



Unpacking High Dropout Rates in Township IT Education through Teacher Experiences

Student: Sethabile Dladla 1250726

Research submitted in conformity with the requirements for the degree of Master of Education

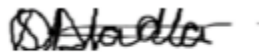
**Department of Educational Technology
University of the Witwatersrand**

Supervisor: Dr Alton Dewa

Date: July 2024

Declaration

I, Sethabile Dladla, declare the following in relation to this project: This project has not been submitted previously for a degree, nor has it been submitted as part of the requirements for any other academic qualification. I confirm that I am the sole author of this project and that any assistance received during my research and the preparation of the project has been acknowledged and referenced accordingly. All information sources and literature utilized in this project are properly cited and referenced within the document.



Date: 26 July 2024

Acknowledgement

My deepest appreciation extends to my esteemed supervisor, Dr. Alton Dewa. Your unwavering patience and unwavering support acted as a beacon throughout this endeavor. Your encouragement, both gentle and firm, propelled me forward, while your wisdom served as a compass, guiding me through the intricacies of this project. I am deeply indebted to your invaluable guidance.

To my mother, my heart overflows with immense gratitude for my mother, Sibongile Elizabeth Dladla. Your unwavering belief in me served as an anchor throughout this journey. Every word of encouragement, every expression of faith, fueled my spirit and propelled me forward. This dissertation, and all my achievements, are a testament to your unwavering love and support. To you, Mom, I dedicate this work with a heart brimming with immense love and gratitude.

Abstract

High dropout rates of Information Technology learners in South African township schools pose a significant barrier to preparing the nation's workforce for the demands of the Fourth Industrial Revolution (James et al., 2023). This is particularly concerning within the field of Information Technology (IT), where a skilled workforce is critical for economic development (Papamitsiou et al., 2020). Understanding the factors that contribute to student dropout in IT education is paramount to addressing this challenge and ensuring equitable access to success (Aldowah et al., 2022). This study employs a qualitative approach to investigate the phenomenon of high dropout rates among IT learners in South African townships. Through in-depth interviews with IT teachers, the research delves into the lived experiences of educators on the frontlines of this issue. Thematic analysis will be utilized to identify recurring themes that illuminate the challenges faced by both teachers and students within the township IT education environment. This research focuses on the unique perspective of IT teachers, who occupy a critical position within the Multilevel Framework (Bryk & Schneider, 2002) – bridging the gap between individual students, the school environment, and the broader community. By analyzing the insights and experiences of these educators, the study aims to identify key factors contributing to high dropout rates in township IT education. The subsequent analysis will offer valuable recommendations to inform stakeholders, including policymakers, educators, and community organizations. These recommendations will be designed to develop targeted interventions that address the identified challenges and improve learner outcomes in township IT programs. Ultimately, this research seeks to contribute valuable knowledge and understanding to the ongoing effort of improving access to and success in IT education for all South African learners.

Key Words: High dropout rates, Information Technology (IT) learners, Fourth Industrial Revolution, Qualitative approach, In-depth interviews, lived experiences, School Based Support Team, Multilevel Framework

Table of Contents

Declaration	i
Acknowledgement.....	ii
Abstract.....	iii
Abbreviations	vi
Chapter One: Study Overview and Background	1
1.1 Introduction of the Study	1
1.2 Background of the Study	2
1.3 Problem statement.....	2
1.4 Aim of the study	4
1.5 Research Questions	4
1.6 Rationale of the study	4
Chapter Two: Literature review	7
2.1 Introduction.....	7
2.2 Relevance of Information Technology in the 21st century	7
2.3 Information Technology and Computer Applications Technology in South African Schools .	9
2.4 Challenges faced by teachers in teaching IT in secondary schools in South Africa	10
2.5 South African curriculum on Information Technology	12
2.6 Conceptual Framework of the research.....	16
2.7 Conclusion of the literature review	19
Chapter Three: Research Design and Methodological approach.....	20
3.1 Introduction	20
3.2 Research design	20
3.3 Research Methodology	21
3.4.1 Ontology.....	23
3.4.2 Epistemology.....	25
3.4.3 Interpretation	25
3.4.4 Methodology Approach	27
3.4.5 Case study.....	27
3.5 Data production instruments.....	29
3.5.1 Data collection techniques	29

3.6 Data Analysis	30
3.8 Ethical Consideration	31
Chapter Four: Data Presentation, Analysis, and Interpretation	33
4.1 Introduction.....	33
4.2 Data presentation	33
4.3.1 Need for continuous professional development	35
4.3.2 IT Curriculum Transformation in Schools.	37
4.3.3 Lack of computing resources	38
4.3.4 Need for communities of practice.....	40
4.3.3 High dropout rate of Information Technology learners.....	44
4.3.4 School-based support systems for IT teachers	46
4.3 Data Analysis	49
4.4 Conclusion	50
Chapter Five: Discussion	52
5.1 Discussions.....	52
5.2 Response to the research questions	54
5.3 Conclusion	56
Chapter Six: Conclusion.....	58
Introduction.....	58
6.1 Overview of the study	58
6.2 Limitations of the study	60
6.3 Recommendations.....	61
6.4 Implications for future research	62
6.5 Conclusion	63
Appendix A: Data collection instrument:	70
Appendix B: Ethics clearance letter.....	71

Abbreviations

CAT-Computer Applications Technology

CAPS-Curriculum Statement and Policy Statement

GDE- Gauteng Department of Education

ICT-Information Communications Technology

IT-Information Technology

SBST- School Based Support Team

SMT-School Management Team

STEM-Science Technology Engineering Mathematics

FET-Further Education and Training

Chapter One: Study Overview and Background

1.1 Introduction of the Study

The contemporary world is witnessing an exponential growth in technological adoption. This necessitates a corresponding adaptation within the educational system. Curriculum reform, incorporating technology as a tool for enhanced learning and future workforce preparation, becomes imperative. However, a crucial challenge lies in the underestimation of Information Technology (IT) within the educational sector. Stakeholders, encompassing students, parents, educators, and even policymakers, often prioritize traditional subjects like science, mathematics, and biology. This focus overlooks the potential of IT education to cultivate critical thinking, computational thinking, and problem-solving skills through programming and computer systems operation. South Africa, compared to its regional counterparts, demonstrates a proactive approach towards integrating technology into public schools. Moller and Crick (2018) emphasize the need for learners to acquire "fundamental programming knowledge alongside complementary subjects like hardware, software, Boolean logic, and binary representation".

While the Curriculum Assessment Policy Statement (CAPS) incorporates Information and Communication Technology (ICT) in secondary education, the primary objective remains equipping students as consumers rather than producers of technology. McNaughton et al. (2017), as referenced by Moller and Crick (2018), advocate for fostering broader digital literacy and IT proficiency to address the growing societal demand for adaptable digital skills and technology-driven learning. A crucial disconnect exists between policy and implementation. Despite substantial funding allocated to ICT programs, prioritizing basic skills like typing, emailing, and spreadsheet creation overshadows the development of sophisticated problem-solving techniques inherent in advanced IT education.

Furthermore, township schools in South Africa grapple with limited resources, inadequate support structures, overcrowded classrooms, under-qualified teachers, and the challenging socioeconomic realities of their student population. These factors collectively impede the effective acquisition and comprehension of complex problem-solving

approaches, directly impacting the efficacy of IT education. The Gauteng province's initiative to establish specialized STEM schools, including a focus on IT, presents a promising step. However, inadequate support for educators teaching these subjects creates a perception of incompetence, fostering a negative learning environment and consequently diminishing student interest in IT-related career paths

1.2 Background of the Study

The burgeoning technological landscape necessitates a corresponding evolution within educational systems. Information Technology (IT) education plays a pivotal role in equipping students with the requisite skills to navigate this tech-driven world. South Africa, however, faces a paradoxical situation. While a significant number of graduates possess degrees in computer science, information technology, and information systems - qualifying them to teach IT at the Further Education and Training (FET) level - they are often deployed to teach other subjects [2]. This phenomenon stems from the systemic challenges plaguing the education sector. Furthermore, the curriculum prioritizes introductory subjects like Computer Application Technology (CAT) over core IT education in many schools, despite the availability of computer labs [2]. This approach inadvertently delays students' exposure to crucial 21st-century skills, including data management, digital citizenship, and programming, as outlined in the modified CAPS curriculum (2012). The burgeoning fields of artificial intelligence, coding, robotics, and metaverse programming necessitate immediate action from educational institutions. However, the response from students towards such subjects remains concerning, with high drop-out rates observed even before the matriculation level. This research aims to delve into the specific challenges encountered by IT educators in South African township schools. A crucial challenge lies in the substantial student attrition from the subject, often attributed to inadequate support from stakeholders, encompassing not only educators but also policymakers and the broader school administration.

1.3 Problem statement

The growing global demand for programmers necessitates a corresponding emphasis on Information Technology (IT) education within South African schools. However, several critical factors contribute to a concerning decline in student enrollment and engagement

with the subject. Data suggests a scarcity of schools offering dedicated IT programs, resulting in restricted student access to this crucial domain [Insert Reference]. This lack of exposure hinders the development of essential 21st-century skills like computational thinking, problem-solving, and digital literacy, crucial for success in the contemporary technological landscape. Statistics from the National Senior Certificate Examination Report (2020) reveal a concerning trend of decreasing student participation in the IT matric exam (4346 in 2016 to 3712 in 2020). This continuous drop signifies a potential disconnect between the curriculum and student interest, requiring investigation. The dwindling student numbers directly impact IT educators. Inadequate support structures, potentially stemming from resource constraints or a lack of recognition of the subject's importance, leave educators struggling to motivate students and ensure effective learning outcomes. The consideration of removing IT from the curriculum altogether or replacing it with less demanding subjects like Computer Applications Technology (CAT) poses a serious threat. This approach would further marginalize IT education, hindering students' preparation for the technology-driven job market. Government initiatives to equip schools with computing resources seem underutilized. Inefficient resource allocation or a lack of proper training for educators could be contributing factors to this situation. The curriculum may not adequately reflect the evolving demands of the "digital economy." Skills like programming, artificial intelligence, and data science are increasingly sought after, and the education system needs to adapt to equip students with these competencies. This confluence of factors creates a critical situation. Students are deprived of the opportunity to develop crucial skills for future success, potentially infringing upon their right to a holistic and relevant education that prepares them for active participation in society. A multi-pronged approach is necessary. Increased access to dedicated IT programs, improved support for educators, a curriculum aligned with industry needs, and efficient utilization of resources are crucial steps. Furthermore, fostering student interest through innovative teaching methods and showcasing the relevance of IT skills in various career paths can play a vital role in reversing the declining enrollment trend.

1.4 Aim of the study

To explore and understand the experiences of Information Technology (IT) educators in secondary schools, specifically focusing on the challenges they face and potential solutions to improve IT teaching and learning.

Objectives of the study

- To identify ways to mitigate the challenges faced by teachers and learners in teaching and learning IT in secondary schools.
- To propose solutions to the prevalent challenges faced by teachers and learners in teaching and learning IT in secondary schools.

1.5 Research Questions

What are the experiences of Information Technology teachers with regards to the high dropout rate of Information Technology learners in South African township schools?

1.5.1 Sub-Questions

1. What are the challenges reported by Information Technology teachers for teaching IT as a subject in South African township schools?
2. How do Information Technology teachers in township schools perceive the effectiveness of their current teaching strategies in addressing the high dropout rate of Information Technology learners?
3. What roles do school-based support systems play in assisting IT teachers to influence learners not to drop the subject?

1.6 Rationale of the study

The exponential growth of technology has transformed our lives, demanding increased human capability to leverage information effectively. To bridge the digital divide and prepare students for future success, the Department of Education must prioritize the incorporation of IT into the school curriculum. It not only equips them with vital technical skills but also fosters their ability to adapt to ever-changing environments. Computing in education provides diverse learning environments, catering to varied needs and fostering the 21st-century skills crucial for navigating a world saturated with digital technologies. Embracing IT education isn't simply about catching up with technological advancements;

it's about preparing our students to thrive in a dynamic, tech-driven future. The Fourth Industrial Revolution (4IR), characterized by the fusion of physical, digital, and biological worlds, is rapidly transforming the nature of work (Schwab, 2016). In this dynamic landscape, Information Technology (IT) education plays a crucial role in equipping current students with the skills needed to thrive in the workforce of tomorrow.

IT programs provide students with a strong foundation in technical skills, such as programming, data analysis, and cybersecurity (Beaglehole & Cook, 2020). These skills are increasingly in demand across various industries, enabling graduates to create, manage, and interpret information effectively in an increasingly data-driven world (World Economic Forum, 2020). Moreover, understanding the underlying principles of IT systems empowers individuals to adapt to emerging technologies and contribute to their development (Brynjolfsson & McAfee, 2014). Beyond technical expertise, IT education fosters the development of crucial soft skills essential for success in the 4IR. Problem-solving and critical thinking skills, honed through project-based learning and collaborative activities, enable graduates to tackle complex challenges and innovate solutions (Hartman et al., 2017). Effective communication and teamwork skills, nurtured through group projects and presentations, prepare students to collaborate effectively in diverse teams, a hallmark of the 4IR workplace (World Economic Forum, 2020).

The rapid pace of technological change necessitates continuous learning and adaptation. IT programs often emphasize these crucial skills by exposing students to diverse technologies and encouraging them to embrace new challenges (Bawane et al., 2020). This fosters a growth mindset, allowing graduates to stay relevant in a constantly evolving job market (Mindset Works, 2023). IT education increasingly incorporates elements of entrepreneurship and intrapreneurship, equipping students with the skills to identify opportunities, develop innovative solutions, and navigate the business world (Manolova & Brush, 2017). This empowers graduates to not only find employment but also to create their own opportunities and contribute to the digital economy.

While IT education offers valuable preparation for the 4IR workforce, challenges remain. Equitable access to quality IT education and addressing the digital divide are crucial to

ensure inclusive participation in the 4IR (UNESCO, 2022). Additionally, fostering ethical considerations around technology use and data privacy is vital (Dutton, 2019). IT education equips current students with the technical, soft, and adaptable skills necessary to navigate the dynamic job market of the 4IR. By continuously evolving and addressing emerging challenges, IT programs can play a pivotal role in preparing future generations to contribute meaningfully to this transformative era.

