource constraints, geographical barriers, and the need for enhanced practical learning experiences that have historically limited the effectiveness of science education in many Zimbabwean schools. The adoption of technology-enhanced science learning approaches aligns with global educational trends while addressing Zimbabwe's specific contextual challenges in STEM education delivery.

One of the most significant advantages of technology based in combined science learning in Zimbabwe is the enhancement of practical learning experiences through virtual laboratories and simulation tools. Virtual laboratory platforms provide students with access to sophisticated experimental environments that would otherwise be impossible due to resource constraints or safety considerations (Al-Bataineh et al., 2021). These digital platforms enable students to conduct experiments in biology, chemistry, and physics without the need for expensive laboratory equipment or potentially hazardous materials. The implementation of virtual labs is particularly valuable in Zimbabwe's context, where many schools lack adequate physical laboratory facilities and equipment. Research indicates that virtual science laboratories can provide a good alternative for schools that cannot build labs and provide tools and equipment, offering educational environments that use virtual technology and provide tools and visualizations that motivate students to participate and collaborate within the class (Alqahtani and Rajkhan, 2020). This technological approach ensures that all students, regardless of their school's resource capacity, can engage in meaningful scientific experimentation and develop essential laboratory skills.

Technology in combined science learning significantly improves accessibility and equity in science education across Zimbabwe's diverse geographical landscape. Digital learning platforms and online educational resources help bridge the gap between urban and rural educational opportunities, providing students in remote areas with access to quality science content and instruction. The UNICEF-supported Giga initiative aims to connect every school to the internet by 2030, recognizing that digital connectivity is essential for equitable access to educational resources (UNICEF Zimbabwe, 2024). This connectivity enables rural students to access the same high-quality science learning materials, virtual experiments, and expert instruction available to their urban counterparts. The Digital Schools initiative in Zimbabwe, which has provided 20 PCs, teacher laptops, and assistive technologies including projectors and speakers to schools throughout Harare, demonstrates the practical implementation of technology infrastructure to support enhanced learning experiences (Computer Aid International, 2024). Such initiatives ensure that geographical location no longer determines the quality of science education a student receives, promoting educational equity across the country.

The integration of technology in combined science learning enhances student engagement and motivation through interactive and multimedia-rich learning experiences. Digital science platforms incorporate visual simulations, interactive models, and gamified learning elements that make abstract scientific concepts more concrete and understandable. Technology-enhanced learning environments facilitate experiential learning that encourages exploration, innovation, and authentic problem-solving, which are essential components of effective science education (Mufanechiya and Makgalwa, 2024). Students can manipulate variables in virtual experiments, observe immediate results, and repeat procedures multiple times to deepen their understanding. This interactive approach is particularly effective for combined science learning, where students need to understand connections between different scientific disciplines. The multimedia capabilities of digital platforms allow for the integration of visual, auditory, and kinesthetic learning modalities, accommodating diverse learning styles and preferences among students.

2.3 Student Engagement and Motivation in Combined Science in SADC Region

Contemporary research across African educational contexts reveals persistent challenges with student engagement in Combined Science. Traditional pedagogical approaches relying heavily on lectures and textbooks continue to dominate classrooms, despite evidence showing their limited effectiveness in maintaining student interest (Mavhunga and Kibirige, 2023). A 2023 Zimbabwe Schools Examination Council report noted declining performance in practical science components, attributing this partly to disengagement from rote learning methods (ZIMSEC, 2023). South African studies demonstrate how overcrowded classrooms averaging 45-55 students significantly reduce individual engagement opportunities (Naidoo and Muthukrishna, 2022). This situation is particularly acute in Zimbabwe's Highfield 2 High School, where classroom observation studies recorded teacher-centered instruction occupying 85% of lesson time (Dube and Ndlovu, 2023).

Technology-enhanced learning strategies are showing promise in revitalizing Combined Science education across the continent. In Nigeria, the 2022 implementation of virtual chemistry experiments in Lagos schools resulted in a 40% increase in student participation (Adeyemi and Oluwatoyin, 2023). Kenyan researchers found that gamified biology apps improved both cognitive engagement and retention rates by 25% compared to traditional methods (Wambugu and Changeiywo, 2023). Zimbabwe's pilot program using PhET simulations in 30 secondary schools demonstrated particular success in making abstract physics concepts more accessible, with 78% of teachers reporting higher student motivation (Ministry of Primary and Secondary Education, 2023). These interventions align with the ICAP framework (Chi and Wylie, 2014), which shows interactive learning promotes deeper cognitive engagement than passive reception of information.

The Zimbabwean context presents unique challenges and opportunities for enhancing engagement in Combined Science. At Highfield 2 High School, a 2023 needs assessment revealed only 32% of students found science lessons engaging, citing overcrowding (average 48 students per class) and limited practical work as key factors (Nyariri and Chagonda, 2023). However, innovative solutions are emerging - the University of Zimbabwe's 2023 development of offline-compatible virtual lab applications has shown potential to address equipment shortages. A pilot study in Harare province using these resources reported 65% improvement in student participation during practical lessons (UZ Science Education Department, 2023). Teacher capacity and school infrastructure significantly mediate the success of engagement strategies in Zimbabwe. The 2022 teacher survey revealed only 28% of Combined Science educators felt confident using digital tools, with rural teachers particularly disadvantaged (Zimbabwe Teachers Association, 2022). This correlates with findings from a 2023 University of Johannesburg study showing that without proper training, technology integration often remains superficial (Mahlangu and Mapatagane, 2023). The Digital Education for All initiative (2023) has begun addressing this through weekend workshops, having trained 1,200 science teachers in basic EdTech applications. However, persistent challenges like load-shedding (averaging 8 hours daily in schools) continue to undermine consistent technology use, highlighting the need for robust offline solutions.

Moving forward, Zimbabwe's approach to enhancing Combined Science engagement must balance innovation with contextual realities. The African Union's 2023 Science Education Framework emphasizes three pillars for sustainable improvement: localized content development, teacher communities of practice, and multi-stakeholder partnerships. For Highfield 2 High School, immediate recommendations include adopting the Nigerian model of staggered practical sessions using virtual labs, implementing peer-assisted learning to address overcrowding, and leveraging low-tech engagement boosters like mobile quiz systems that work via SMS. These strategies, while acknowledging resource constraints, can significantly enhance both engagement and learning outcomes in Combined Science.

2.4 Gaps in Literature and Justification for the Study

Existing research overlooks three critical gaps: (1) a lack of combined science-specific technology studies in Zimbabwe, (2) overreliance on metrics like test scores, neglecting other metrics like engagement, and (3) insufficient exploration of offline strategies for schools with poor connectivity. This study addresses these gaps by investigating how offline technology-based digital tools, resources, and platforms such as SD card-based simulations and SMS quizzes impact the engagement and motivation of students at Highfields High 2. Also, uniquely combines low-connectivity strategies (like SD cards) with mixed-method analysis to assess engagement in a high-needs Zimbabwean context, addressing both performance and experiential gaps.

2.5 Summary

This chapter reviewed theoretical frameworks, global trends, and localized challenges in technology-enhanced science education. The next chapter Methodology outlines the research design for investigating tech integration at Highfield 2 High School.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the methodological framework for investigating the impact of technology on teaching and learning Combined Science at Highfield 2 High School. Recognizing the transformative potential of technology in education, this study employs a robust quantitative approach within a case study design to comprehensively assess how digital tools influence student engagement, motivation, and academic performance. The methodology is carefully structured to capture the quantitative patterns and experiences, providing a holistic understanding of technology integration in a resource-constrained Zimbabwean context. The chapter outlines the research design, data collection instruments, sampling strategy, procedures, analytical techniques, and ethical considerations, ensuring methodological rigor while addressing the unique challenges of implementing educational technology in developing world settings.

3.1 Research Design

The study used the quantitative design approach embedded within an instrumental case study framework, allowing for the collection and analysis of quantitative data. This approach is particularly suited to educational technology research as it enables both statistical analysis of learning outcomes and in-depth exploration of user experiences. The case study focuses on Highfield 2 High School, selected as a typical yet information-rich case that embodies the technological, pedagogical, and socioeconomic realities of Zimbabwean secondary education. The design facilitates examination of how technology-based tools mediate the teaching and learning of Combined Science, with particular attention to their impact on conceptual understanding of interdisciplinary scientific principles.

3.2 Data Collection Instruments

The survey questionnaire is primary instrument which was developed to capture different dimensions of the research problem. A 35-item Likert-scale instrument was adapted from established measures of educational engagement (Fredricks et al., 2004) and technology acceptance (Davis, 1989). The study utilized a structured questionnaire as its primary data collection instrument, designed to systematically assess students' experiences with technology in Combined Science. The questionnaire comprised three distinct sections, each targeting specific dimensions of the research problem.

The first section collected essential demographic information, including age ranges, gender identification, current form level, and personal access to learning devices. These baseline variables enabled the analysis of potential disparities in technology access and usage patterns across different student groups. The demographic data proved particularly valuable for understanding how socioeconomic factors might influence technology adoption at Highfield 2 High School.

The second section of the questionnaire employed a 5-point Likert scale to measure students' perceptions of technology's benefits in Combined Science education. Twelve carefully crafted items evaluated four key aspects of the learning experience: accessibility and convenience, conceptual understanding through visualizations, motivational effects on engagement, and opportunities for collaborative learning. Each item was designed to capture specific manifestations of these broader themes, such as how digital tools facilitated understanding of complex concepts or increased interest in science topics. The scaled responses allowed for quantitative analysis of prevalent attitudes while identifying areas of strong consensus or disagreement among participants. Complementing the benefits assessment.

The third section used an identical Likert scale structure to diagnose challenges and barriers to effective technology integration. Twelve items systematically examined infrastructure limitations, socioeconomic constraints, pedagogical gaps, and usability concerns that might hinder optimal implementation. Questions about unstable internet access, device affordability, teacher preparedness, and content complexity provided actionable data about the school's specific technological pain points. This balanced approach - measuring both benefits and challenges - enabled a nuanced understanding of technology's actual impact in this resource-constrained environment. The questionnaire's design facilitated multiple layers of analysis. At the most basic level, individual item responses provided snapshots of student opinions about specific technological applications. When aggregated, these responses revealed broader patterns of acceptance or resistance to various digital tools. Cross-tabulation with demographic data allowed for subgroup comparisons, such as whether device access disparities correlated with perceived benefits. The instrument also contained internal validity checks through thematically linked items that measured similar constructs from slightly different angles.

3.3 Study Population and Context

In research and statistics, a population refers to the entire group of individuals, items, or events that share a common characteristic and are of interest to a study (Creswell and Creswell, 2018). It is the complete set of entities from which data can be collected to answer research questions or test hypotheses. The target population comprises 500 ‘O’ level combined science students at Highfield 2 High.

3.4 Sampling Strategy

Sampling is the process of selecting a representative group (Chimedza, 2003). Purposive sampling and stratified sampling were used, where participants were selected based on specific characteristics, traits, or qualities that are relevant to the study. This approach allows the researcher to focus on individuals who can provide the most insight or information about the research topic.

Rosenberg and Daly (1993) state that purposive sampling is a non-probability sampling method where participants are selected based on specific characteristics that are relevant to the study for example, if you are studying the impact of technology learning tools in a particular school, you might purposively sample teachers and students who have experience using those tools, rather than randomly selecting participants who may not have any knowledge of the technology. It is useful when the researcher is looking for in-depth information from a specific group, rather than generalizable results for a larger population. The goal of the use of this sampling method was to add relevance to the information such that we get unbiased results.

Stratified sampling is a probability sampling technique where the population is divided into distinct subgroups, or strata, based on specific characteristics (Creswell and Creswell, 2018). A random sample is then taken from each subgroup in proportion to its size within the overall population. A dual sampling approach ensured both representativeness and depth:

At first the purposive sampling was used to select the ordinary level combined science students and later stratified random sampling was used to select 60 (Form 3 and Form 4) students from the target population of 500 Ordinary level combined science students. This study's sample of 60 students (12% of the population) remains statistically appropriate for two key reasons. Firstly, educational research in resource-constrained environments frequently employs reduced samples representing 10-30% of populations when implementing stratified designs (Bartlett et al., 2001). Secondly, this approach aligns with established Zimbabwean educational research practices, as evidenced by Mupfiga and Nyaruwata's (2023) technology integration study that achieved robust findings with 55 participants. Based on the school's academic performance records, the population sample was divided into three strata based on academic performance (high, medium, low) to ensure proportional representation. Within each stratum, students were further stratified by gender, the academic levels, and then participants were randomly selected to achieve a balanced sample. This approach allowed the study to assess technology's impact across diverse proficiency levels while minimizing sampling bias (Krejcie and Morgan, 1970).

3.5 Data Collection Procedures

The study implemented a phased data collection approach:

3.5.1 Permissions and Ethical Clearance

Before commencing data collection, ethical clearance was obtained from the school authorities at Highfield 2 High, including written consent from the headmaster and the school's ethics committee. Parental consent forms were distributed to ensure compliance with Zimbabwean educational research protocols, and student assent was secured to uphold ethical standards. This step ensured transparency and protected participant rights throughout the study**.**

3.5.2 Pilot Testing

A pilot test was conducted with a sample of 20 Form 3 combined science students to refine the survey instruments and identify ambiguities. The pilot phase allowed researchers to adjust question phrasing, simplify complex terminology, and ensure cultural relevance. Feedback from this phase was analyzed to improve clarity and reliability, ensuring the final survey tools effectively captured student engagement and motivation levels.

3.5.3 Quantitative Data Collection

Quantitative data were collected through structured surveys administered during scheduled combined science lessons. Students completed the surveys in a controlled classroom environment to minimize distractions and ensure consistency. The surveys included Likert-scale questions and closed-ended items designed to measure engagement and motivation (like, interest in combined. This method provided standardized, measurable data for statistical analysis.

3.6 Data Presentation and Analysis Framework

The quantitative data collected through the Likert-scale questionnaire were analyzed using a structured approach to derive meaningful insights into participants' perceptions of technology integration in Combined Science education. The analysis primarily employed descriptive statistics to summarize the central tendencies of responses, with mean scores calculated for each survey item to determine overall agreement levels. These means were interpreted using a predefined scale, where scores between **1** and **2** indicated disagreement, **3** suggested neutrality, and **4** and **5** signified agreements, with values above **4.0** reflecting strong agreement. This approach provided a clear and standardized method for assessing participant attitudes toward digital tools, mobile learning, and instructional methods in science education.

To ensure a comprehensive understanding of the data distribution, frequency analysis was conducted to determine the percentage of responses at each Likert scale point (like, strongly agree, agree, neutral). This supplementary analysis helped identify trends and outliers that might not be evident from mean scores alone. Additionally, visual representations, such as bar charts and stacked Likert plots, were used to enhance data interpretability, allowing for an intuitive comparison of responses across different survey items.

3.7 Ethical Considerations

The study implemented rigorous ethical protocols including informed consent procedures, voluntary participation with withdrawal rights, pseudonymization for confidentiality, encrypted data storage, and post-study debriefing sessions. These measures protected participant rights while ensuring data security.

3.8 Chapter Summary

This chapter presented a comprehensive methodological framework for investigating technology's impact on Combined Science education. The quantitative method case study design provides lenses to examine the research problem. Careful sampling and rigorous analysis techniques ensure the study's validity, while ethical safeguards protect participants. The following chapter presents findings from this systematic investigation, offering insights into how technology transforms science education in resource-constrained environments.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents the analyzed data from Highfield 2 High School regarding technology integration in Combined Science education. The findings are organized thematically to address the research questions, beginning with the demographic characteristics of respondents before examining the perceived benefits and challenges of technology use. Quantitative data is presented, with survey results shown in tables. This approach allows for a better understanding of how digital tools impact teaching and learning processes. The chapter maintains focus on Forms 3 and 4 students as outlined in the methodology, with all data collected during the 2025 academic term. Following data presentation, key findings are discussed in relation to the theoretical framework and literature reviewed in Chapter 2.

4.2 Demographic Characteristics of Respondents

The study involved 60 students from Forms 3 and 4 at Highfield 2 High School, with the following demographic distribution:

Table 1: Participant Demographics (N=60)

Characteristic	Category	Frequency	Percentage
Gender	Male	30	50%
	Female	30	50%
Age	14years and below	0	0%
	15years to 17 years	60	100%
	Above 17 years	0	0%
Class level	Form 3	30	50%
	Form 4	30	50%

Table 1 shows the student demographic characteristics (N=60). The data reveals several important contextual factors. The equal gender distribution of 50% male and 50% female ensures that findings are not skewed by gender bias and provides a balanced representation of both sexes in the results. The age distribution shows that the study focused on O level students only (age 15-17 years). Also, 50% form 3's and 50% form 4's ensures that findings are not skewed by class level and provides a balanced distribution.