Chapter Two: Literature review

2.1 Introduction

Information technology as a discipline is considered extremely difficult and there are many factors that contribute to its teaching and learning. Furthermore, reasons why there are complex problems associated with it cumulate on a case-to-case basis. This chapter provides an overview of the relevance and challenges that are in literature which have been studied. The literature mainly focuses on the challenges that are faced by Information Technology educators.

2.2 Relevance of Information Technology in the 21st century

In a study by Webb, Davis, Katz, Reynolds, Chamb, & Syslo, et al (2016), they have investigated the need for Information Technology in the school curriculum since schools are viewed as beacons of hope, especially for the children of the working class. It is the responsibility of the schools to bring about the change that is required by the changes in the world. The integration of Technological tools in the classroom will not only offer learners a variety of choices but will even enhance their teaching and learning process. While also responding to the needs of the 21st century. IT skills include problem solving, problem providing solutions to complex problems Against this backdrop, schools should take the lead in re-directing educational curriculum practices where the learners are given an opportunity to develop skills such as critical and rational thinking, computational thinking and providing solutions to the problems that exist in the social, economic, and political world. Passey (2017) defines Computer Science as the “study of development” (p.23). Therefore, there is a need to figure out the experience of teachers teaching the subject, so that the policy makers can provide the needed support. Curriculum and pedagogy: Schools should investigate how technology might improve subject understanding, critical thinking, and personalized learning, going beyond just using it for routine chores.

Digital divide affects the teachers' and students' access to technology and internet connectivity across socioeconomic groups. The difference between people with and without Internet connection is known as the "digital divide." However, the digital gap is complex and involves a wide range of elements, including relevance, cost, quality, and

accessibility. According to Mason and Dodds (2005) as cited in Sun and Metros, the digital divide indicates the difference in educational attainment between students who have access to digital technology at home and those who do not. Bensimon et al. (2006) concluded that white students and students from minority groups had different access to resources. What is relevant in all this is that the lack of access to technology often deepens other inequalities that exist in society. While some other school subjects may not be directly affected by the lack of computing resources. One of the most important pre-requisites for offering IT as a school subject is access to computers. The caps document clearly states the requirements for IT is that schools should have "Entry-level computers (to ensure a lifespan of 4 - 5 years), networked" CAPS 2012.

Learners who can make effective use of technologies will be able to compete successfully in a rapidly changing, technology-driven world economy (Fletcher, 2003, p. 81). Thus, this illustrates the importance of computers at schools. However, it has been noted that most of south African township schools have little to no resources. One of the digital divide issues pointed out by Galuszka (2007) is the inequitable distribution of technology resources. Equitable resource distribution guarantees that everyone has access to the resources and for each person to receive their fair portion of them. According to Milheim (2006), the biggest problem with the digital divide was that underrepresented groups did not have enough access to technological resources. This is very prevalent in the schools that are at these schools because they often fail to offer satisfactory education. As stated by Holmes (2002), p. 196, the "very diverse and low-income feeder middle schools" offer pupils little in the way of resources and produce an unsatisfactory learning environment. Since unequal access to technologies is sometimes caused by a lack of institutional resources, socioeconomic class influences students' access to institutional resources as well as their opportunity to employ technology (Dika & Singh, 2002). People who do not perform well academically and acquire poor-quality education may find it difficult to advance in their socioeconomic status and face difficulties in the job market.

2.3 Information Technology and Computer Applications Technology in South African Schools

In South African schools, the seemingly synonymous fields of Information Technology (IT) and Computer Application Technology (CAT) present distinct landscapes with unique challenges for both learners and teachers. While both subjects engage with technology, their foci and complexities differ significantly. IT, at its core, delves into the theoretical underpinnings of technology. It explores the fundamental concepts of computing, data structures, algorithms, and networking. Learners grapple with programming languages, computer architecture, and the ethical implications of technology in a globalized society (Department of Basic Education, 2020). This theoretical foundation equips them to understand the "how" and "why" behind technology, fostering a deeper understanding of its workings. However, the abstract nature of these concepts can pose a challenge for some learners, requiring strong analytical and problem-solving skills. Additionally, the rapid evolution of technology necessitates constant updates to curricula and teaching approaches, demanding both adaptability and a passion for lifelong learning from teachers. In contrast, CAT focuses on the practical application of technology in everyday life. Learners master using software packages for word processing, spreadsheets, presentations, and multimedia applications (DoBE, 2019). They gain confidence in navigating digital environments, solving real-world problems using technology, and effectively communicating information through various digital platforms. While seemingly more "user-friendly" than IT, CAT can still present challenges for learners struggling with basic computer literacy or lacking critical thinking skills needed to apply software creatively. Teachers face the challenge of balancing the need for technical proficiency by fostering critical thinking and digital citizenship skills within the curriculum.

Furthermore, the availability of technology infrastructure and resources can significantly impact learning outcomes in both subjects. Uneven access to computers and internet connectivity across South African schools creates disparities in learning opportunities, exacerbating existing inequalities (Govender & Lorenzo, 2022). Teachers grapple with the additional challenge of adapting their teaching methods to cater to diverse learning environments and resource constraints. IT and CAT, while intertwined in the digital landscape, offer distinct learning experiences with unique challenges for both learners and

teachers. Recognizing these differences is crucial for developing effective curricula, providing appropriate support, and fostering a vibrant digital learning environment for all South African students. This close association and shared reliance on computing power can create a perception of them as being one and the same. Furthermore, the prevalence of user-friendly interfaces in both IT and CAT domains blurs the lines for non-technical individuals. Both utilize graphical user interfaces (GUIs) and intuitive design elements, leading to the misconception that the underlying complexities are similar (Beaglehole & Cook, 2020). This superficial similarity can mask the distinct knowledge and skills required for working in each field.

Moreover, the educational landscape can inadvertently contribute to the confusion. Many introductory technology courses might cover both IT and CAT topics due to time constraints or curriculum design, potentially fostering a holistic, yet undifferentiated, understanding (Hartman et al., 2017). This initial exposure might not adequately highlight the nuances and specializations within each domain. Addressing this conflation necessitates a multifaceted approach. Educational institutions can emphasize the distinct theoretical frameworks and skillsets associated with each domain. Industry professionals can advocate for clearer job descriptions and titles that reflect the specific expertise required (Bawane et al., 2020). Finally, individuals seeking to navigate these realms can benefit from actively seeking resources and engaging in deeper exploration to appreciate the unique contributions of both IT and CAT. By recognizing the reasons behind the confusion and taking steps towards clearer understanding, we can empower individuals to engage more effectively with these technologies and contribute meaningfully to the ever-evolving digital landscape.

2.4 Challenges faced by teachers in teaching IT in secondary schools in South Africa

In the study of “Implementing Computer Science Curriculum in schools in Poland-Issues, challenges and practice”. Syslo (2017) has outlined the challenges which are faced by schools with the implementation of Information Technology in their schooling system. The most critical challenge that they have discovered is ‘How to motivate’ learners to continue with the study of CS. The subject is quite abstract and thus very demanding. Therefore,

students find themselves demotivated to continue with the subject and in most cases opt to choose other less demanding subjects. Which has been the case with South African schools as well. Statistics show that when learners begin their FET phase they are fascinated by the subject, however as they progress through the grades, they find themselves dropping IT and opting to do CAT. The study also revealed that there was a total of four challenges associated with the inclusion of IT in their schools. With the emphasis on the fact that students should not equate CS with just programming as there are other important concepts that are taught in the subject. Koorse, Calitz, & Cilliers, (2010) have also discovered that in South African schools the most demanding concept in IT is the programming component, which also carries more marks. Thus, if students fail to grasp this component, you find that they get demotivated as their overall mark is affected, often negatively and thus they choose to drop the subject. Furthermore, this constant dropout rate affects the teachers that are teaching the subjects, as they are then required by their schools to teach other subjects, which they did not major in, resulting in some schools opting on dropping the subject.

While Information Technology (IT) education holds immense significance in the contemporary world, research suggests numerous challenges faced by educators delivering this subject in township schools (Webb et al., 2016). This study delves into these challenges and explores potential areas for improvement. A crucial concern lies in the scarcity of targeted interventions to attract and retain qualified IT educators within these institutions. Notably, other STEM subjects benefit from initiatives like the Secondary School Improvement Plan (SSIP) designed to enhance educator competency (Milano, 2019). This lack of dedicated support for IT educators stands in stark contrast to the growing demand for skilled IT professionals across various industries (Blažič, 2022). Furthermore, educators acknowledge the inherent complexity of IT as a subject, requiring more instructional time than allocated in the Curriculum Assessment Policy Statement (CAPS) document (Koorse et al., 2010). The perceived inadequacy of time dedicated to the programming component often leads to rushed instruction, potentially hindering student comprehension of key concepts. Consequently, encountering difficulties in grasping the material, many students lose interest and opt to discontinue the subject altogether.

2.5 South African curriculum on Information Technology

Koorse, Calitz, & Cilliers, et al (2010) has also discovered that in South African Curriculum the most demanding concept in IT is the programming component, which also carries more marks (its weight has been estimated to be around 60%). Thus, if students fail to grasp this component, you find that they get demotivated as their overall mark is affected, often negatively and thus they choose to drop the subject. Moreover, it was also noted that due to the abstract nature of the programming component, students often find it hard to comprehend the codes, thus resulting in them not being able to interpret the code and even write their own codes. This is often since many of them have been part of a schooling system that does not teach students how to think critically or how to solve problems. According to Koorse the recommended time that is allocated to Information technology is 4 hours which is inadequate for educators to teach the subject in depth. Thus, teachers find themselves rushing over the content which makes it difficult for students to grasp the concepts. Furthermore, the teaching and learning process is negatively affected by the school's socioeconomic status. Whereby you find that the schools lack in important resources that are necessary for the effective teaching and learning of IT. Lastly, this constant dropout rate affects the teachers that are teaching the subjects, as they are then required by their schools to teach other subjects, which they did not major in. resulting in some schools opting on dropping the subject. The study investigated "the decline in interest in IT as a subject and the difficulty of IT as a subject" (Koorse, Calitz, & Cilliers, et al, p.2, 2010). Which poses a challenge for the workplaces in the 21st century as they require the skills that are taught in this subject.

2.5 Information Technology teacher training and support

Stemming the tide of information Technology IT subject drop-out in schools requires not only engaging curriculum but also empowered and equipped teachers. Workshops designed specifically for IT teachers can play a crucial role in achieving this (O'Leary, E.S., Shapiro, C., Toma, S. et al, 2020). By focusing on areas like effective pedagogical

strategies, active learning techniques, and building inclusive learning environments, such workshops can significantly impact classroom dynamics and student success. Through collaborative exercises and peer-to-peer learning, workshops can equip teachers with practical tools like inquiry-based learning, project-based approaches, and gamification (Alenezi, 2023). These strategies shift the focus from passive knowledge acquisition to active exploration and problem-solving, fostering deeper engagement and intrinsic motivation in students (Wang, 2023). Additionally, exploring inclusive teaching practices like differentiated instruction and culturally responsive pedagogy can create learning environments that cater to diverse needs and learning styles, reducing feelings of frustration and disconnection that often contribute to drop-out (Bell & Kozlowski, 2022). Investing in effective workshops for IT teachers acknowledges their vital role in fostering a love for coding and technology in their students. By providing ongoing support, opportunities for collaboration, and practical tools for creating engaging and inclusive classrooms, we can empower teachers to become changemakers, leading the way to a future where fewer students abandon the fascinating world of Information Technology. As Information Technology (IT) literacy becomes increasingly crucial in the 21st century, supporting educators who teach IT is paramount. Departments of Education can play a pivotal role in strengthening IT instruction by implementing a multifaceted approach.

Providing robust professional development opportunities is essential. Equipping teachers with the latest technical skills and effective pedagogical approaches for IT education is crucial. This can involve workshops, online courses, or mentorship programs led by IT experts and experienced educators (UNESCO, 2022). Additionally, fostering collaborative learning communities among teachers allows them to share best practices and address challenges collectively (Looi, Chan & Wu, 2020). Ensuring equitable access to technology and resources is critical. Departments of Education should invest in equipping schools with up-to-date hardware, software, and high-speed internet access. This not only benefits IT classes but also allows for technology integration across other subjects (World Economic Forum, 2020). Additionally, providing resources like online learning platforms and digital libraries can enhance student engagement and support differentiated learning.

Developing and promoting innovative curricula tailored to local needs and aligned with evolving industry demands is crucial. Departments of Education can collaborate with IT professionals and educational researchers to create curricula that prioritize problem-solving, critical thinking, and collaboration skills alongside essential technical knowledge (Rosen, Wolf and Stoeffler, 2020). Furthermore, incorporating real-world projects and industry partnerships can provide students with authentic learning experiences and connect them with potential career paths. Recognizing and valuing IT educators is essential for attracting and retaining talent. This can involve offering competitive salaries, providing opportunities for career advancement, and acknowledging their contributions to student success. Departments of Education can also establish award programs to celebrate outstanding IT educators and showcase their innovative practices. By implementing these strategies, Departments of Education can empower teachers to deliver high-quality IT instruction, preparing students to thrive in an increasingly tech-driven world.

2.6 Advantages of having IT at school level

Equipping South African classrooms with Information Technology (IT) is not just about trendy gadgets; it's about empowering students to thrive in the 21st century. Integrating IT offers a multitude of advantages, preparing young minds for a future woven with digital threads. One key benefit lies in bridging the digital divide. In a world increasingly reliant on technology, access to IT skills levels the playing field, ensuring all students, regardless of socio-economic background, have the tools to compete and contribute meaningfully (Roth, 2020). IT literacy unlocks opportunities for further education, employment, and active participation in a digital society.

Beyond access, IT fosters critical thinking and problem-solving skills highly sought after in the modern workforce. Interactive learning platforms and coding exercises challenge students to think creatively, analyze information, and devise solutions using technology (Nair, 2020). This not only enhances academic performance but also equips them with valuable skills for navigating the complexities of an ever-changing world. Furthermore, IT education cultivates collaboration and communication in a globalized landscape. Online platforms connect students across geographical boundaries, fostering teamwork and intercultural understanding (Zakaria and Yusof, 2020). By harnessing the power of digital

tools, students learn to effectively communicate ideas, share knowledge, and collaborate on projects, preparing them for a future where virtual interactions are commonplace. IT empowers students to become responsible and ethical digital citizens. Learning about online safety, data privacy, and responsible technology use equips them with the critical awareness needed to navigate the digital world safely and ethically (Royakkers, Timmer, Kool & van Est, 2018). This fosters responsible digital citizenship, ensuring students contribute positively to the online environment.

Early IT education fosters cognitive development and problem-solving skills. Engaging with interactive technologies encourages experimentation, critical thinking, and computational thinking, skills crucial for navigating the complexities of the digital world (Kotsopoulos et al., 2017). Young learners develop logical reasoning and algorithmic thinking through coding activities, laying the foundation for future success in STEM fields (Barron & Wing, 2006). Introduction of IT skills at an early age promotes digital literacy and fluency. As technology permeates every aspect of life, understanding its fundamentals becomes essential. Early exposure allows learners to develop confidence and competence in using technology for communication, research, and creative expression (UNESCO, 2022). This empowers them to participate actively and critically in the digital landscape. It cultivates creativity and innovation. Interactive tools and platforms like game design or animation software facilitate exploration and expression, allowing young learners to experiment with ideas and bring them to life digitally (Resnick, 2009). This fosters a growth mindset and encourages them to become responsible and innovative users of technology. Being exposed to IT education can bridge the digital divide and promote equity in education. Ensuring access to technology and quality IT education for all young learners, regardless of background, is crucial to empower disadvantaged communities and prepare them for future opportunities in the tech-driven job market (World Economic Forum, 2020).

However, it's crucial to acknowledge the importance of age-appropriate pedagogy and ethical considerations when implementing early IT education. Activities should be engaging, developmentally appropriate, and prioritize critical thinking over passive content consumption (ISTE, 2023). Additionally, fostering responsible digital citizenship and addressing online safety concerns are essential components of a holistic approach.

Furthermore, introducing IT education at an early age offers a multitude of benefits for young learners, equipping them with essential skills for the digital age, fostering creativity, and promoting equity in education. By implementing age-appropriate approaches and addressing ethical concerns, we can harness the power of technology to cultivate responsible and empowered digital natives. Therefore, integrating IT into South African classrooms is not simply an educational trend; it's an investment in the future. By equipping students with the skills and knowledge to thrive in a digital world, we empower them to become active participants, critical thinkers, and responsible citizens, shaping a brighter future for themselves and their communities.

2.6 Conceptual Framework of the research

The proposed study explores the challenges that are faced by educators teaching IT in South African Township schools. Therefore, when defining challenges, we refer to the difficulties faced by the educators particularly when they teach the subject. Although it has been noted that teachers face a harsh reality of students being demotivated in progressing with the subject throughout the entire FET phase. Within the South African context. A thorough framework for examining the challenges faced by educators teaching IT should consider several interrelated contextual, institutional, and individual issues. Therefore, the chosen framework for the study is the multi-level framework.

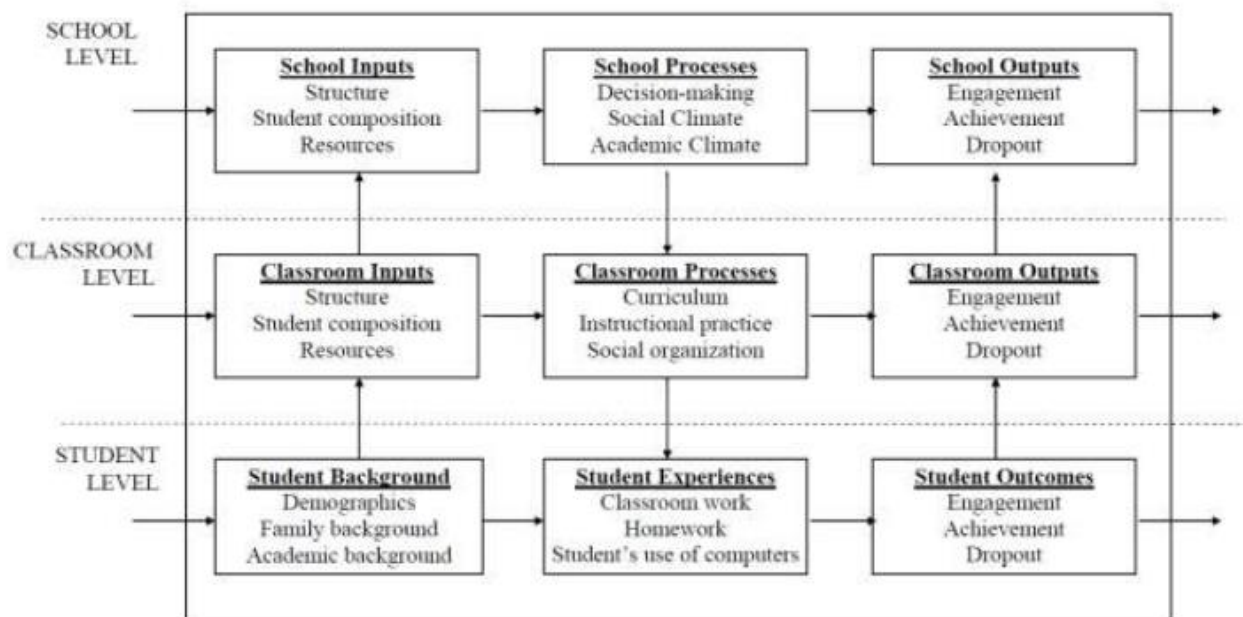


Figure 1: The Multi-Level Framework

(Adapted from N Ndlovu (*A Multilevel Conceptual Framework for analyzing school effectiveness*. Source: Rumberger and Palardy) (2004).)

This research utilizes the Multilevel Framework (MLF) to investigate the complexities of high dropout rates in township IT education. The MLF surpasses one-dimensional analyses by acknowledging the "nested structure" of educational systems (Bryk et al., 2015). It posits that student outcomes are influenced by a dynamic interplay of factors at various levels, including individual, classroom, school, and district (Bryk & Raudenbush, 2012). This holistic approach offers valuable insights into the dropout phenomenon, particularly when coupled with the unique perspective of teachers.

Considering variables functioning at several levels, the multi-level framework is an effective tool for this research. It goes beyond one-level analyses, which frequently overlook the wider picture, and enables a more sophisticated comprehension of the ways in which different factors interact to affect educational outcomes. It has aided in the identification of opportunities for systemic solutions that deal with problems at several levels and has facilitated the use of evidence in public policy, education, and other areas of decision-making. By understanding the interplay of various factors at different levels, this framework can offer valuable insights into the complexities of the IT learner dropout phenomenon in

township schools. The teacher-centric approach using the MLF can provide a holistic understanding of the dropout phenomenon in township IT education. Notably, teachers occupy a unique position within the Multilevel Framework, bridging the gap between individual students, the school environment, and the broader community.

The MLF emphasizes the importance of examining individual student characteristics that may contribute to dropout decisions (Haney & Tinto, 2011). Teacher interviews can illuminate factors such as students' prior academic achievement, motivation towards IT learning, socioeconomic background, and personal circumstances (Pascarella & Terenzini, 2005). Teacher experiences can offer insights about students struggling with foundational skills necessary for success in IT courses, or a lack of access to technology outside of school hindering their learning (Adedoyin & Jegede, 2019).

The framework encourages investigation into classroom-level factors that influence student engagement and dropout (Gamoran & Ruijsenaars, 2017). Teacher narratives can shed light on their pedagogical approaches, the quality of classroom interactions, and the availability of resources specific to IT education (Cheng, 2018). Teacher accounts of the challenges they encounter in creating a stimulating learning environment due to limited access to computers or outdated software. Additionally, the level of student support within the classroom, such as individualized attention or peer tutoring programs, can be explored through teacher interviews (Wang et al., 2013).

The MLF highlights the significance of school-level factors such as leadership for instance the School Based Support Team (SBST), culture, and available resources in dropout rates (Leithwood et al., 2004). Teachers' perspectives can illuminate the overall school climate towards IT education, the availability of guidance counselors or social workers to address student needs, and the level of parental involvement (Hoover-Dempsey et al., 2001). The teachers' statement might reveal a lack of administrative support for IT programs or a negative school culture that discourages students from pursuing IT careers.

The framework acknowledges the influence of district-level policies and resource allocation on student outcomes (Hallinan, 2008). Teacher interviews can provide insights into curriculum mandates, professional development opportunities for IT teachers, and the availability of district-wide support programs for struggling learners (McNulty, 2002).

Teachers may describe a disconnect between the prescribed IT curriculum and the realities of township schools, or a lack of district-offered professional development focused on implementing innovative teaching methods for IT education.

By employing the MLF through teacher experiences, this research can paint a multifaceted picture of the dropout phenomenon in township IT education. Understanding the interplay of individual, classroom, school, and district factors will enable the development of targeted interventions to address the root causes of dropout and improve learner outcomes.

2.7 Conclusion of the literature review

The literature unveils the intricacies of IT education within South African township schools. While highlighting the undeniable importance of IT literacy in the modern era and the numerous advantages of curriculum integration, the review concurrently acknowledges the multifaceted challenges that hinder effective learning in this domain.

One pivotal obstacle lies in the unequal distribution of resources across educational institutions. This disparity in access to technology and internet connectivity exacerbates existing inequalities and creates uneven learning opportunities for students (Govender & Lorenzo, 2022). Additionally, the inherent abstract nature of IT, particularly its theoretical underpinnings, presents a significant hurdle for some learners, demanding strong analytical and problem-solving skills (Department of Basic Education, 2020). Furthermore, the review identifies a concerning trend of student demotivation and high dropout rates, often attributed to the demanding nature of IT, particularly the emphasis on programming (Koorse et al., 2010; Syslo, 2017). Thereafter, the review underscores the need for robust professional development and ongoing support for IT educators, as the current lack of such resources hinders their effectiveness (UNESCO, 2022).

Furthermore, this review paints a nuanced picture of IT education within South African township schools, acknowledging both its potential and the challenges that impede its successful implementation. Addressing these challenges through targeted interventions and a multi-faceted approach holds the key to fostering a more equitable and effective learning environment, ultimately preparing students to flourish in a world increasingly shaped by technology.

Chapter Three: Research Design and Methodological approach

3.1 Introduction

This research adopts a qualitative approach to investigate the lived experiences of Information Technology (IT) educators in South African public schools, with a particular focus on township schools. The chosen methodology aligns with the study's objective of gaining an in-depth understanding of the challenges and opportunities encountered by these educators within their specific context. The guiding research question for this qualitative inquiry is: What are the experiences of Information Technology teachers with regards to the high dropout rate of Information Technology learners at in South African Township schools?

To address the research question, the following sub questions will be used:

- What are the challenges reported by Information Technology teachers for teaching IT as a subject in South African township schools?
- How do Information Technology teachers in township schools perceive the effectiveness of their current teaching strategies in addressing the high dropout rate of Information Technology learners?
- What roles do school-based support systems play in assisting IT teachers to influence learners not to drop the subject?

This chapter will cover the methods and designs used to answer the research questions asked in the study.

3.2 Research design

According to Johnson & Onwuegbuzie (2004), a research design is the configuration of parameters for data collection and analysis with the goal of extrapolating the sample's findings to the entire population. A foundational idea pertaining to the phenomena of research states that a study's objectives can only be accomplished by adhering to a framework. The term "research design" refers to the framework that described how the study was carried out. The research design outline, as shown in the image below. The participants and the methods of sample were specified, along with the research technique

that was employed. A description of the equipment used for data collection is included, as well as the methodology employed to conduct this investigation.

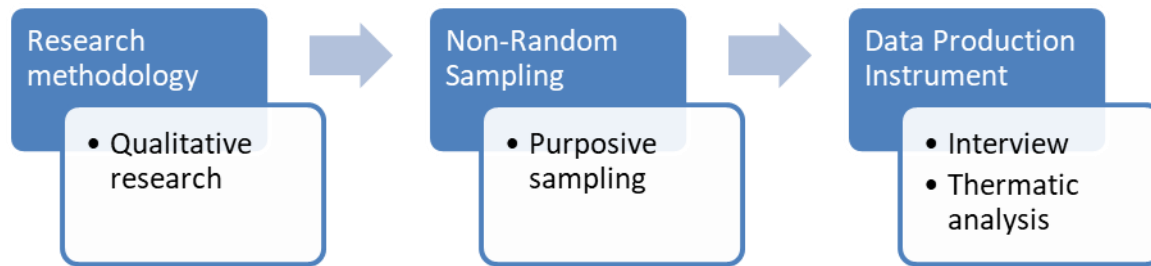


Figure 2: The research methodology

3.3 Research Methodology

Research methodology refers to the procedures or approaches utilized in the search, selection, processing, and assessment of relevant material. A research paper's methodology section allows the reader to evaluate a study's dependability and general validity. According to Denzin and Lincoln (2005), the nature of the phenomenon being studied, and the research question(s) under study dictate the research approach. The platform for the researcher's chosen research approach is provided by the research question. The current research is a methodical, logical, and sequential development regarding the collection and acquisition of relevant data, followed by analysis and interpretation, which will result in a final product in the form of useable knowledge. The study's qualitative research methodology was chosen because it supports the comprehension and interpretation of meaning that come from interactions between people. Interviews conducted in-depth were used to gather data. The following are mentioned by Denzin & Lincoln (2011) as principles related to qualitative research:

- Qualitative research is relational in nature; it examines the relationships within a system and starts with an attempt to comprehend the entire. It is holistic in nature.
- Understanding a specific social context is the main goal of qualitative research; predictions about it are not always the focus.
- Qualitative research necessitates extensive and continuous data processing; also, the researcher must act as the research instrument in qualitative research design.

It also includes space for the researcher's personal prejudices and ideological inclinations to be described.

The study project favors qualitative research. Qualitative research is characterized as one in which the researcher serves as the primary tool for gathering and analyzing data. Considering the research's setting, direct interactions with participants are conducted. To provide a description of the participant experiences, the researcher convinced the participants in the interviews to explicitly characterize the nature of the phenomenon. This method allowed for the collection of information. The accuracy of the information gathered is guaranteed by the word-for-word transcription of the interview recordings. In that instance, research findings can be examined and high-quality responses to the research question can be given.