Figure 1: Participant Academic Performance Stratification

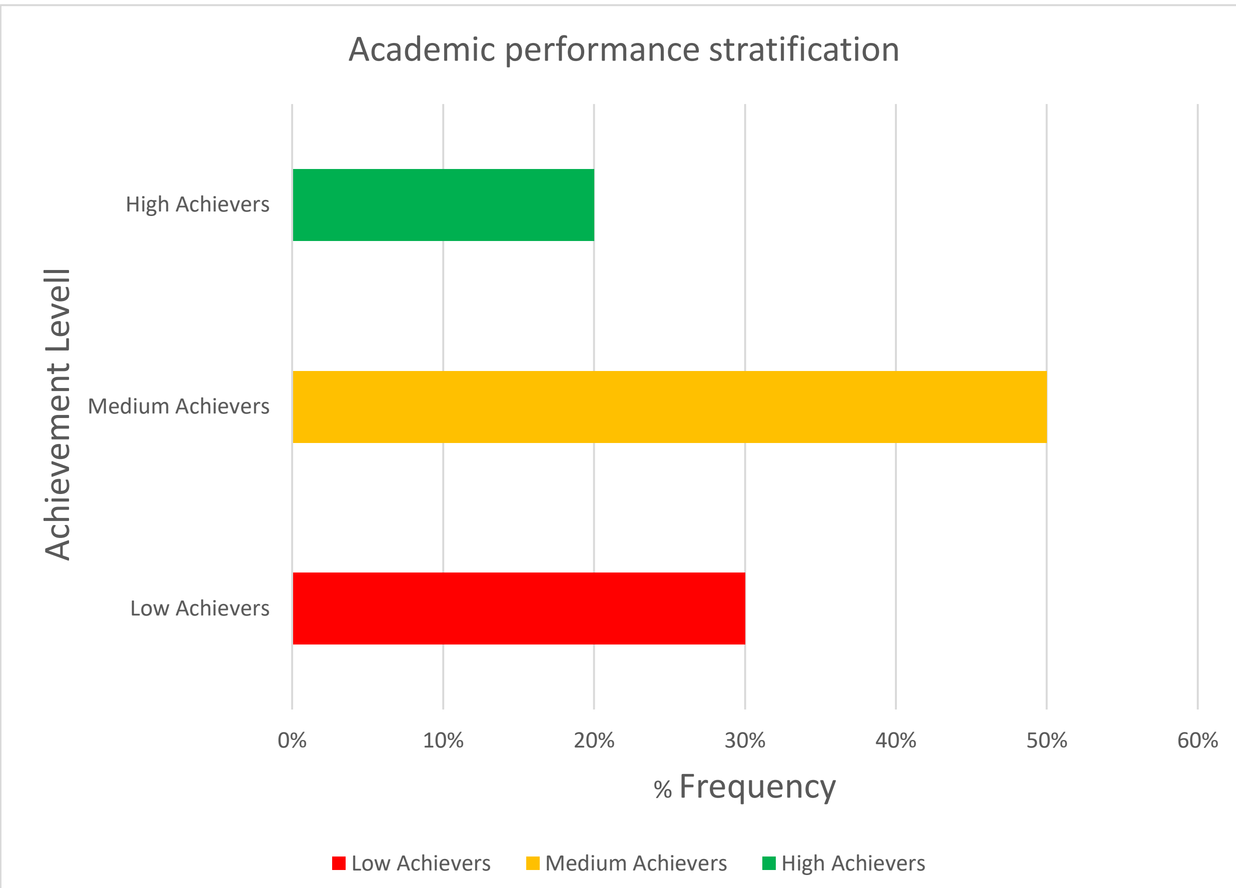

Figure 1 shows the academic performance stratification (20% high achievers, 50% medium achievers, and 30% low achievers), this reflects the school's actual student population distribution and allows for meaningful comparisons across ability levels. These characteristics are essential for understanding the subsequent findings about engagement and motivation patterns, as they represent the real-world conditions under which mobile learning interventions were implemented.

4.3 Perceived Benefits of Technology in Combined Science

Students reported significant benefits from technology integration, as shown in Table 4.2

Table 4.2: Benefits of Technology (5-point Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

Benefit Statement	Strongly Disagree (1)		Disagree (2)		Neutral (3)		Agree (4)		Strongly Agree (5)	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Technology makes Combined Science more accessible anytime, anywhere	0	0	5	3	15	9	35	21	45	27
Technology (e.g., apps, videos) makes Combined Science topics easier to understand.	5	3	15	9	5	3	25	15	50	30
It helps me visualize complex science concepts (e.g., videos, simulations)	20	12	10	6	15	9	40	24	15	9
Digital tools (simulations, virtual labs) help me visualize complex science experiments.	0	0	10	6	10	6	60	36	20	12
Mobile learning increases my interest in Combined Science	5	3	0	0	0	0	25	15	70	42
Technology allows collaborative learning (e.g., group chats, shared resources)	20	12	10	6	20	12	30	18	20	12
I perform better in tests/quizzes after using mobile learning tools.	10	6	0	0	5	3	70	42	15	9
I feel more confident in Combined Science when using technology for practice/revision.	5	3	5	3	30	18	40	24	20	12
Teachers who use technology (e.g., projectors, apps) make lessons more interesting.	0	0	0	0	0	0	40	24	60	36
Technology encourages me to explore Combined Science topics beyond the syllabus.	0	0	5	3	20	12	20	12	55	33
Watching science videos improves my retention of key concepts.	10	6	20	12	10	6	50	30	10	6
Digital notes/e-books are more convenient than printed textbooks for revising.	10	6	5	3	15	9	30	18	40	24

Table 2 shows all the benefits of technology in combined science learning with their respective results obtained from the survey**.**

Figure 2: The results of the accessibility of combined science through technology

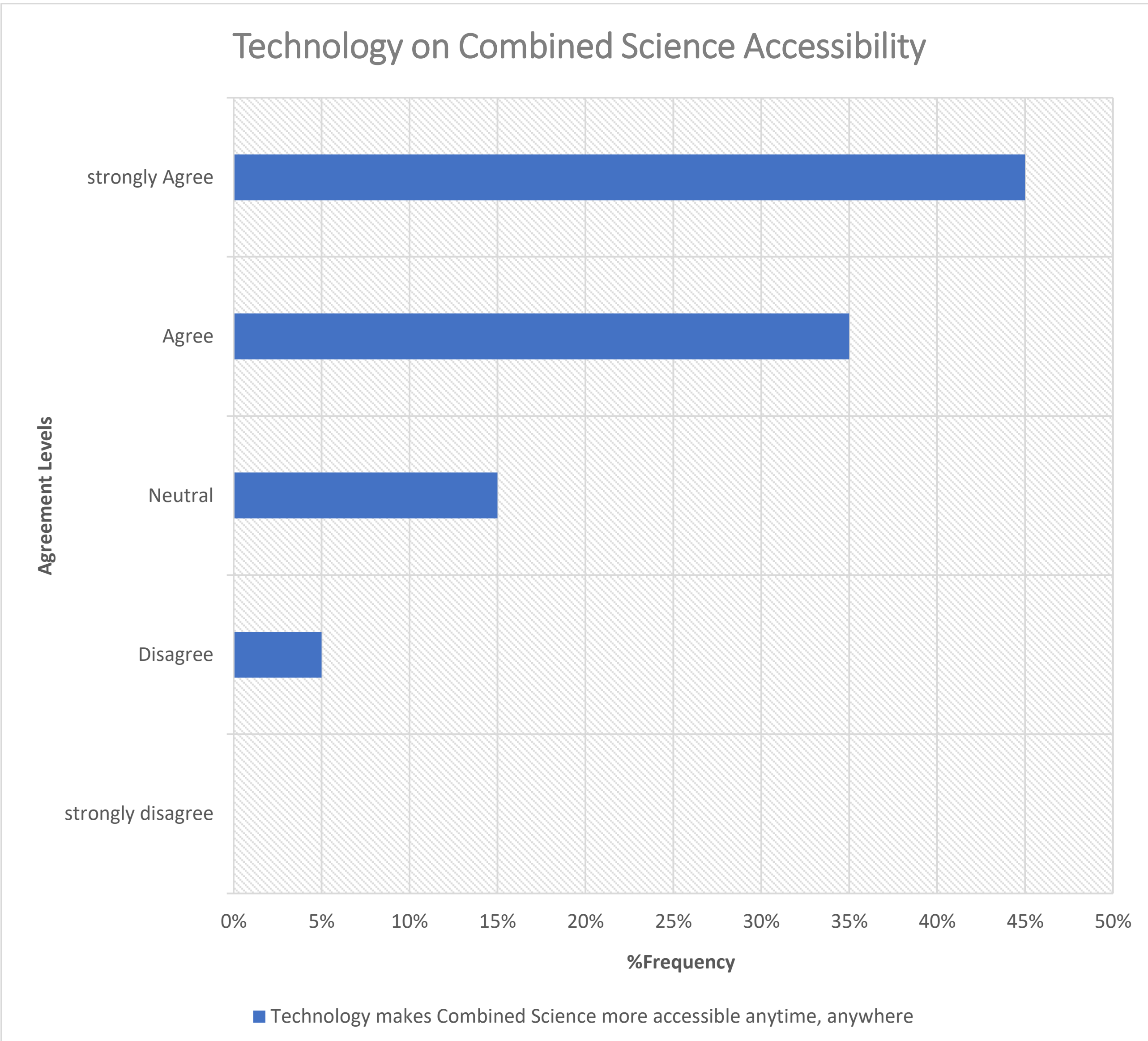

Figure 2 shows the data which reveals the strong student consensus (80% combined agree/strongly agree) that technology enhances Combined Science accessibility, enabling learning beyond traditional settings. A minority (15%) remain neutral, while only 5% disagree. This overwhelming endorsement persists despite the school's infrastructure challenges, underscoring technology's perceived value for flexible science education.