3.4 Research Process (Philosophical assumptions)

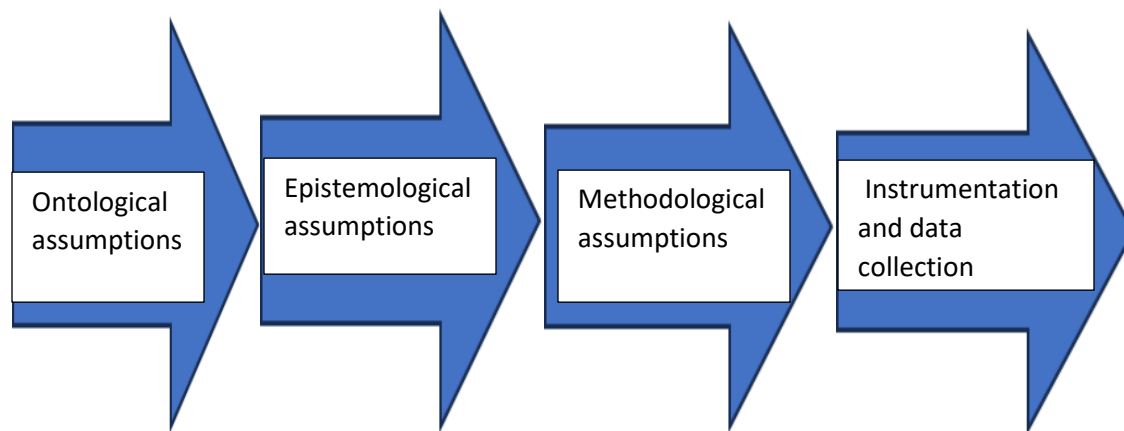


Figure 2: The research processes.

Philosophical concepts and beliefs have an impact on good research to provide a true and accurate study. Understanding the conceptual foundations of qualitative research begins with figuring out how it fits into the overall research process, appreciating its significance as a research component, and thinking about how to actively include it into a study. Philosophy is the application of philosophical concepts and precepts to guide our academic pursuits. When designing a study, philosophical presumptions are typically the first thing

that come to mind. These suppositions influence the formulation and subsequent investigation of research questions (Graue, 2015).

Thus, the philosophical presumptions in this work were grounded in the investigation of the nature of experience (ontology) and the perception of knowledge (epistemology). This is meant to bolster the degree of validity and dependability of the research. The ontological and epistemological stances of the researcher serve as the philosophical foundation for a research endeavor and influence every stage of the research process.

3.4.1 Ontology

Ontology, according to Crotty (2003), is "the study of being." In Ahmed (2008). The nature of life and how objects are seen are the main topics of this study. It explains the nature of existence, what it is, and the classification system. Some people could believe that everything is essentially the same and that everything is connected. Some people think that there is an infinite variety of real objects in the world. Ontology, also referred to as the study of being, has long been a topic of study for philosophers and is applied in numerous different domains. It can be seen as fundamental since one's ability to comprehend reality, correctly interpret it, and successfully classify what is genuine can be influenced by the researcher's assumptions. The emphasis of the study and the methodology used in it may be influenced by the researcher's assumptions. The way that society is seen may have an impact on these presumptions. Whether social entities should be seen as objective or subjective is the central topic in ontology. Choose whether social actors' perceptions and actions inside the confines of your investigation create social phenomena, or whether the universe is external to the social world. It greatly influences how they operate in their line of work.

It is crucial to consider various experiences that could contribute to the educational process because different schools have varied environments and settings. Because the subject of this qualitative study is public schools in various locations, it is vital to keep in mind that experiences and opinions on various topics may vary and may even be idealistic. According to Guba and Lincoln (1994), idealism is an ontological viewpoint that holds that an individual's actions and mental composition define what is real. Idealism maintains that concepts, awareness, and reality are arbitrary because they are based on experience. It can never be universal since experiences are not universal.

According to Bryman and Bell (2011), assumptions made by researchers can be predicated on two things: whether social entities should be objective (objectivism) and based on findings and theories, or subjective (constructionism) and based on societal experiences and structure (Mayer, 2015). The constructionist perspective holds that knowledge is not a glimpse into an objective truth, but is instead something that people create, partly through social interactions. Objectivism holds that social entities have an existence of their own apart from the social actors who care about them. It argues that social actors and social entities are not the same thing. As opposed to this, subjectivism (also known as constructionism or interpretivism) maintains that social actors' perceptions and subsequent actions shape social reality. Constructionism is a formal ontological perspective that maintains social agents create social objects and their meanings on a continuous basis. How reliable is it to say that knowledge comes from seeing social occurrences repeatedly? Hegel contends that we cannot confine knowledge to a world defined by causal laws since individuals from different political, economic, and cultural backgrounds interpret and comprehend social events in different ways (Scott, 2013).

In contrast to positivism, "beliefs" are important for the progress of knowledge. Knowledge cannot be founded on an objective reality; rather, it can be based on how individuals perceive or are aware of reality. According to Scott (2013), information comes in many forms, and we need to cultivate an empathic understanding to fully appreciate its diversity. This implies that to produce information that will be understood and valuable to everyone, subjectivities must be combined because everyone has their own subjective impressions. According to Feinberg and Soltis (2009), observation is dependent on interaction even if our minds are actively creating perceptions based on experience. Potrac, Jones, and Nelson (2014) argue that after emphasizing the interpretivism that gives rise to knowledge, we must radically abandon positivism as the basis for world interpretation and instead focus on understanding the meaning of our world rather than knowledge as an objective truth.

This study adopts a subjective viewpoint when examining the disparities that could be particularly noticeable in schools and the potential familiarity that teachers may have with IT. The study's topic and conclusions were not influenced by the researcher; yet the results

are dependent on the participants' initial circumstances and surroundings. The objective-driven views of education, as articulated by Skinner (1968), must give way to a revolution in education that aims to implement an interpretivism philosophy. This revolution will require students to demonstrate "objective" behavior to demonstrate their understanding of the material that has been imparted to them. This is since learning settings can affect the experiences of both teachers and students. Regarding techniques of instruction and learning, generalization is not possible. The practices, materials, instructional methods, and culture from School A might not always be used in School B. It follows naturally that knowledge cannot be reduced to an object. Interpretivism is defined as the idea that knowledge should be based on the interpretation and understanding of the meanings of observations. Interpretations of what we observe help to understand social concerns and human behavior. As we do this, empathy is also necessary for the development of meaningful understanding, suggesting that we should try to understand other people's viewpoints by empathizing with them.

3.4.2 Epistemology

Our perception of knowledge is intricately linked to the dominant epistemology within a particular culture. Epistemology, as defined by Mi & Ryan (2018), delves into the nature, sources, and justification of knowledge. It essentially explores the theoretical frameworks through which societies understand how we acquire knowledge about the world and how we differentiate between justified true belief and mere opinion. This field of study extends beyond simply understanding "how knowledge came to be"; it critically examines the underlying values and belief systems that shape our very understanding of what constitutes knowledge in the first place. These values and belief systems, in turn, are heavily influenced by our daily experiences and cultural context (Smith, 1996).

3.4.3 Interpretation

From an epistemological standpoint, positivism is an old paradigm that is still widely used in research, but because of its objective nature, it is completely inappropriate for this subject. Positive thinking emphasizes the value of information in general and places a stronger emphasis on considering facts and pure data without being swayed by human bias. (Pus & Alharahsheh, 2020). The positivist perspective is based mostly on science.

It basically says that scientific trends, verifications, and principles support the validity of personal knowledge. It is not thought that context and experience-based differentiation has a significant impact on an individual's consciousness. It completely rejects scientific theories and principles and aims to connect them to people's consciousness and their experiences, each of which is unique.

In contrast to positivism's objective approach, the interpretivism paradigm considers a person's personal life. It was created to address the positivist approach's unsatisfactory objective beliefs. "With the assumption that human beings cannot be explored in a similar way to physical phenomena, interpretivism is more concerned with in-depth variables and factors related to a context. It considers humans as different from physical phenomena as they create further depth in meanings." (Pus & Alharahsheh, 2020). This epistemological paradigm considers differences in environment, values, culture, and beliefs, among other things. It does not rely on antiquated scientific theories, nor does it hold that society has the power to mold an individual; rather, it is through the experiences of a unique person that is molding society.

Having stated that, the interpretivism paradigm guided the conduct of this study. The goal of employing this paradigm is to gain a subjective, thorough, and intense comprehension of the technique's educators employ to teach IT and the rationale behind them. Considering the disparities in access to resources and other components, this is also an attempt to comprehend the difficulties that educators and students can encounter. Ryan (2018) contends that interpretivism views knowledge and reality as subjective, historically, and culturally specific, and based on context. People's experiences and perceptions of them are included in this.

Out of all the paradigms mentioned above, interpretivism best describes this study since its main goal is to comprehend the participants' individual experiences as IT teachers engage in the teaching and learning experiences. Moreover, this paradigm represents actual actions rather than being influenced by philosophical opinions. Data provided is live and not an assumption.

3.4.4 Methodology Approach

This research seeks to understand the experiences of educators teaching IT at public schools. Methodologies employed in this regard may be more qualitative. In a qualitative approach, category data is empirically collected, usually from human subjects, and then examined to seek patterns. Two examples of ways to achieve this are to look at how users interact with computer software and to examine the substance of social media posts. Contextualizing an observation in connection to its surroundings is a crucial aspect of qualitative research, as noted by Creswell and Poth (2017). This is a systematic study of complex reality in unstructured settings. The way people view various aspects of their lives, how people act alone or in groups, how businesses operate, and how interactions impact social relationships are just a few examples of these occurrences. Denzin & Lincoln (2011) state that qualitative research takes an interpretive, normative approach to its subject and has multiple elements. The intricacy of qualitative research facilitates the creation of a thorough picture of the topic under study.

In short, qualitative research is characterized by its comprehensive approach, which seeks to understand the entirety of a subject and considers the broader context (Leedy & Ormrod, 2010). It delves into the interactions among different components within systems. Rather than focusing solely on making predictions, qualitative research aims to gain insight into social conditions. Data analysis in qualitative research is both labor-intensive and continuous as the researcher has to dig out for precious information relevant to the study. Researchers in qualitative studies become integral to the research process, allowing space for the exploration of their own biases and ideological perspectives. Additionally, ethical considerations and obtaining informed consent are fundamental aspects incorporated into the design of qualitative research studies. Ethical considerations, including obtaining informed consent, are integral components of qualitative research design, emphasizing the importance of ethical practice throughout the research process.

3.4.5 Case study

This study is a case study. Yin (2013) claims that a case study research approach examines a phenomenon within its real setting, considering any relevant boundaries. A case study, according to Sturman (1997), is a general term for an examination of an

individual, a group, or a phenomenon. Therefore, a case study is an in-depth account of a specific occurrence and its analysis, such as the description of the instance and the events as well as an explanation of how these features were discovered, which is the research process itself. As stated by Flyvbjerg (2011), a case study is utilized when something needs to be analyzed and described in detail. Examples of such things include an individual (their behavior, special needs, situation in life, personal history, etc.), a group of individuals (a school division, a group of students with special needs, staff, etc.), a problem (or multiple problems), a process, a phenomenon, an event in a particular setting, etc. The real-life occurrences are examined in this study within a realistic and natural setting. According to Yin (2013), case studies can be used to investigate, clarify, or describe events or phenomena as they occur in their natural settings. It is rooted in the fact that the study's conclusions are trustworthy and truthful. The case study's objective was to provide a thorough understanding of every participant while considering the variations and parallels between their circumstances.

A case study can be viewed as an account of an event, incident, or problem since it focuses on the complexity and particulars of the case under consideration. A case study focuses on context and individual experience, emphasizing that changing the environment with the aim of achieving a particular goal will make the research less accurate and meaningful. Because of the genuine state of the findings, research is research.

It was not anticipated that the study's interview subjects would all come from the same background. The public schools from which the participants were drawn had varying resources and approaches to teaching and learning. The realness and reliability of the results are encouraged by the disparities among the participants. The present investigation is bolstered and delineated by the notion of case studies, given its consideration of the varied experiences and contextual backgrounds that educators may possess. The individual experiences of each participant—which could be quite distinct from one another—play a significant part in solidifying the nature of this research. This is because the study examines the participants' subjective opinions.

3.5 Data production instruments

The focal point of this study is IT teachers in the FET phase (Grade 10-12) that are working at South African Public schools. The reason for this choice is that there are not many public schools that offer IT, some of those that were offering the subject decided to drop it entirely. Thus, it is important to some of the challenges that they may be facing. Moreover, it is crucial to assess whether they are receiving the necessary skills that will prepare them for the demands of the impending industrial revolution. Purposive sampling was the technique employed. In qualitative research, researchers often utilize purposive sampling, a non-random method. This technique involves selecting participants based on their specific characteristics and potential to offer valuable insights relevant to the research question. Unlike random sampling, which emphasizes generalizability through minimizing bias, purposive sampling prioritizes in-depth understanding from strategically chosen individuals.

Whether a quantitative or qualitative technique is employed, sample procedures are made to maximize validity and effectiveness, as noted by Palinkas, Green, Wisdom, and Hoagwood (2013). Sampling, however, needs to be consistent with the goals and underlying assumptions of either technique. While achieving breadth of comprehension is the primary aim of quantitative procedures, obtaining depth of understanding is the major goal of qualitative methods.

3.5.1 Data collection techniques

According to Paradis, O'Brien, Nimmon, Bandiera, and Martimianakis (2016), interview data ought to be recorded and then transcribed. The precise phrases used by participants are crucial to any research project because they facilitate the identification of themes in the responses they provide throughout the data collection stage. According to Monday (2020), an interview is a conversation among several people on a topic of mutual interest that emphasizes the social context of research findings and the significance of human interaction for knowledge generation. According to Doody & Noonan (2013), there are several reasons to use interviews, including:

- The need for highly customized data.
- The requirement for probing opportunities.

- A high return rate is essential.
- The responders have trouble writing in English or speak the native dialect of the nation poorly.

Within the research domain, data collection represents a systematic and targeted endeavor. It entails the gathering and meticulous evaluation of measurement information pertaining to specific variables (Kabir, 2016). This process serves a fundamental purpose: to acquire high-quality evidence that facilitates in-depth analysis and the construction of a robust argument addressing a particular research inquiry. This emphasis on data collection extends across diverse research fields, irrespective of the chosen methodology (qualitative or quantitative). The integrity of any research endeavor hinges upon the accuracy and effectiveness of the data collection process.

Furthermore, this approach guaranteed the accuracy and dependability of the data gathered. Therefore, using an audio recorder to conduct semi-structured interviews with each participant, data was gathered for this study and later transcribed for documentation and reference.