Figure 3: Students' level of agreement on benefits of using technology in Combined Science

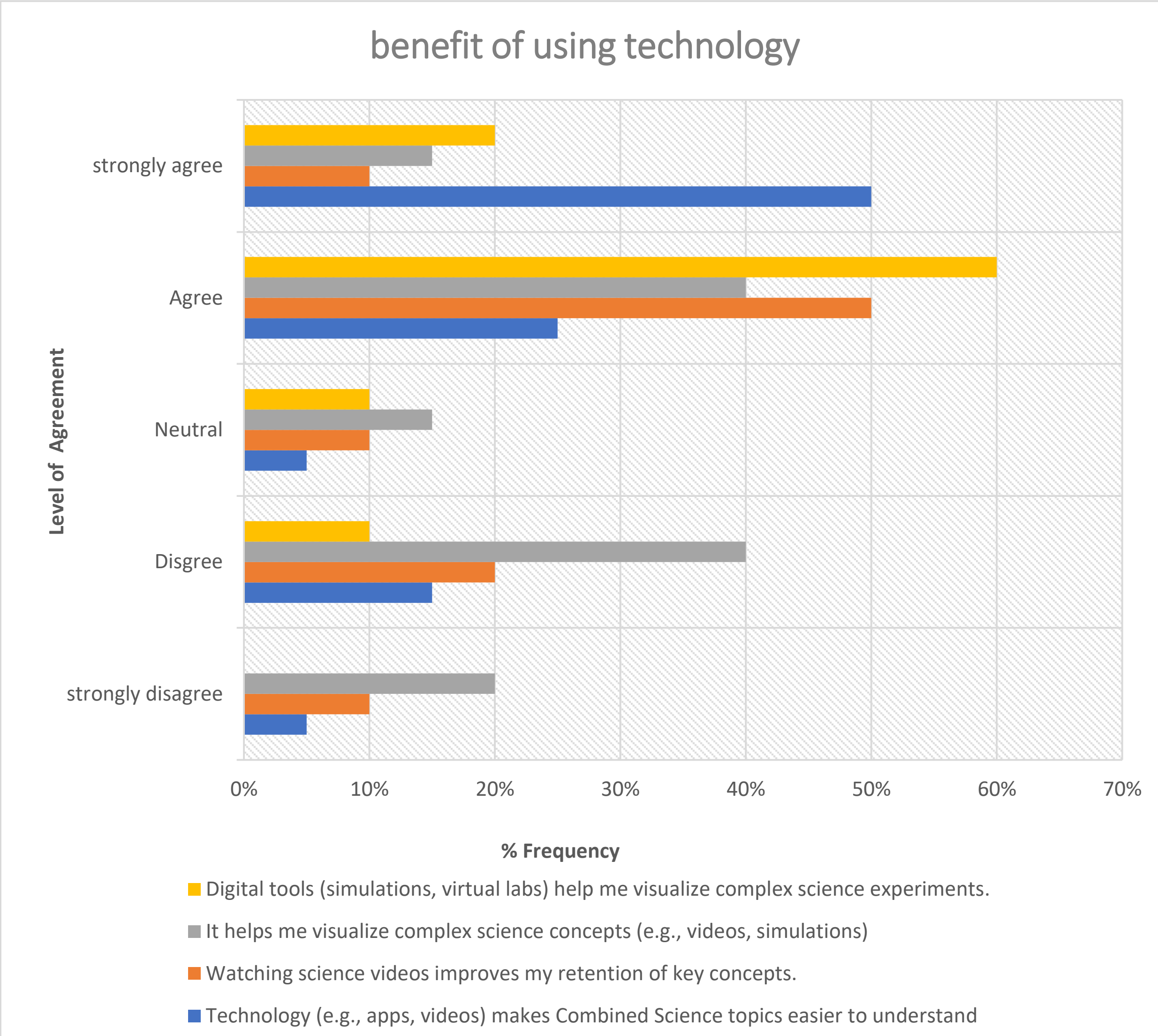

Figure 3 shows the survey results highlight strong student support for using digital tools in Combined Science, particularly for visualizing experiments (80%) and simplifying topics (75%). However, the effectiveness of technology varies depending on the application. While a modest majority (55%) believe it aids in visualizing complex scientific concepts, a notable 30% remain skeptical. Video-based learning shows the most divided response60% report improved retention, but 30% disagree, pointing to inconsistent learning benefits. In essence, technology proves most effective in presenting tangible scientific experiments, yet falls short when tackling more abstract material.

Figure 4: Technology on Convenience and Collaboration

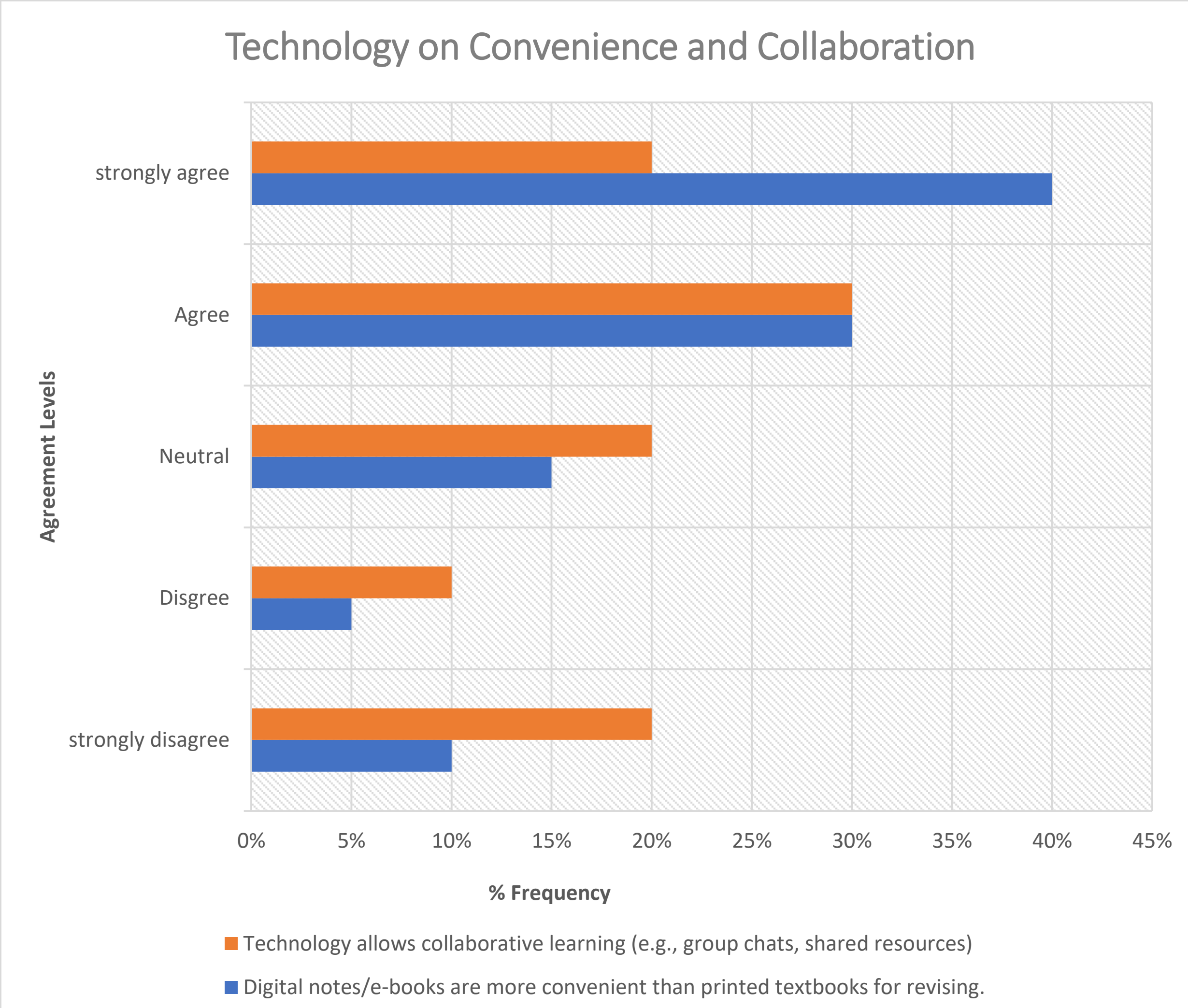

Figure 4 shows a notable contrast in students' views on how technology supports learning. A substantial majority (70%) prefer digital notes and e-books for their convenience during revision, reflecting a strong endorsement of technology for personal study. In contrast, opinions are more divided on its use for collaborative learning only half of the students (50%) believe technology effectively supports group work. Meanwhile, 30% remain neutral, and another 30% express disagreement (with 10% disagreeing and 20% strongly disagreeing). These results indicate a marked inclination toward using technology for individual learning rather than as a tool for collaboration.