3.6 Data Analysis

Without being analyzed, interpreted, comprehended, reviewed, and inspected, data is not considered reliable. Data analysis is the process of cleaning, transforming, and modeling data to locate appropriate data for wise decision-making. The objectives of data analysis are to extract actionable insights from the data and make decisions based on that analysis. Since data analysis makes a significant contribution to the research's conclusion, Thorne (2000) views it as the most significant component of the study. Similarly, Thorne (2000) proposes qualitative data analysis as a more in-depth approach to data analysis. This method involves breaking down data into smaller pieces and looking for patterns based on participant responses, rather than utilizing statistics and mathematical graphs (content analysis). To produce high-quality work as opposed to work focused solely on quantity, this research used a qualitative data analysis approach. Also, a thematic analysis of the data was conducted. When words and descriptions are present in the data, we refer to it as qualitative data. Despite being observable, this data is more subjective to analyze in study and more challenging to compare. To collect this kind of data, focus groups, individual

interviews, and open-ended survey questions are commonly employed. Aspers & Corte (2019) define qualitative data as any information that can be recorded but is not quantitative or mathematical in nature, or not classified as quantifiable data. This is usually accomplished by drawing distinctions between the qualitative and quantitative data and contrasting them. This leads to the common perception that words and numbers are one and the same. Even words, though, can be counted and measured, and their presence or absence can be used to interpret something. The split is therefore not distinct. One feature of qualitative data is that it typically consists of information that may be described and analyzed rather than quantified. This information can be textual, spoken, auditory, or visual.

This research relied on participants' experiences because it was interpretive, which helped to identify a trustworthy hypothesis. According to Albuquerque, Lucena, and Freitas Lins Neto (2014), research participants are people who participate in the study to give information, much of which is personal. In this scenario, study participants are picked by two methods: purposive sampling method and a random sampling method (Patel, Doku & Tennakoon, 2003). The data a researcher is trying to obtain will determine the approach to choose. While the random sampling approach chooses participants at random to meet size and power criteria, the purposive selection method represents the target population.

This study used a purposeful sampling strategy that was subject- and grade-specific. Only teachers teaching IT participated in this study since their experiences made the information, they offered the most trustworthy. Consequently, the target population was represented by this selection process.

3.8 Ethical Consideration

Ethical considerations are fundamental in qualitative research, ensuring the protection of participants' rights and well-being throughout the research process (Smith, 2018). In qualitative research, ethical guidelines dictate the researcher's conduct in various stages, from participant recruitment to data collection, analysis, and dissemination of findings (Jones & Brown, 2019). Researchers must obtain informed consent from participants, clearly outlining the purpose, procedures, potential risks, and benefits of the study (Smith, 2018). Furthermore, confidentiality and anonymity must be maintained to safeguard

participants' privacy, with data securely stored and accessible only to authorized individuals (Brown & Lee, 2020). Researchers are also ethically obligated to minimize harm and ensure voluntary participation, providing opportunities for participants to withdraw from the study without repercussions (Jones & Brown, 2019). Throughout the research process, reflexivity is essential, encouraging researchers to critically reflect on their own biases, assumptions, and potential impact on the research (Brown & Lee, 2020). Adhering to ethical principles not only upholds the integrity of the research but also contributes to building trust between researchers and participants, ultimately enhancing the credibility and validity of the qualitative thesis (Smith, 2018).

Chapter Four: Data Presentation, Analysis, and Interpretation

4.1 Introduction

This chapter delves into the experiences of Information Technology (IT) teachers in South African township schools through a qualitative lens. Drawing upon in-depth, semi-structured interviews with five (5) participants, the exploration begins with their firsthand accounts of navigating IT education within their unique township schools. This rich textual data, subsequently transcribed and anonymized, form the foundation for the analysis and interpretation that follows, shedding light on the challenges and triumphs specific to teaching IT in township schools.

4.2 Data presentation

According to Thody (2006), data presentation in qualitative research conveys information to the study site. This creates the foundation for the reader to engage with and observe the subjects of the writer's investigation. In addition, it produces an intricate representation of reality and facts, aiming to establish the study's credibility. In a qualitative investigation, data can be presented in a variety of ways, including a table, graph, text, and more, to enable logical inferences to be made from the information acquired.

Interviews with one participant from each of the five schools—a total of five individuals—were used to gather data. The quotes from the interviews were used verbatim to preserve the respondents' privacy. The code names for the first school (S1), the second school (S2), and so forth were used to identify the data collection sites. Prefixes: T1#1 (first teacher from school B), T1#2 (second teacher from school B), and so on were pseudo-named for the first teacher from the first school (see Table 2). The second teacher from the first school was pseudo-named for school A, and so on for the second teacher from the second school. The interviews took place at convenient times and locations for them. Every educator interviewed consented to being audio recorded to guarantee precise data collection.

Table 2: Schools and Teachers Pseudo names

School Pseudo name	Teacher Pseudo name
S1	T1#1
S2	T2#1
S3	T3#1
S4	T4#1
S5	T5#1

The following sub-research questions were the focus of the interviews.

1. What are the challenges reported by Information Technology teachers for teaching IT as a subject in South African township schools?
2. How do Information Technology teachers in township schools perceive the effectiveness of their current teaching strategies in addressing the high dropout rate of Information Technology learners?
3. What roles do school-based support systems play in assisting IT teachers to influence learners not to drop the subject?

In a bid to bolster IT learner outcomes, particularly at Matric level, several initiatives are taking root in South Africa. One promising approach involves professional development programmes for IT teachers, equipping them with the latest pedagogical strategies and technological advancements. These programmes provide teachers with the tools and confidence to navigate the evolving digital landscape and cater to diverse learning styles. Additionally, initiatives focusing on curriculum reform strive to make IT education more engaging and relevant by incorporating real-world problem-solving and project-based learning. This shift away from rote memorization aims to spark student interest and develop critical thinking skills crucial for success in Matric exams. Furthermore, efforts are underway to bridge the digital divide by equipping schools with essential IT infrastructure and internet connectivity. This ensures equitable access to technology and eliminates a

major barrier to quality IT education. Finally, collaborative initiatives linking universities and schools are fostering mentorship programmes and teacher exchange opportunities. These interactions can bring fresh perspectives and best practices to Matric classrooms, further enriching the learning experience and boosting exam preparedness. While challenges remain, these multifaceted initiatives offer a glimmer of hope for elevating IT learner outcomes and empowering South African youth to thrive in the digital age.

4.3.1 Need for continuous professional development

The rapid pace of technological advancement necessitates continuous professional development (CPD) for Information Technology (IT) teachers in South Africa. This ongoing training is crucial as it ensures teachers remain up to date with evolving algorithms, software updates, and emerging technologies, preventing them from becoming outdated. Moreover, CPD enhances pedagogy beyond mere coding proficiency, enabling teachers to employ innovative teaching strategies that cater to diverse learning styles, foster critical thinking, and promote ethical tech use. These programmes also facilitate knowledge exchange, exploration of new tools, and refinement of teaching approaches, ultimately maximizing student engagement, and learning outcomes. Additionally, CPD equips teachers to address unique challenges in the South African context, such as limited resources and unequal access to technology, by fostering culturally relevant and adaptable teaching methods. By staying abreast of advancements, teachers remain motivated and enthusiastic, creating a dynamic classroom environment that cultivates a passion for IT and encourages deeper learning among students. Despite the programmes available for CPD, many participants revealed that there not effective. The teacher for S1, pseudo named T1#1 commented,

The Department of Education has training available for IT teachers. However, they are not talking to the requirements of IT curriculum. It's more of a theory, that is, the importance of IT in schools without showing the pedagogy aspects.

According to the opinion of T1#1, a critical discrepancy exists between the Department of Education's IT teacher training and the practical demands of the school curriculum. This

suggests a potential knowledge gap between the training developers and classroom practitioners. The training appears to prioritize theoretical pronouncements on the inherent value of IT education, neglecting to equip teachers with pedagogical tools for translating this value into meaningful learning experiences. Consequently, teachers remain unsure how to bridge the gap between theoretical knowledge and classroom application, potentially leading to ineffective instruction and disengaged students. This highlights the urgent need for training programs that are grounded in curriculum-specific pedagogy, empowering teachers with the practical skills and instructional strategies necessary to translate the intended learning outcomes of the IT curriculum into engaging and impactful classroom practice. A similar sentiment was mentioned by T3#3, whose remarks were,

Teaching Information Technology, and particularly programming concepts, presents significant challenges for educators. In light of this, ongoing professional development in programming pedagogy is crucial for the Department of Education to prioritize. Unfortunately, the current training programs often do not adequately address the practical aspects of teaching programming effectively. This leaves IT teachers feeling inadequately equipped and unable to fully support student learning, leading to frustration for learners.

The comment made by T3#3 underscores the challenges inherent in teaching IT and programming, particularly in effectively conveying concepts aligned with students' expectations. Despite participation in extant training programs, IT educators often encounter a dearth of emphasis on practical pedagogical strategies tailored to programming instruction. Consequently, this deficiency contributes to a sense of inadequacy among teachers, impeding their capacity to facilitate meaningful student learning experiences and culminating in learner frustration.

IT software keeps on changing. For example, in South African township schools, teachers teach programming using Delphi 10 software. However, the latest Delphi provided by Embarcadero is RAD Studio 12.0 Athens. If not trained on the new

software, it may create frustration for both the teacher and learner. Such experiences were raised by T4#4 who mentioned,

Programming software keeps on changing. On the workshops that we attended, there was nothing pertaining to the latest programming software. We are used to the old versions of software, and experience challenges with the new ones. It is the role of the department to upskill us with the new software so that we are better equipped to deliver the lessons with confidence.

T4#4 expresses growing frustration with a crucial gap in their IT teacher training and the glaring misalignment between training content and the evolving reality of programming software. Teachers lament that workshops remain rooted in outdated versions of programming software, leaving them clinging to old tools while students encounter the ever-shifting landscape of new software. This disconnect breeds insecurity and hinders effective lesson delivery. Teachers grapple with unfamiliar interfaces and functionalities, diminishing their confidence and impacting student learning. In addition, T4#4 implores the Department to acknowledge this critical gap and prioritize "upskilling" teachers with the latest software. Equipping them with the necessary knowledge and proficiency to navigate the dynamic world of programming, they can be better practicing teachers.

4.3.2 IT Curriculum Transformation in Schools.

South Africa's Curriculum and Assessment Policy Statement (CAPS) for Information Technology lays out a comprehensive vision for educating students in the digital age. It's more than just coding and software; it's about fostering critical thinkers, responsible users, and future-ready citizens. At its core, the CAPS framework embraces a holistic approach. It doesn't solely focus on technical skills, but also prioritizes problem-solving, creativity, and ethical understanding. It recognizes the ever-evolving nature of technology and emphasizes adaptability and lifelong learning. The curriculum is structured around five interlinked areas: Communication Technologies, Systems Technologies, Internet Technologies,

Data and Information Management, and Social Implications. This diverse landscape aims to equip students with the tools to communicate effectively, navigate digital environments securely, manage information responsibly, and understand the impact of technology on society.

The teaching methodologies advocated in CAPS promote active learning, collaboration, and project-based activities. This hands-on approach ensures students don't just learn about technology but learn through technology. It encourages them to experiment, solve real-world problems, and develop critical thinking skills that go beyond technical proficiency. Furthermore, the CAPS framework acknowledges the importance of catering to diverse needs and contexts. It provides educators with flexibility to adapt their teaching approaches to accommodate different learning styles, resources, and socio-economic backgrounds. This ensures all students can develop their digital literacy and embrace the potential of technology in their lives.

4.3.3 Lack of computing resources

The digital divide in South Africa casts a long shadow over its classrooms, influencing students' academic journeys in concerning ways. The lack of computing resources, from functional computers to reliable internet access, creates a steep barrier to entry for the field of Information Technology (IT). Learners, especially those from underprivileged backgrounds, struggle to grasp complex concepts without hands-on practice, leading to frustration and discouragement. Consequently, many choose to switch paths, opting for CAT fields where the resource dependence might seem less daunting. This phenomenon has broader implications, potentially creating a skills gap in the crucial IT classes while perpetuating existing socioeconomic inequalities. Participants are complaining mainly about the maintenance of digital technologies facilities. These sentiments were raised by T#3 from S#3 who said that,

The computer laboratories exist nonetheless, maintenance is often inadequate and consequently it is observed that a significant number are malfunctioning and consequently the students are required to share a

single computer, such that only one student is actively engaged in the task while the remaining students are passive observers which thwarts the purpose of acquiring essential subject-specific skills.

T#3 paints a concerning picture of the state of computer labs in educational institutions. Despite having dedicated spaces for technology-integrated learning, inadequate maintenance renders a significant portion of computers unusable. This forces students to share malfunctioning machines, creating an ineffective learning environment where only one student actively engages in the task while others become passive observers. This scenario thwarts the purpose of acquiring essential subject-specific skills, potentially hindering their academic progress and future career opportunities. The comment also highlights the need for immediate action to improve maintenance practices and ensure all computers are functional. Additionally, strategies to prevent overcrowding and promote active participation for all students within the lab are crucial to maximize the potential of this valuable learning resource. T#1 also shared similar sentiments and commented,

The high number of students enrolled in the Grade 10 Information Technology (IT) class requires that I ask the learner to use the computer by rotating. This, however, can adversely affect classroom management, as some students become bored and disrupt the entire teaching and learning process.

The comment highlights a significant challenge faced by the teacher due to limited resources in the IT classroom. The sheer number of students enrolled in the Grade 10 IT class necessitates a rotating system for computer usage, which creates several potential problems. While the teacher acknowledges the importance of hands-on experience, using this method likely leads to students having unequal access to technology and varying levels of engagement. Those waiting their turn to use the computer might easily become restless and disruptive, affecting the overall learning environment for everyone. This scenario suggests a need for alternative solutions to address the limitations, such as incorporating more group activities, utilizing alternative technology where possible, or advocating for

increased resources to provide individual access to computers. Without such action, the teacher's ability to effectively manage the classroom and ensure equitable learning for all students remains compromised. Furthermore, T#5 added that,

The most frustrating thing is that when I request for maintenance, I am told that I should do it. For some reason since I am an IT teacher, I am expected to be a technician and be able to fix these problems myself. I really do not understand where they got this idea.