Figure 5: Technology on student confidence and performance

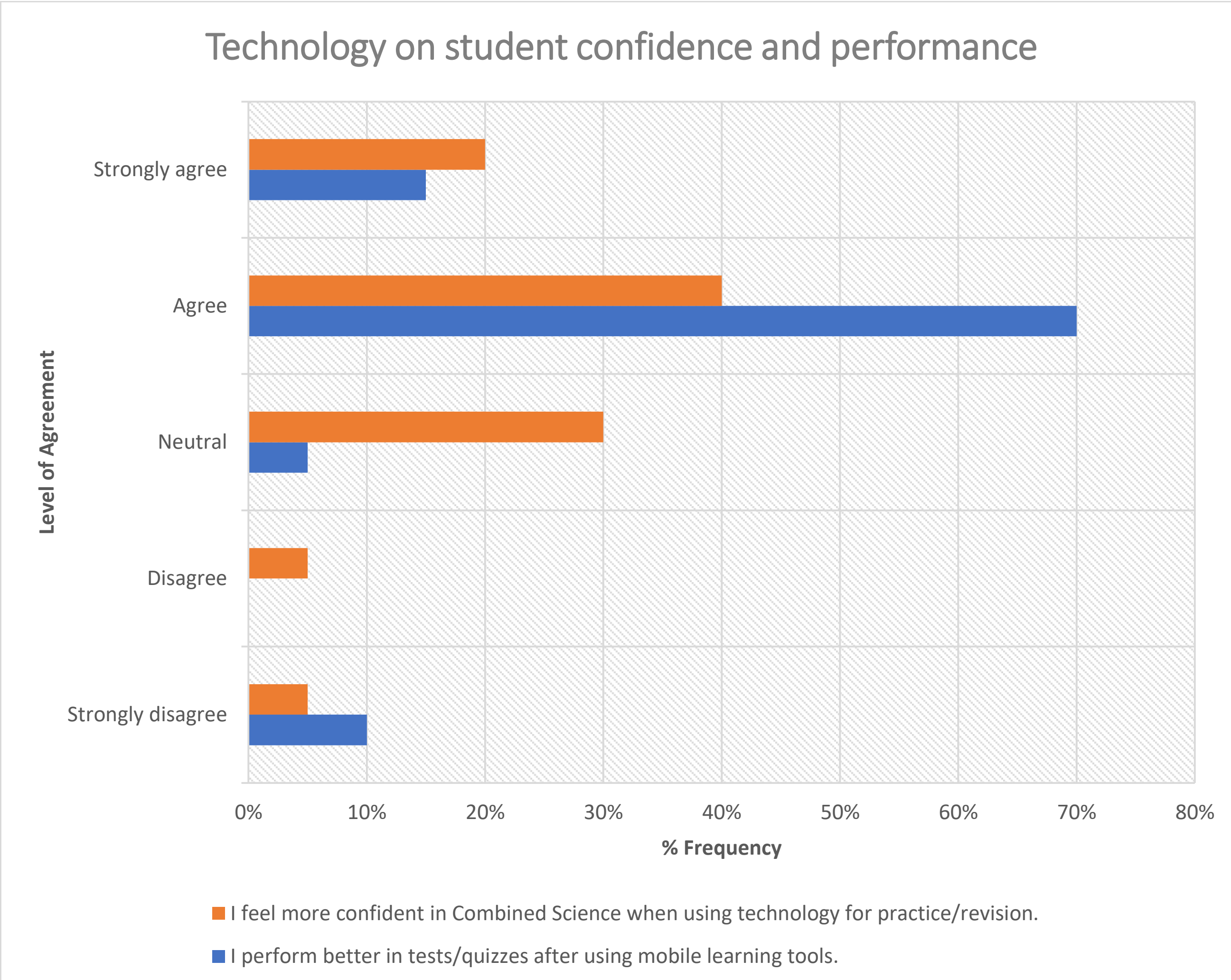

Figure 5 reflects a strong student agreement on the academic advantages of using technology, with 85% agreeing that mobile tools enhance their performance in tests and quizzes (70% agree and 15% strongly agree). In contrast, the effect on student confidence is more moderate only 60% report feeling more confident during tech-assisted revision, while 30% remain neutral. This indicates that although technology is widely perceived to improve academic results, its influence on boosting students' self-assurance during revision is less consistent.

Figure 6: Technology on student interest and motivation

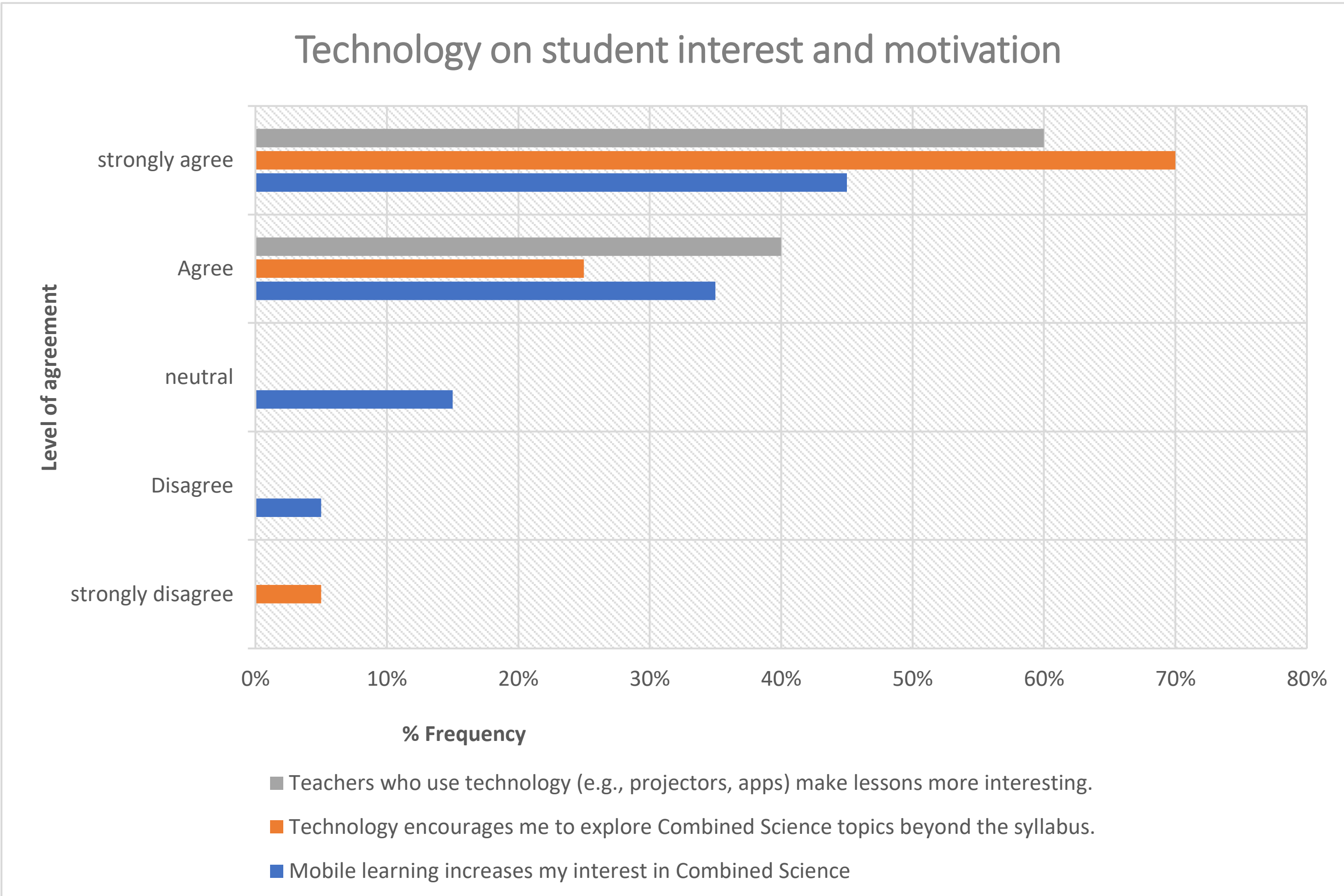

Figure 6 highlights the substantial role technology plays in boosting student motivation in Combined Science. There is overwhelming approval that technology use makes lessons more engaging, with a notable 60% strongly agreeing. Similarly, mobile learning tools received near-universal support, as 95% of students affirmed these tools enhance their interest in the subject. Although slightly less unanimous, 75% of respondents acknowledged that technology inspires them to explore topics beyond the syllabus, while 20% remained neutral. Importantly, disagreement across all areas was minimal (at or below 5%), reinforcing the conclusion that technology is a highly effective catalyst for increasing student engagement and curiosity in science learning.

4.4 Challenges of Technology in Combined Science

Although students recognize the advantages of using technology in learning, several obstacles still hinder its effective integration. These include challenges related to infrastructure, accessibility, teacher readiness, and the suitability of digital tools, all of which limit the full potential of technology in education.

Table 3: Technology Implementation Challenges (5-point Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

Challenge Statement	Strongly Disagree (1)		Disagree (2)		Neutral (3)		Agree (4)		Strongly Agree (5)	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Unstable internet disrupts my online science lessons.	0	0	0	0	10	6	50	30	40	24
I struggle to afford mobile data for learning apps/videos.	0	0	5	3	10	6	45	27	40	24
My school lacks enough devices (tablets, computers) for all students.	0	0	0	0	0	0	50	30	50	30
Some science apps/software are too complex for me to use.	10	12	10	6	30	18	30	18	20	12
I get distracted by social media/games when using devices for learning.	10	6	10	6	40	24	30	18	10	6
Teachers rarely use technology in our Combined Science classes.	5	3	0	0	15	9	60	36	20	12
Digital science content (e-books, videos) is not in my native language.	40	24	20	12	0	0	30	18	10	6
Virtual labs cannot replace hands-on experiments effectively	0	0	0	0	5	3	25	15	70	42
Power outages limit my access to online science resources.	0	0	0	0	0	0	20	12	80	48
I worry about privacy/security when using educational apps.	20	12	5	3	60	36	10	6	5	3
My parents/guardians restrict my screen time for learning.	15	9	15	9	50	30	5	3	15	9

Teachers lack training to integrate technology into science lessons	5	3	5	3	20	12	60	36	10	6

Table 3 highlights the significant barriers students encounter when using technology for Combined Science learning, with core issues stemming from inadequate infrastructure, limited resources, and insufficient implementation.

Figure 7: Technology Connectivity challenges

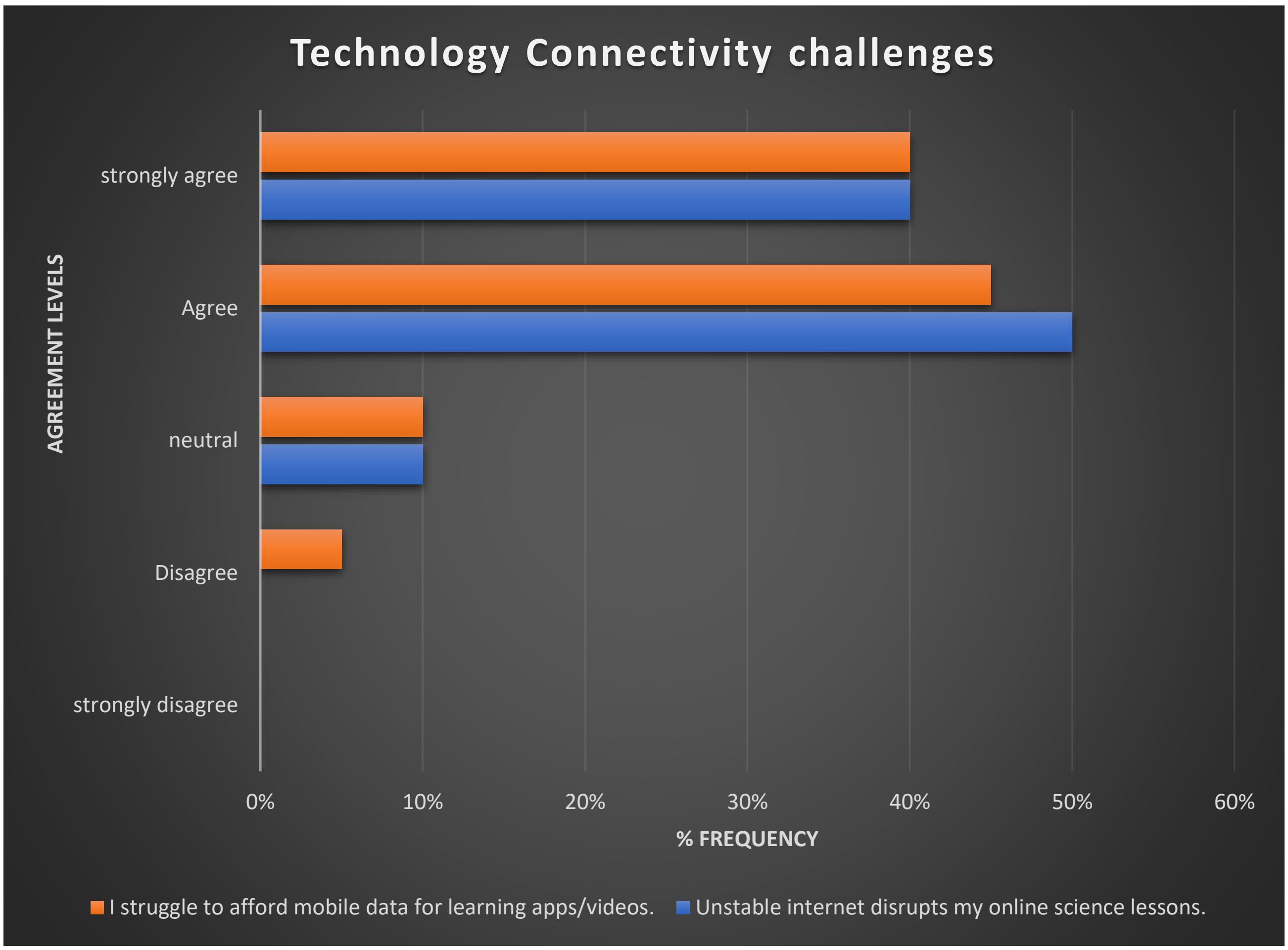

Figure 7 shows severe connectivity challenges: 90% of students agree unstable internet disrupts online science lessons (50% agree + 40% strongly agree), while 85% struggle to afford mobile data (45% agree + 40% strongly agree). Neutral and disagreement responses are minimal, confirming connectivity and cost as near-universal barriers to tech-enabled learning at Highfield 2 High School.

Figure 8: Infrastructural challenges on Technology

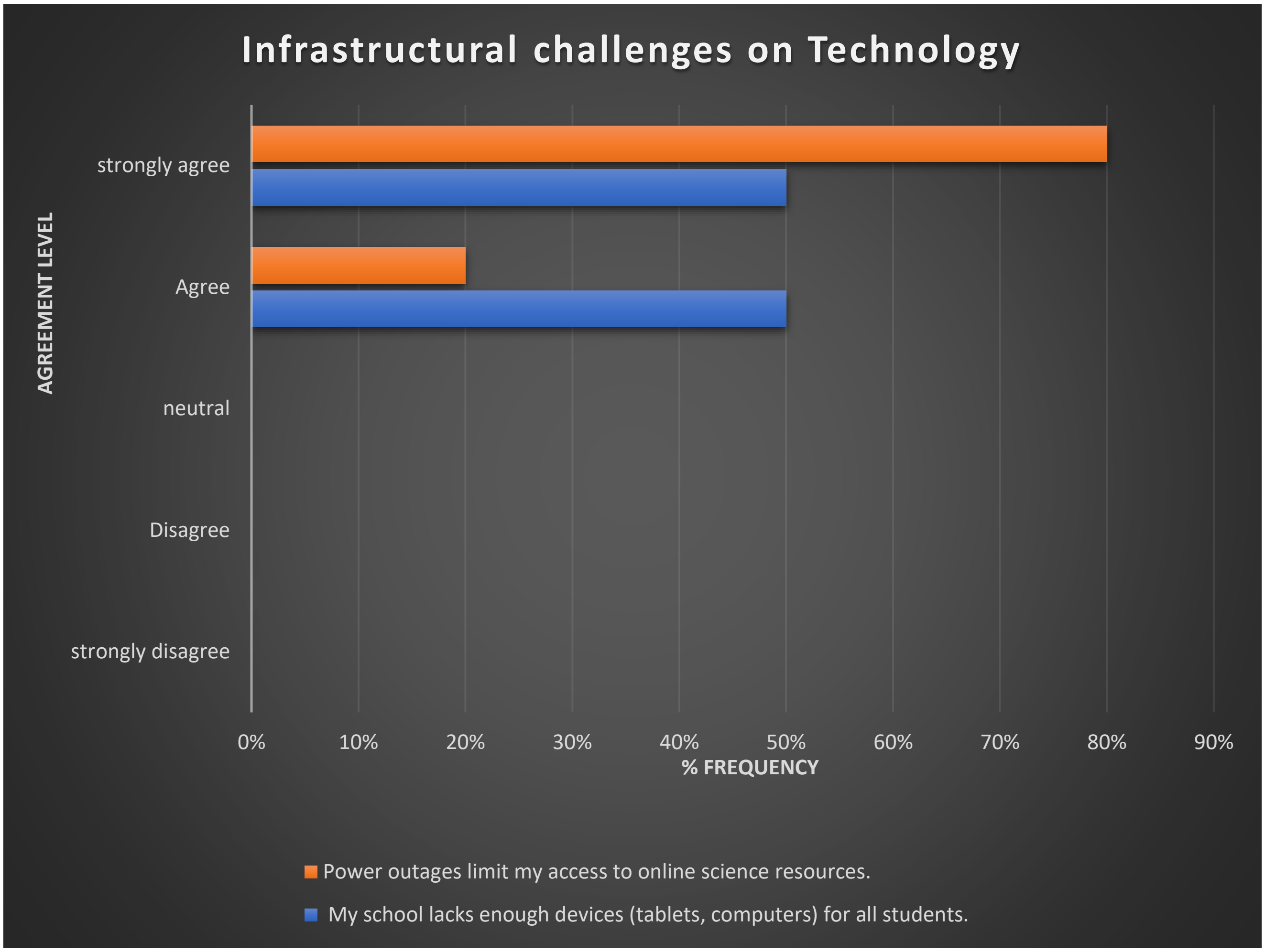

Figure 8 highlights the major infrastructure challenges impeding technology use at Highfield 2 High School. Every student surveyed (100%) agreed that power outages hinder access to online learning resources, with 80% strongly agreeing. Additionally, 90% of students identified a lack of school devices as a significant barrier (50% strongly agree, 40% agree). With zero neutral or dissenting responses, this data clearly reflects that unreliable electricity and limited device availability are core obstacles to effective technology integration in education.