This statement highlights a potentially problematic misattribution of roles within the school's computer infrastructure management as mentioned by T5#5. The expectation placed upon T5#5 suggests a conflation of IT educators with technical support personnel. This may indicate a limited understanding of the distinct skillsets associated with each profession. While IT teachers possess valuable pedagogical expertise in facilitating technology literacy and responsible digital citizenship, system maintenance and troubleshooting typically fall within the domain of dedicated IT technicians. This potential ambiguity in role delineation requires further investigation to ensure the optimal utilization of both educators and technical support staff in fostering a robust and sustainable school technology environment.

4.3.4 Need for communities of practice

The rapidly evolving landscape of Information Technology (IT) education necessitates continuous learning and adaptation for educators. Communities of practice (CoPs) emerge as a valuable solution, cultivating supportive networks where IT teachers can cultivate their knowledge, collaborate effectively, and spearhead innovative approaches. Firstly, CoPs offer targeted professional development (PD) tailored to the specific challenges encountered in the classroom. By leveraging the collective expertise of their peers, educators can directly address these issues, empowering them to remain current with technological advancements and seamlessly integrate them into their curriculum (Hwang, 2011). This collaborative learning environment surpasses traditional PD

methodologies by fostering problem-solving and knowledge application within a real-world context. CoPs facilitate knowledge sharing and resource development. Experienced teachers impart their best practices, lesson plans, and pedagogical strategies, while newer educators gain invaluable mentorship and support (Hightower, Wiens & Guzman, 2021). This collaborative creation of resources fosters innovation and enriches the learning experience for both teachers and students. This bidirectional exchange of knowledge ensures continuity and growth within the IT education community.

They nurture an environment of innovation and experimentation. Through the exchange of ideas and experiences, teachers are inspired to explore creative approaches to IT education. This collaborative problem-solving leads to the development and adoption of innovative teaching methods grounded in the collective wisdom of the community (Smith et al, 2022). This fosters a culture of continuous improvement within the field, leading to improved learning outcomes for students. Moreover, combat isolation and burnout, which are prevalent challenges faced by IT educators due to the fast-paced nature of the field. By providing a supportive community of understanding peers, CoPs reduce feelings of isolation and burnout, ultimately contributing to increased job satisfaction and teacher retention (Lee and Cheng, 2023). This fosters a more sustainable and resilient teaching force. In conclusion, CoPs hold immense potential for IT educators, offering a multifaceted approach to professional development, knowledge sharing, and fostering a culture of innovation. By cultivating collaboration and support, these communities empower teachers to navigate the rapidly evolving IT landscape, enhance their pedagogical practices, and ultimately equip students with the critical IT skills necessary for success in the digital age. This was evidenced by the remarks made by T1#1, who mentioned:

Imagine teaching IT at the high school level but being the only one in charge. No colleagues to share ideas off, no one nearby to share resources or frustrations with. That's the reality for many IT teachers. Unlike in other

subjects where teachers can form teams and support each other, IT teachers work in isolation.

T1#1 paints a stark picture of isolation and lack of support faced by many IT teachers in high schools. The immense challenge of single-handedly navigating the ever-evolving world of technology, designing engaging curriculum, troubleshooting technical issues, and motivating students is all done without the vital collaboration and knowledge-sharing that other subjects enjoy. This isolation can lead to feelings of being overwhelmed, under-equipped, and discouraged, potentially impacting both teacher well-being and the quality of IT education offered to learners. The absence of a support network also hinders professional development, making it difficult to stay updated on the latest trends and best practices in IT education. This participant also highlights the urgent need for initiatives that address the unique challenges faced by IT teachers, fostering communities of practice, providing access to shared resources, and promoting collaboration to empower them and ultimately enhance the learning experience for students. T5#5 also reiterated that:

This isolation can be tough. If you're struggling to find teaching methods that work for your students, there's no one who comes in to help or to ask for advice. This can lead to feeling trapped and feeling ineffective. We need opportunities to connect with colleagues, share resources, and learn from each other. If we have a stronger community of practice or dedicated professional development, we could break the impasse of this isolation and become more effective educators for our students.

The participant gives a picture of the emotional and professional toll that IT teacher isolation can have. T5#5 highlights the immense difficulty of navigating challenges without access to support or collaboration. The feeling of being "trapped" and "ineffective" emphasizes the emotional burden isolation carries, potentially leading to burnout and diminished job satisfaction. The participant also calls for "opportunities to connect with colleagues" reflecting a yearning for a collaborative learning environment where resources, strategies, and experiences can be

shared. This desire for a "stronger community of practice" underscores the belief that peer interaction and professional development are crucial for growth and effective teaching. Ultimately, the participant reveals a deep understanding of the detrimental impact of teacher isolation and a passionate plea for a more collaborative and supportive educational ecosystem. Another strong point was made by T2#2 which supports the claims made by T1#1:

The singular availability of IT within my cluster underscores the potential challenges faced by instructors specializing in less prevalent subjects. The recent discontinuation of IT subject at a neighboring school further emphasizes the vulnerability of such offerings due to fluctuating student enrollment. Consequently, opportunities for intra-cluster collaboration are severely limited, often necessitating the pursuit of connections beyond immediate boundaries. Unfortunately, these attempts may prove unsuccessful, resulting in a sense of isolation and a lack of readily available peer support, which can negatively impact professional development and teaching effectiveness.

The absence of peer collaboration can significantly hinder the professional development and pedagogical efficacy of isolated IT educators. Without colleagues to engage in constructive dialogue and knowledge exchange, these instructors may struggle to identify and address potential limitations in their own teaching approaches. This isolation can lead to stagnation, perpetuating potentially ineffective instructional strategies due to the lack of peer feedback and support for innovation. The experience of T2#2, teaching IT as the sole instructor in her entire school district, exemplifies this challenge. Carrying the full responsibility of the curriculum without the benefit of collaborative learning underscores the profound impact of isolation on both the professional well-being and pedagogical effectiveness of IT educators. In certain ways, T4#4's observation is consistent with T1#1's, which was recorded as follows:

While fortunate to have a supportive Head of Department (HOD) within my school, limitations emerge during external training workshops. These

workshops, intended to facilitate the teaching of complex topics, frequently involve presenters with extensive industry experience but limited pedagogical expertise. This dissonance can render the training less effective for educators like me. In essence, presenters lack the specialized skillset of knowledge transfer, and the absence of functional Professional Learning Groups (PLGs) further exacerbates the issue. The establishment of robust PLGs, grounded in pedagogical principles and facilitated by knowledgeable practitioners, could demonstrably improve the efficacy of such training initiatives for educators seeking to enhance their instructional practices.

T4#4's experience deviates from the previous narratives by highlighting the limitations of external training for educators, even within a supportive departmental setting. Despite having departmental support, T4#4 encounters a recurring challenge: a mismatch between trainers' expertise and educator needs. These workshops frequently engage industry professionals with limited pedagogical expertise, resulting in knowledge transfer that is less effective for educators seeking practical teaching strategies. This pedagogical disconnect is further exacerbated by the absence of functional Professional Learning Groups (PLGs). The lack of these collaborative networks restricts opportunities for peer learning and support, which are crucial for translating training insights into effective classroom practices.

4.3.3 High dropout rate of Information Technology learners

The high dropout rate among Information Technology (IT) learners in South Africa is a concern among educational communities. Lack of digital resources is a major hurdle, with many students facing limited access to technology, reliable internet, and proper study environments. This can be compounded by inadequate academic preparation, particularly in mathematics and science, which form the foundation for many IT programming concepts. Additionally, the curriculum itself may not always keep pace with the rapidly evolving IT industry, leaving learners feeling unprepared for the practical demands of the workforce. Furthermore, a lack

of efficient support systems within institutions, coupled with limited career guidance and mentorship, can leave students feeling isolated and unsure of their career path, leading to discouragement and ultimately, dropping out. The subject is abstract by nature and thus students hardly conceptualise it. Many students find programming difficult for a combination of reasons. It requires a shift in thinking from natural language to a precise, logical language understood by computers. This involves mastering syntax, rules, and unfamiliar structures, which can feel abstract and challenging compared to everyday communication. Additionally, programming demands strong problem-solving and analytical skills to break down complex tasks into smaller, solvable steps. Debugging errors, where even a single misplaced comma can cause issues, can be frustrating and lead to feelings of inadequacy leading to dropping out of the subject. The sheer volume of information to learn, from different programming languages to algorithms and data structures, can be overwhelming, especially for learners in Grade 10. Furthermore, the lack of immediate visual feedback or concrete results can be discouraging, leaving some students questioning their progress and struggling to stay motivated. The participants asserted the same claim that learners find the subject very difficult. T3#3 remarked,

Learners find the subject very difficult particularly when teaching the nested if loops, looping structures arrays and databases. Generally, learners do not like to solve mathematically related problems. Thus, when they move to upper grades, they drop IT. This subject requires a strong foundation in mathematics. While many Grade 10 students choose it with the expectation of focusing solely on Microsoft Suite applications, they discover that the course delves deeper into programming concepts. This can lead to challenges for some students, particularly when mastering fundamental syntax elements like "if...else" statements.

T1#1 highlights a potential mismatch between student expectations and the actual content of a Grade 10 computer science course. While many students choose the subject expecting to focus solely on Microsoft Office applications, they discover

that the curriculum dives deeper into programming concepts, requiring a solid foundation in mathematics. This shift in focus can present challenges for some students, especially when grappling with fundamental syntax elements like "if...else" statements. This suggests a need for clearer communication about the true nature of the course content to ensure students are adequately prepared and equipped to handle the academic demands of IT. T3#3 also commented that,

Lower performance in IT compared to other subjects can be discouraging for some learners, potentially leading them to consider dropping the subject or switching to CAT.

T3#3 highlights a potential issue surrounding student engagement in IT courses which may lead them to eventually drop out. The participant suggests that learners who perform lower in IT compared to other subjects might experience discouragement, which could lead them to consider abandoning the subject entirely or opting for a different one, which can be a subject which they perceive as easier compared to IT.

4.3.4 School-based support systems for IT teachers

School Based Support Teams (SBSTs) can provide multifaceted support to IT teachers, including addressing technical challenges, facilitating software installation and configuration, and collaborating on technology integration aligned with learning objectives (Smith, 2021). Additionally, SBSTs can support students with technological difficulties, promote safe technology practices, and bridge communication between IT teachers and stakeholders to advocate for resources and professional development (Johnson, 2018). These comprehensive efforts underscore SBST's crucial role in optimizing technology use for educational purposes.

However, IT teachers in South Africa face a concerning tide of student dropouts, and the intended support systems within schools often face limitations. Overcrowded classrooms with diverse student backgrounds challenge teachers' ability to provide individualized attention, particularly for those struggling with programming concepts (Brown, 2020). Outdated equipment and limited

technology access further hinder engagement in practical learning (Davis, 2019). Additionally, while the curriculum adapts to the evolving IT industry, it can lag, placing the burden on teachers to bridge the gap with limited resources and training (Wilson, 2023). Moreover, inadequate career guidance and mentorship systems deprive students of crucial support in understanding the complexities of the IT field, leading to uncertainty and disillusionment (Adams, 2022). This lack of holistic support leaves IT teachers under-equipped to address the multifaceted reasons behind student dropouts, resulting in a sense of overwhelm T1#1 mentions that:

While our school maintains a School Based Support Team (SBST), it has not, to date, provided sufficient support for effective teaching and learning within the IT curriculum. This necessitates that I independently address any technical challenges that arise, which can be quite time-consuming. To enhance the learning experience for students, the implementation of an SBST member specifically dedicated to facilitating the IT curriculum is highly recommended.

T1#1 reveals that there is a significant gap in the current School Based Support Team's (SBST) structure. The participant highlights that the SBST lacks the capacity to adequately support the unique needs of the IT curriculum. This results in the educator having to independently troubleshoot technical issues, which diverts valuable time away from their primary teaching responsibilities. T1#1 calls attention to a clear course of action: the inclusion of an SBST member who possesses the expertise to directly facilitate IT instruction and address technical issues. This would alleviate the burden on the IT educator, allowing them to focus on teaching and improve the overall student learning experience in the IT classroom. T3#3 shares similar sentiments as she commented:

Our school has a School Based Support Team (SBST) on paper. However, this team appears to be non-functional in addressing the specific requirements of the IT curriculum. Consequently, we end up having a lot of

problems ranging from the infrastructure functionality and learners dropping the subject."

Similar to T1#1, T3#3 discloses a critical concern regarding the effectiveness of the School Based Support Team (SBST) within the school. While the SBST ostensibly exists, T3#3 suggests it is not operational in addressing the specific requirements of the IT curriculum. This ineffectiveness compels the teacher to divert valuable time and resources away from their core teaching responsibilities, potentially contributing to issues like infrastructure malfunction and student disengagement from the subject. T4#4 added:

The current School Based Support Team (SBST) at our school seems to lack the necessary expertise to address the high dropout rate of the learners in IT. I believe that the SBST would benefit from targeted training workshops to equip them with the knowledge and skills necessary to effectively support IT teachers. This would be particularly valuable in addressing the daily challenges such as providing guidance to the learners about the importance of IT in their future endeavors."

T2#2 commented that:

As a newly qualified teacher, I was unaware of the existence of the School Based Support Team (SBST). Unfortunately, my induction process did not comprehensively cover the intricacies of the school hierarchy, including the structure and function of various support entities. Consequently, I have developed a habit of independently addressing challenges I encounter, without fully utilizing available resources.

T4#4 highlights that as a newly qualified teacher the participant was not made aware of the existence of the School Based Support Team (SBST), indicating a potential gap in the onboarding process for new teachers. This means that induction programs seem to lack sufficient coverage of the school's internal structure and support systems, including the roles and responsibilities of entities like these. As a result of this limited awareness, the teacher has adopted a pattern

of self-reliance when addressing challenges, rather than seeking out available resources.

4.3 Data Analysis

Qualitative data analysis encompasses various methodologies for extracting meaning from diverse data sources, ranging from semi-structured interviews to documents. As Savin-Baden & Howell-Major (2013) posit, it involves a systematic process of deconstructing and interpreting data while remaining agnostic to its format. While a fundamental framework may guide the analysis, tailoring the approach to the specific data and research question remains crucial.

Unlike quantitative analysis, qualitative analysis prioritizes depth over volume. The focus lies on meticulously unpacking the data, immersing oneself in its nuances, and recognizing the inherent context and individual experiences embedded within. This process resembles deconstructing a literary work, akin to analyzing characters, plotlines, and underlying themes. However, while a book report summarizes the key points, qualitative analysis aims to distill the essence of the data without losing its richness and complexity. The challenge lies in effectively conveying the depth and context while crafting a coherent and meaningful interpretation.