Figure 9: Technology's Performance and the interface challenges

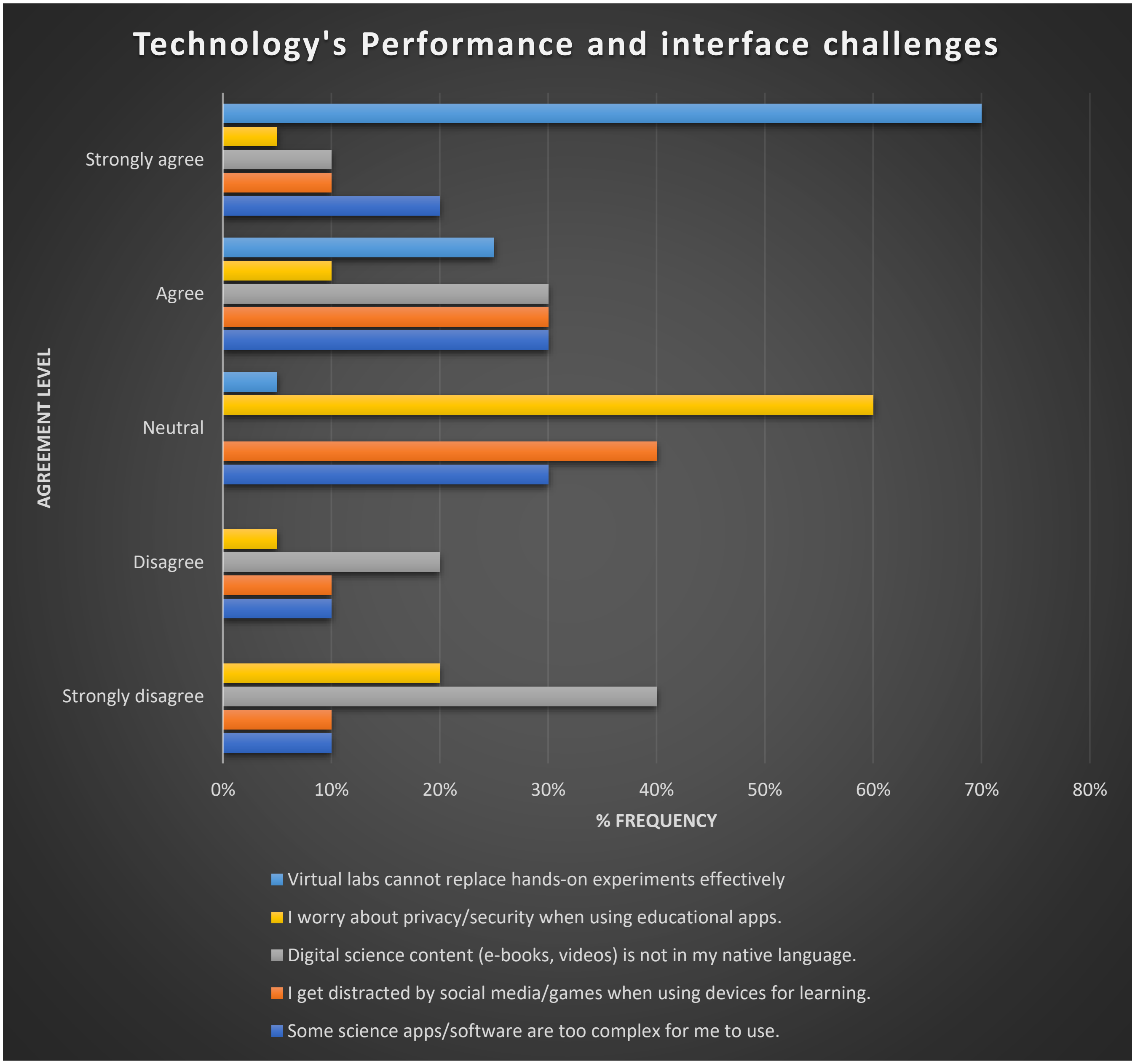

Figure 9 shows several key concerns regarding the use of technology in Combined Science education. The most dominant issue is the perceived inadequacy of virtual labs 95% of students believe they cannot substitute for real, hands-on experiments, revealing a significant gap in pedagogical effectiveness. Technical challenges are also notable as half of the students (50%) report that certain apps are too complicated to use, and 40% struggle with digital content not being available in their native language. Additionally, 40% of students acknowledge being distracted by social media while using devices for learning, though privacy concerns are relatively low, with only 15% expressing worry. The sizeable proportion of neutral responses 30% for app complexity and 40% for distraction indicates that these issues may vary depending on individual circumstances. Overall, the inability of virtual labs to effectively replicate physical experimentation stands out as the most widely shared concern among students.

Figure 10: Teacher technical skills and parent decisions on Technology

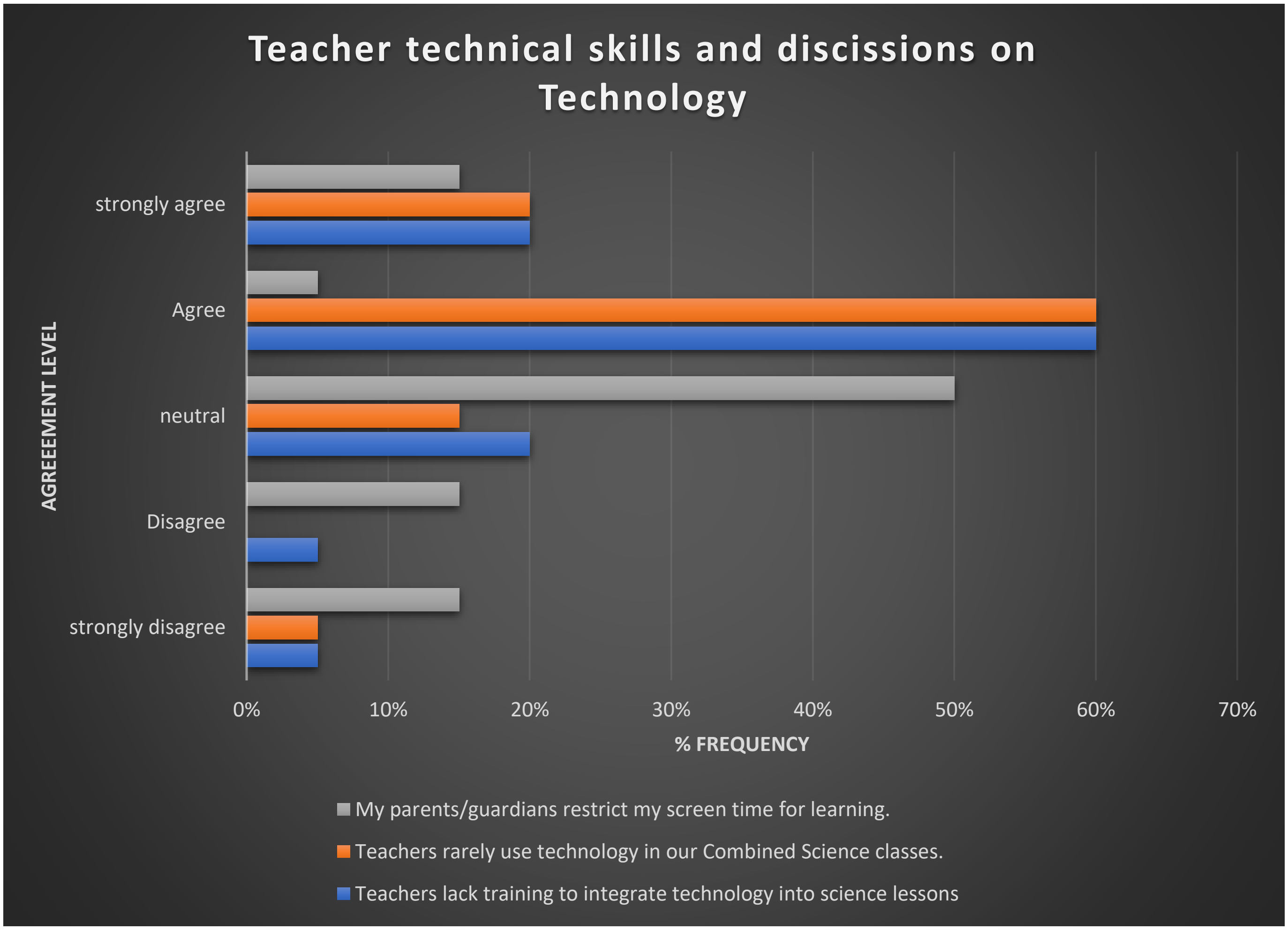

Figure 10 shows that 80% of students indicate that teachers seldom use technology in class, underscoring limited classroom adoption. Additionally, 70% of students attribute this to inadequate teacher training in tech-based instruction. In contrast, parental restrictions on screen time appear to play a minimal role, with only 20% of students affected. Overall, the findings emphasize that structural and professional development shortcomings, rather than parental influence, are the primary barriers to effectively incorporating technology into science teaching.

4.6 Summary

This chapter has presented empirical evidence that technology positively impacts Combined Science learning at Highfield 2 High School, despite significant implementation barriers. The quantitative data shows that digital tools enhance engagement and conceptual understanding when accessible, but systemic constraints limit their transformative potential. Crucially, the study reveals how students develop localized coping strategies that merit further investigation. These findings set the stage for the recommendations regarding sustainable technology integration in resource-constrained environments.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter synthesizes the key findings, conclusions, and implications of the study investigating the impact of technology on Combined Science education at Highfield 2 High School. Drawing upon the quantitative method data presentation in Chapter 4, it revisits the research questions posed in Chapter 1, evaluates the study's alignment with theoretical frameworks, and acknowledges methodological constraints. The chapter culminates in evidence-based recommendations for educators, policymakers, and researchers, aimed at optimizing technology integration in resource-constrained combined science contexts while addressing equity and sustainability.

4.5 Discussion of Key Findings

The analysis of quantitative data crystallized four dominant themes. Firstly, technology demonstrably enhances conceptual understanding, particularly for abstract scientific phenomena; 80% of students reported better comprehension through visualizations like 3D molecular models and virtual labs, strongly supporting Mayer's (2005) Cognitive Theory of Multimedia Learning and the Constructivist Learning Theory's emphasis on active engagement. Secondly, infrastructure limitations, particularly power instability frequent power outages (100%), and a lack of sufficient technological devices at schools (90%) affecting most of the planned digital activities, present a formidable constraint. This echoes van Dijk's (2006) Digital Divide Theory, highlighting how material access barriers in resource-constrained settings like Zimbabwe significantly curtail technology's potential, necessitating adaptive strategies like SD card content distribution. Also, the infrastructure limitations created an implementation gap between the technology's potential and actual use, echoing Rogers' Diffusion of Innovations regarding compatibility factors. Thirdly, device access showed a strong positive correlation with engagement scores, suggesting that technology might inadvertently widen existing achievement gaps without targeted interventions. Finally, the study found evidence of adaptive strategies like offline tools and peer-sharing that partially overcame constraints. The findings align with Mupfiga and Nyaruwata's (2023) Zimbabwean study while adding new insights about interdisciplinary science education specifically.

5.3 Conclusion

The study supports four overarching conclusions regarding technology's role in Combined Science education. Firstly, technology significantly enhances learning when accessible, as digital tools have been shown to improve both conceptual understanding and student engagement. This aligns with constructivist learning theory and self-determination theory, highlighting how interactive and multimedia-based learning fosters deeper comprehension. However, the extent of these benefits is heavily dependent on reliable access to technology, making infrastructure a critical factor in determining its effectiveness. Secondly, infrastructure remains the primary constraint to successful technology integration. The findings indicate that power instability, affecting all the respondents, was a more significant barrier than teacher resistance or curriculum misalignment. This reinforces van Dijk's (2006) digital divide theory within Zimbabwean contexts, illustrating how systemic technological limitations hinder equitable access to digital learning opportunities. Thirdly, equity must be a driving force in technology implementation. The study reveals that disparities in device access contributed to widening achievement gaps, with lower-income and lower-achieving students being disproportionately affected. Without targeted interventions, technology rather than bridging gaps can inadvertently worsen educational inequities, meaning necessitating a focus on inclusive solutions to ensure broader accessibility and fair learning outcome is the best. Lastly, contextual adaptation plays a vital role in successful technology integration. The study emphasizes that the most effective strategies were those tailored to local conditions, such as using offline SD card-based resources and leveraging WhatsApp groups for content sharing. This finding is consistent with Rogers' (2003) diffusion of innovations theory, which underscores the importance of compatibility and trial ability in determining the success of new technologies within specific educational environments. Together, these conclusions highlight both the transformative potential of technology in science education and the critical factors that must be addressed to ensure its effective implementation.

5.4 Recommendations

The recommendations for enhancing technology integration in Combined Science education at Highfield 2 High School focus on three key stakeholder groups: educators, policymakers, and researchers. To maximize the benefits of technology-based learning while mitigating its challenges, the following recommendations are proposed.

1. For educators, adopting offline-first tools is crucial to overcoming connectivity challenges. Scaling SD card-based simulations and SMS quizzes for core topics like chemical bonding and genetics can ensure continuous access to digital learning resources. Additionally, developing a school repository of offline-compatible resources, such as pre-downloaded simulations, would provide students with engaging materials even during power outages. Optimizing device access is also essential to ensure equitable participation. Partnering with NGOs to establish solar-powered charging stations could further mitigate issues related to load-shedding.
2. For Zimbabwean policymakers, a national offline learning repository should be curated to ensure widespread access to ZIMSEC-aligned, offline-accessible Combined Science content, including simulations and e-modules. Infrastructure investment must be prioritized, with a focus on solar energy systems and device subsidies for schools with the greatest need. Additionally, integrating digital literacy into teacher certification programs would ensure educators are equipped to use technology effectively in their instruction. Curriculum-device integration should also be mandated, requiring low-connectivity tech strategies such as SMS-based assessments to be embedded within STEM education policies, promoting inclusivity and accessibility.
3. For researchers, conducting longitudinal studies to track Form 3–4 students' academic performance following exposure to technology would provide valuable insights into its effectiveness in improving ZIMSEC pass rates. Equity-focused designs should also be explored, particularly in interventions tailored for low-achieving students, such as adaptive learning applications in local languages like Shona and Ndebele. Finally, cross-country comparisons could be beneficial, allowing Zimbabwe’s offline strategies to be benchmarked against successful initiatives like Tanzania’s solar-powered tablets and Zambia’s mobile science labs. These recommendations collectively provide a roadmap for addressing technology barriers while fostering inclusive and effective Combined Science education in Zimbabwe.

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My name is **Praise Rachel Mufemi**, a student researcher from **Bindura University of Science Education (BUSE)** with registration number **B222390B**. I am currently conducting a study titled:

"Assessing the Impact of Technology on Teaching and Learning in Combined Science. This research seeks to understand how technology-enhanced learning tools such as educational apps, simulations, digital textbooks, and online resources affect the way students learn and teachers deliver Combined Science. Your experiences and perspectives are crucial in helping educators improve teaching strategies and make science education more interactive, accessible, and effective. I kindly invite you to participate in this study by completing a short questionnaire and/or engaging in an interview. All responses will remain **confidential** and used solely for academic purposes. Your honest feedback will contribute to meaningful advancements in science education at our school and beyond. By ticking **"Yes,"** you voluntarily agree to participate in this study. Your honest responses will be greatly appreciated. If you select **"No,"** thank you for your time, and your participation will end here.

○ **Yes, I agree to participate**

○ **No, I decline to participate**

Appendix 1: STUDENT INTERVIEW GUIDE

SECTION A: DEMOGRAPHIC INFORMATION

(Questionnaire for Students)

1. Select your age range:

○14 years and below ○ 15–16 years ○ 17 years and above

2. Tick the gender that applies to you:

○ Male ○ Female

3. Select your current level of education:

○Form 1 ○ Form 2 ○ Form 3 ○Form 4

4. Do you use mobile devices for learning Combined Science?

○Yes ○ No

SECTION A: Perceived Benefits of Technology in Combined Science

(5-point Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

Statement	1	2	3	4	5
Technology makes Combined Science more accessible anytime, anywhere	○	○	○	○	○
Technology (e.g., apps, videos) makes Combined Science topics easier to understand.	○	○	○	○	○
It helps me visualize complex science concepts (e.g., videos, simulations)	○	○	○	○	○
Digital tools (simulations, virtual labs) help me visualize complex science experiments.	○	○	○	○	○
Mobile learning increases my interest in Combined Science	○	○	○	○	○
Technology allows collaborative learning (e.g., group chats, shared resources)	○	○	○	○	○
I perform better in tests/quizzes after using mobile learning tools.	○	○	○	○	○
I feel more confident in Combined Science when using technology for practice/revision.	○	○	○	○	○
Teachers who use technology (e.g., projectors, apps) make lessons more interesting.	○	○	○	○	○
Technology encourages me to explore Combined Science topics beyond the syllabus.	○	○	○	○	○
Watching science videos improves my retention of key concepts.	○	○	○	○	○
Digital notes/e-books are more convenient than printed textbooks for revising.	○	○	○	○	○

SECTION C: Challenges of Technology in Combined Science

(5-point Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

Statement	1	2	3	4	5
Unstable internet disrupts my online science lessons.	○	○	○	○	○
I struggle to afford mobile data for learning apps/videos.	○	○	○	○	○
My school lacks enough devices (tablets, computers) for all students.	○	○	○	○	○
Some science apps/software are too complex for me to use.	○	○	○	○	○
I get distracted by social media/games when using devices for learning.	○	○	○	○	○
Teachers rarely use technology in our Combined Science classes.	○	○	○	○	○
Digital science content (e-books, videos) is not in my native language.	○	○	○	○	○
Virtual labs cannot replace hands-on experiments effectively	○	○	○	○	○
Power outages limit my access to online science resources.	○	○	○	○	○
I worry about privacy/security when using educational apps.	○	○	○	○	○
My parents/guardians restrict my screen time for learning.	○	○	○	○	○
Teachers lack training to integrate technology into science lessons	○	○	○	○	○

Thank you!!!