Drawing on teacher experiences, this study examined the underlying causes of high dropout rates in township schools. This study employed thematic analysis, a versatile and robust methodology for qualitative data exploration across diverse theoretical frameworks (Braun & Clarke, 2006). This approach aligns well with the study's aim of understanding experiences, thoughts, and behaviors. Thematic analysis transcends paradigmatic boundaries, serving effectively in post-positivist, constructivist, or critical realist research (Braun & Clarke, 2006). Notably, the constructivist orientation, emphasizing the social, cultural, and structural shaping of individual experiences, aligns particularly well with thematic analysis. As Braun & Clarke (2006) define, a theme represents a "patterned response or meaning" arising from the data, illuminating the research topic. It operates at a more abstract level than categories, requiring deeper interpretation and integration of the

"manifest content" (Nowell et al., 2017). Thematic analysis facilitates the identification of themes regardless of their frequency within the data set.

During data presentation, the following themes were identified: Need for continuous professional development; High dropout rate of Information Technology learners; School-based support systems for IT teachers; Curriculum transformation, Lack of computing resources in schools, Need for communities of practice.

4.4 Conclusion

The research underscores the critical importance of IT education in the 21st century. Its calls for an emergent implication of equipping learners with the necessary skills to navigate the digital world, bridge societal divides, and develop essential competencies like critical thinking and problem-solving. This fosters their preparedness for future opportunities in an increasingly technology-driven world.

However, the research acknowledges significant challenges hindering the effective implementation of IT education. Unequal distribution of resources across schools exacerbates existing inequalities by creating disparities in access to technology and internet connectivity. Additionally, the abstract nature of IT, particularly its theoretical underpinnings, can pose difficulties for some learners, demanding strong analytical and problem-solving abilities. Furthermore, the demanding nature of the subject, with an emphasis on programming, can lead to student discouragement and subject abandonment, resulting in high dropout rates. Finally, the review highlights the crucial yet often neglected aspect of inadequate teacher training and support. The lack of robust professional development opportunities and ongoing support for IT educators hinders their effectiveness in delivering engaging and impactful instruction.

The research explores potential solutions to address the identified challenges and promote effective IT education. Equipping schools with up-to-date hardware, software, and high-speed internet access is crucial to provide learners with the necessary technological infrastructure. Additionally, developing engaging and relevant curricula tailored to local needs, incorporating real-world projects, and

prioritizing the development of problem-solving and critical thinking skills is essential for fostering student motivation and engagement. The study also emphasizes the importance of investing in ongoing teacher training and support. Providing workshops, mentorship programs, and opportunities for collaboration empowers educators with effective pedagogical strategies and fosters a supportive learning environment. Introducing IT skills at an early age fosters digital literacy, computational thinking, and creativity, while addressing ethical considerations to ensure responsible and safe engagement with technology.

Finally, the research introduces the Multi-level Framework (MLF) as a valuable tool for understanding the interconnected factors influencing IT education. This framework emphasizes the importance of examining various levels, including individual learners, classrooms, schools, and districts, to gain a holistic understanding of the challenges and potential solutions. By adopting a multi-level approach, stakeholders can develop comprehensive and effective strategies to address the complexities of IT education in township schools.

This thematic analysis reveals a nuanced picture of IT education in South African township schools. While acknowledging the undeniable importance of IT education for student success in the 21st century, the research also sheds light on the significant challenges that must be addressed. By implementing evidence-based strategies and utilizing frameworks like the MLF, stakeholders can work towards creating a more equitable and effective learning environment, ultimately equipping students with the necessary skills and knowledge to thrive in the digital age.

Chapter Five: Discussion

Building upon the established presence of a digital divide, this chapter delves into its ramifications within the realm of Information Technology (IT) education. Characterized by unequal access to technology and information resources, this persistent disparity acts as a significant barrier to achieving equitable opportunities in the field. The ramifications extend beyond the individual level, potentially hindering societal progress and inclusivity. Therefore, this chapter emphasizes the crucial role of accessible and inclusive IT education in addressing the digital divide and fostering a more equitable landscape.

5.1 Discussions

This research delves into the multifaceted challenges faced by IT educators in South Africa. The analysis highlights several key themes demanding scholarly discourse and proposes potential solutions.

The study emphasizes the critical need for ongoing professional development opportunities for IT educators. The rapid pace of technological advancement necessitates continuous learning to maintain pedagogical relevance in the face of evolving algorithms, software iterations, and emerging technologies (Smith, 2021). However, current CPD initiatives often fail to address the practical needs of the IT curriculum, creating a gap between theoretical knowledge and practical classroom application. Recent studies advocate for CPD programs tailored to specific curriculum areas, equipping educators with the necessary skills and instructional strategies for effective teaching (Johnson & Thompson, 2020). South Africa's Curriculum and Assessment Policy Statement (CAPS) outlines a comprehensive framework for fostering digital literacy among learners. However, translating this vision into practical teaching methods remains a challenge (Ngubane & Molefe, 2021). The study underscores the importance of integrating critical thinking, problem-solving abilities, and ethical considerations within the IT curriculum. Additionally, aligning teaching methodologies with the diverse needs of student cohorts is crucial to ensure holistic development in digital literacy pursuits.

The analysis reveals the detrimental effects of limited computing resources in South African IT classrooms. The persistent digital divide, characterized by a lack of functional

computers and reliable internet access, exacerbates teaching difficulties, and discourages students (Chimhavi & Manzira, 2022). Addressing this issue requires improved maintenance protocols, ensuring operational infrastructure, and implementing strategies to prevent overcrowding in computer labs. CoPs serve as valuable platforms for IT educators to share knowledge, collaborate, and support each other's professional growth (Williams & Bisschoff, 2021). The lack of well-established CoPs hinders educators' ability to effectively navigate pedagogical challenges, potentially leading to feelings of isolation and burnout. The analysis identifies a potential link between the scarcity of computing resources and the rising dropout rates among IT learners. A combination of factors, including inadequate academic preparation and a lack of support mechanisms, contributes to student attrition. Concerted efforts are needed to strengthen academic preparation and foster supportive learning environments (Molefe & Ngwenya, 2020).

Furthermore, overcrowded classrooms, outdated equipment, and limited access to technology within schools often lead to a one-size-fits-all teaching approach, hindering educators' effectiveness and negatively impacting student retention and academic outcomes (Chimhavi & Manzira, 2022). A multifaceted approach prioritizing continuous professional development, curriculum reform, equitable resource allocation, establishment of CoPs, and enhanced school-based support systems is necessary to address these challenges. Research suggests several factors contributing to the decline in student enrollment and high dropout rates in IT classes at higher grade levels. Moreover, the abstract nature of programming concepts, particularly as students' progress to higher grades, presents a significant hurdle (Jones & Smith, 2022). Transitioning from natural language to the precise, logical language of computers necessitates mastery of syntax, rules, and unfamiliar structures. This can be daunting, especially when compounded by the need for strong problem-solving and analytical skills. Debugging errors, where minor mistakes can disrupt program functionality, can further erode student confidence. The vast amount of information encompassed within the IT curriculum, ranging from various programming languages to algorithms and data structures, can overwhelm learners, especially in higher grades with more complex coursework (Taylor & Johnson, 2022). The cumulative effect of these challenges can lead to feelings of inadequacy and frustration, prompting some students to opt for alternative subjects perceived as less demanding. The

absence of immediate visual feedback or concrete results in programming can diminish student motivation and engagement, particularly in higher grades where abstract concepts predominate (Brown & Wilson, 2022). This lack of progress markers may exacerbate feelings of uncertainty and contribute to a decline in student interest over time.

These findings highlight the multifaceted challenges inherent in IT education in South Africa. Addressing these issues requires a comprehensive approach that prioritizes continuous professional development for educators, curriculum reform, equitable resource allocation, fostering collaborative learning environments, and strengthening school-based support systems. Collaborative efforts among researchers and policymakers are crucial to develop a more effective and inclusive pedagogical approach that fosters digital literacy among South African learners.

5.2 Response to the research questions

1. *What are the challenges reported by Information Technology teachers for teaching IT as a subject in South African township schools?*

Information Technology (IT) teachers in South African township schools face a myriad of challenges that hinder their ability to effectively teach IT as a subject. A significant hurdle is the lack of adequate resources and infrastructure. Teaching is still characterized by traditional methods (teacher-centered education) as the teachers dominate the learning process due to lack of resources. Many schools lack basic computer labs, reliable internet connectivity, and up-to-date software, making it difficult to provide hands-on learning experiences. Additionally, overcrowded classrooms and limited individualized support for students exacerbate the problem. Furthermore, socioeconomic factors in townships, such as poverty and limited access to technology outside of school, create a significant digital divide. This can contribute to learners having unequal levels of prior technological knowledge and skills, posing difficulties for teachers catering to diverse student needs. These compounding factors create a challenging environment for IT teachers in township schools, limiting their capacity to deliver a quality IT education.

2. *How do Information Technology teachers in township schools perceive the effectiveness of their current teaching strategies in addressing the high dropout rate of Information Technology learners?*

In the South African context, Information Technology (IT) teachers in township schools often find themselves grappling with the challenge of high dropout rates among their learners. While some teachers may feel their current strategies are contributing to student retention, others perceive challenges rooted in factors beyond their immediate control. These challenges include the persistent socioeconomic disparities facing learners in townships, where limited resources and a lack of technology access at home can create significant barriers to engagement and progress in IT subjects. Additionally, insufficient infrastructure within township schools, such as under-equipped computer labs and unreliable internet connectivity, further impede effective IT instruction.

3. What roles do school-based support systems play in assisting IT teachers to influence learners not to drop the subject?

The school-based support systems play a crucial role in assisting IT teachers to influence learners not to drop the subject. These support systems, which can include guidance counselors, academic mentors, peer-tutoring programs, and specialized technology support staff, provide a multifaceted approach to address the challenges that may lead learners to abandon IT. School-based support systems can proactively identify learners at risk of dropping the subject and intervene early, offering tailored remedial programs or connecting students with resources outside of the classroom to address any underlying issues. However, the research revealed that the school-based support system does not offer things such as guidance counselors, academic mentors, peer-tutoring programs, and specialized technology support staff that may help in reducing drop-rate of learner in IT subject. They do not offer academic assistance to those struggling with the material, helping to bridge knowledge gaps and improve understanding. Additionally, there is no provision of much-needed emotional support and encouragement, fostering a sense of belonging and competence that can counter feelings of frustration or discouragement.

What are the experiences of Information Technology teachers with regards to the high dropout rate of Information Technology learners at in South African Township schools?

Information Technology teachers in South African township schools often report a complex set of intertwined challenges that contribute to the high dropout rate among IT learners. Limited access to essential technology infrastructure, from unreliable internet connectivity to a lack of sufficient computers, poses a significant barrier. Socioeconomic disadvantages play a critical role, as many students in these areas struggle with inadequate resources at home, making it difficult to complete assignments or engage in self-directed learning outside of school hours. Additionally, teachers may find themselves grappling with a lack of continuous professional teacher development to effectively teach IT subjects in a dynamic and rapidly changing field. Furthermore, learners may lack clear guidance on potential career paths in IT, hindering their motivation and perception of the subject's relevance in addressing their future aspirations resulting in them dropping the subject.

5.3 Conclusion

This study unveiled the numerous challenges hindering effective IT education in South Africa, particularly within township schools. A multi-faceted approach is crucial to address these issues. Limited resources like functional computers, reliable internet, and outdated software restrict practical learning opportunities. Traditional teacher-centered methods prevail due to resource constraints, limiting student engagement and interactivity. Overcrowded classrooms further impede individualized attention for students with diverse needs. The digital divide widens the gap as unequal access to technology outside of school creates discrepancies in prior knowledge and skills. Inadequate professional development programs fail to equip educators with the necessary tools to adapt their teaching methods in this rapidly evolving field. These factors, coupled with a lack of guidance on potential career paths in IT, contribute to the concerning high dropout rates.

To address these challenges, continuous professional development must be prioritized to equip educators with the necessary skills for the ever-changing technological landscape. Curricular reform should focus on aligning the program with the demands of the digital world, emphasizing critical thinking, problem-solving, and ethical considerations. Additionally, equitable resource allocation is essential to bridge the digital divide by ensuring schools have access to functional technology and reliable internet. Furthermore, establishing Communities of Practice (CoPs) can foster collaboration among educators,

enabling them to share knowledge, develop effective strategies, and combat feelings of isolation. Strengthening school-based support systems through programs like academic mentoring, peer tutoring, and dedicated technology support can address individual student needs and prevent dropouts.

Moving forward, further research is needed to explore the specific challenges faced by IT educators in different regions. Investigating the potential of technology-assisted learning tools can enhance student engagement and address limitations caused by resource constraints. Lastly, developing targeted interventions to address the underlying socioeconomic factors that contribute to the digital divide and unequal access to technology is crucial. By implementing these recommendations, South Africa can create a more effective and inclusive IT education system, equipping students with the necessary digital literacy skills to flourish in the 21st century.

Chapter Six: Conclusion

Introduction

This chapter concludes our exploration of high dropout rates in township IT education. The preceding chapters provided a comprehensive overview: Chapter 1 highlighted the concerning decline in IT education offerings and high dropout rates in South African township schools. Chapter 2 explored the existing literature on challenges hindering effective IT education. Chapter 3 described the qualitative research methodology employed, utilizing interviews with IT educators. Chapter 4 presented the research findings, revealing key themes from educator experiences. Chapter 5 discussed the findings in relation to existing research and proposed strategies for improvement. This chapter concludes by having a brief discussion of the preceding chapters, providing possible recommendations and implications for future research, including incorporating student voices and investigating targeted interventions. By expanding the scope and conducting further studies, we can work towards a future where IT education is accessible and engaging for all students in township schools.

6.1 Overview of the study

The research sets the stage for the growing importance of Information Technology (IT) skills in the 21st century. The concern of the research is a sharp decline in the number of schools offering IT education and a high dropout rate among students enrolled in the subject. The study emphasizes the crucial role of IT education in equipping students with critical 21st-century skills, such as computational thinking, data analysis, and problem-solving. It explores the challenges faced by IT educators in South African township schools, including limited resources and infrastructure, which can lead to student discouragement. It recognizes the need for further research to delve deeper into the experiences of IT educators and identify solutions to address the identified challenges.

The literature then delves into the existing body of research on IT education. It acknowledges the growing importance of IT literacy in today's world. However, it also identifies key obstacles that hinder effective IT education, such as unequal distribution of resources across schools, the abstract nature of IT concepts that can be difficult for students to grasp, factors leading to student demotivation, and insufficient support for IT

teachers. Additionally, the chapter explores the confusion that sometimes arises between IT and Computer Applications Technology (CAT). The literature review goes on to highlight the potential benefits of a robust IT education program, including bridging the digital divide, fostering critical thinking skills in students, and promoting responsible digital citizenship. Recognizing the complexities involved, it then calls for a multi-faceted approach to create a more equitable and effective IT learning environment for all students.

The research investigated the lived experiences of IT educators working in South African township schools. In recognition of the subjective nature of these experiences and the influence of social context, a qualitative research design was adopted. This approach prioritizes in-depth understanding through methods that capture the richness of individual narratives. Specifically, the study utilized semi-structured interviews to engage with IT educators. This method allows for flexibility while ensuring that key areas of inquiry are explored. To gain a comprehensive picture, a case study design was used, focusing on a real-world South African township school setting. This approach enables capturing both the unique challenges and commonalities faced by IT educators within this context. Purposive sampling ensured targeted participant selection. IT teachers working in the Further Education and Training (FET) phase (Grades 10-12) at public schools were chosen to participate in the study.

Thematic analysis serves as the primary method for analyzing the transcribed interview data. This rigorous technique involves identifying recurring patterns and themes within the educators' narratives, leading to a deeper understanding of their experiences. Ethical considerations were paramount throughout the research process. It critically discussed the importance of informed consent, confidentiality, anonymity, and participant well-being to ensure a safe and respectful research environment. By employing these robust qualitative methods, the study seeks to gain valuable insights into the lived experiences of IT educators in township schools, ultimately contributing to addressing the challenges hindering effective IT education in these contexts.

The research findings are meticulously analyzed and compared to the existing body of literature on IT education challenges. This critical analysis allows for a deeper understanding of how the experiences of IT educators in South African township schools

align with, or diverge from, broader trends documented in research. Following this analysis, the research delves into the practical implications of the research findings. By illuminating the challenges faced by IT educators, the study offers valuable insights for policymakers and practitioners working to improve IT education policy and practice in South Africa. Specific strategies to address the identified challenges and improve IT education outcomes in township schools are proposed. These strategies may encompass recommendations for enhanced professional development programs for IT educators, curriculum revisions that ensure a balance between technical skills and critical thinking, and initiatives to bridge the digital divide.

It concludes by acknowledging the need for further exploration in this crucial area. Recommendations for future research on IT education in developing contexts are presented. These recommendations may include suggestions for expanding the scope of inquiry to encompass a wider range of township schools or exploring the experiences of students alongside those of educators. By fostering ongoing research efforts, the study ultimately aims to contribute to a more equitable and effective IT education landscape for all students in South Africa.

6.2 Limitations of the study

This study acknowledges the limitations inherent in its methodological design and sampling strategy. The exclusive reliance on interviews introduces subjectivity, restricting the findings to the participants' perspectives. Future research could benefit from incorporating a wider range of data collection methods, such as classroom observations or document analysis of school records. Employing a mixed methods approach, which integrates qualitative and quantitative data, would offer a more comprehensive understanding of the phenomenon under investigation. By combining quantitative data's breadth and generalizability with qualitative data's depth and context, a mixed methods approach can illuminate not only the "what" but also the "why" and "how" of the studied phenomenon. Furthermore, the geographically restricted sample, confined to five public schools within three Johannesburg districts due to Department of Education access limitations, restricts the generalizability of the findings. Ideally, future research would encompass a broader range of public schools across diverse township contexts, capturing

the inherent variations within these communities. This broader scope could potentially reveal more nuanced and generalizable insights.

This study recognizes the limitations imposed by its methodology and sample. The potential for subjectivity and the restricted generalizability due to geographical and institutional constraints are acknowledged. Future research endeavors should strive to overcome these limitations by employing a wider range of data collection methods and encompassing a more diverse and representative sample, thereby enhancing the comprehensiveness and generalizability of the research findings.

6.3 Recommendations

This study aimed to investigate the factors contributing to high dropout rates among IT learners in South African public schools, with a particular focus on schools within townships. The research draws on the experiences of teachers at these institutions, revealing a key theme: a lack of resources and inadequate infrastructure within public schools significantly hinder effective IT instruction. This frequently leads to students abandoning the subject altogether. Addressing these challenges requires a multifaceted approach, as neglecting them perpetuates the cycle of disengagement and dropout.

Based on the study's findings, several recommendations can be formulated to address this issue:

1. Infrastructure and Technology Investment:

- Modernize essential classroom technology infrastructure (reliable internet, updated computers, relevant software) in a phased approach.
- Build more computer laboratories to avoid overcrowding in classrooms.

2. Teacher Support and Training:

- Equip IT teachers with training in both technical skill enhancement and innovative pedagogical approaches to foster student engagement.
- Foster knowledge transfer and professional growth through experienced IT teachers mentoring newer colleagues to enable continuous development.

- Build a strong support network such as communities of practice (CoPs) within the teaching community through collaborative lesson planning and resource sharing.

3. Addressing Socioeconomic Factors:

- Collaborate with local businesses and organizations to offer internships, mentorships, and exposure to real-world IT applications, addressing student motivation and career guidance.
- Address socioeconomic challenges hindering learning by providing access to computers that have applications relevant to IT related curriculum for home use.

4. Curricular and Pedagogy Considerations:

- Encourage IT teachers to adopt diverse instructional strategies catering to individual needs and skill levels, increasing accessibility and engagement with IT through project-based and interactive learning approaches.

6.4 Implications for future research

This study sheds light on the complex issue of high dropout rates among IT learners in South African township schools. By employing a multilevel framework and qualitative interviews with IT educators, the research offers valuable insights into the lived experiences that contribute to student dropout within this specific context. Building upon these findings, several avenues exist for future research to further enrich our understanding of this phenomenon.

Here are some key recommendations:

Expanding the research scope to include the perspectives of students alongside educators would provide a more comprehensive picture. Understanding student experiences, motivations, and challenges related to IT education in township schools can lead to more effective intervention strategies. Future research could investigate the effectiveness of specific intervention strategies designed to address the identified challenges. This could involve piloting and evaluating programs that provide adequate resources, strengthen learner support systems, or promote positive societal perceptions of IT careers. While this study focused on township schools in South Africa, the high dropout rates in IT education

may be a broader issue. Future research could explore the generalizability of these findings by investigating IT education dropout rates in different contexts, both within South Africa and internationally. Longitudinal studies tracking students over time could provide valuable insights into the long-term impacts of IT education experiences, particularly for those who drop out. This type of research could help to identify critical junctures where interventions might be most effective in retaining students in IT education programs.

By pursuing these future research directions, we can gain a deeper understanding of the factors influencing IT learner dropout in township schools. This knowledge can then be used to develop and implement targeted interventions aimed at improving IT education outcomes and fostering a more inclusive and equitable learning environment for all students.

6.5 Conclusion

This study investigated the concerning issue of high dropout rates among IT learners in South African township schools, employing the Multilevel Framework (MLF) for a comprehensive understanding (Bryk et al., 2015; Bryk & Raudenbush, 2012). Qualitative interviews with IT teachers provided valuable insights into their lived experiences, revealing key factors contributing to student dropout within the township context. Thematic analysis unearthed the complex interplay of individual, institutional, and socioeconomic factors influencing the phenomenon (Braun & Clarke, 2006).

The findings echo existing literature highlighting the multifaceted nature of student dropout across diverse educational settings (Pascarella & Terenzini, 2005; Tinto, 1993). Notably, the study identified the following themes: Need for continuous professional development; High dropout rate of Information Technology learners; School-based support systems for IT teachers; Curriculum transformation, Lack of computing resources in schools, Need for communities of practice. The lack of adequate resources, limited learner support structures, and negative societal perceptions of IT careers as significant contributors to dropout within the township schools (Adedoyin & Jegede, 2019).

This research contributes significantly to ongoing efforts aimed at improving access to and success in IT education for all learners. By shedding light on the specific challenges faced by both IT teachers and students in the township context, the findings inform the

development of targeted interventions. These interventions might encompass providing adequate resources, strengthening learner support systems, and fostering positive societal perceptions of IT careers through collaborative efforts between educators, policymakers, and community organizations (Cho & Fouad, 2011). Future research endeavors could further enrich the understanding of this phenomenon by considering the following recommendations. Exploring the perspectives of students alongside educators would offer a more comprehensive understanding of the factors influencing IT learner dropout in township schools. Investigating the effectiveness of specific intervention strategies tailored to the identified challenges could contribute further to improving learner outcomes in IT education.

This multi-faceted approach, encompassing both the MLF and the inclusion of teacher experiences, has provided valuable insights into the dropout phenomenon in township IT education. It paves the way for the development of effective and targeted interventions, ultimately contributing to improving learner outcomes and fostering a more inclusive and equitable IT education landscape for all.

References

Ahmed, A. (2008). Ontological, Epistemological and Methodological Assumptions: Qualitative versus Quantitative.

- Albuquerque, U. P., Lucena, R. F., & Freitas, P. D. (2014). Selection of research participants. In *In Methods and techniques in ethnobiology and ethnoecology* (pp. 1-13). New York: Humana Press.
- Aldowah, H., Al-Samarraie, H., Alzahrani, A. I., & Alalwan, N. (2020). Factors affecting student dropout in MOOCs: a cause and effect decision-making model. *Journal of Computing in Higher Education: Volume 32*, 429–454.
- Alenezi, A. (2023). Using Project-Based Learning Through the Madrasati Platform for Mathematics Teaching in Secondary Schools. *International Journal of Information and Communication Technology Education (IJICTE)* 19(1).
- Alharahsheh, H. H., & Pius, A. (2020). A review of key paradigms: Positivism VS interpretivism. *Global Academic Journal of Humanities and Social Science*, 39-43.
- Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria. *Journal of emerging trends in educational research and policy studies*, 272-281.
- Anyango, J. T., & Suleman, H. (2018). *Teaching Programming in Kenya and South Africa: what is difficult and is it universal?* Cape Town.
- Aspers, P., & Corte, U. (2019). What is qualitative in qualitative research. *Qualitative sociology*, 139-160.
- Azungah, T. (2018). Qualitative research: deductive and inductive approaches to data analysis. *Qualitative research journal*.
- Barlow-Jones, G. (2014). Novice Students and Computer Programming: Toward Constructivist Pedagogy. *Mediterranean Journal Of Social Sciences*, 240-252.
- Barlow-Jones, G. (n.d.). Male vs Female IT Student Numbers: what do the stats say.
- Bell, B. S., & Kozlowski, S. W. (2009). Toward a Theory of Learner-Centered Training Design: An Integrative Framework of Active Learning. In *Learning, Training, and Development in Organizations* (p. 38).
- Bell, T., AndreaE, P., & Lambert, L. (2010). Computer Science in New Zealand High Schools. *Australasian Computing Education Conference*, 15-22.
- Blažič, B. J. (2022). Changing the landscape of cybersecurity education in the EU: Will the new approach produce the required cybersecurity skills? *Education Information Technology* 27, 3011–3036.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 77-101.
- (2020). *BROKEN AND UNEQUAL: The state of South Africa Education*. London: Amnesty International.

- Carvalho, A. R., & Santos, C. (2022). Developing peer mentors' collaborative and metacognitive skills with a technology-enhanced peer learning program. *Computers & Education Open*.
- Chiang, I.-C. A., Jhangiani, R. S., & Price, P. C. (2015). *Research Methods in Psychology – 2nd Canadian Edition*. BCcampus.
- Christie, P. (2008). *Opening the doors of Learning changing schools in South Africa*. Johannesburg: Heinemann.
- Creswell, J., & Poth, C. (2017). Qualitative Inquiry and Research Design: Choosing among Five Approaches. *Open Journal of Nursing*.
- (2012). *Curriculum Assessment Policy Document*. : Department of Basic Education.
- Department of Basic Education. (2021). *Information Technology NCS November 2020 Diagnostic Report*. Johannesburg: Department of Education.
- Doody, O., & Noonan, M. (2013). Preparing and conducting interviews to collect data. *Nurse researcher*.
- Dzanzi, D., & Amedzo, K. (2014). Intergrating ICT into Rural South African Schools: Possible solutions for Challenges. In *Department of Business Support Studies, Faculty management Sciences* (pp. 341-348). Central University of Technology, Free State, University of South Africa.
- Flyvbjerg, B. (2011). Case study. *The Sage handbook of qualitative research*, 301-316.
- Gage, N. L. (1989). The paradigm wars and their aftermath: a Historical Sketch of teaching since 1989. *Educational Researcher* 18(7), 4-10.
- Graue, C. (2015). Qualitative data analysis. *International Journal of Sales, Retailing & Marketing*, 5-14.
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. *Handbook of qualitative research*, 105.
- Hightower, A., Wiens, P., & Guzman, S. (2021). Formal mentorship and Formal Mentorship and instructional practices: a Teaching and Learning International Survey (TALIS) study of US teachers. *International Journal of Mentoring and Coaching in Education*.
- Jesionkowska, J., Wild, F., & Deval, Y. (2020). Active Learning Augmented Reality for STEAM Education—A Case Study. *Education Sciences*.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher* Johnson, R. B., & Onwuegbuzie, A. J. . (2004). *Mixed methods research: A research paradigm whose time has come. Educational researcher*, 14-26., 14-26.

- Koorse, M., Calitz, A. P., & Cilliers, C. B. (2010). Programming in South African Schools: The inside story.
- Koorse, M., Cilliers, C. B., & Calitz, A. P. (2010). Motivation and Learning Preferences of Information Technology Learners in South African Secondary Schools.
- Kotsopoulos, D., Floyd, L., Khan, S., Namukasa, I. K., Somanath,, S., Weber, J., & Yiu , C. (2017). A Pedagogical Framework for Computational Thinking. *Digital Experiences in Mathematics Education: Volume 3*, 154–171.
- Looi, C. K., Chan, S. W., & Wu, L. (2020). Crisis and Opportunity: Transforming Teachers From Curriculum Deliverers to Designers of Learning. In *Radical Solutions for Education in a Crisis Context* (pp. 131–145). Singapore: Springer.
- Mason, J. (1996). *Qualitative researching*. Sage Publications, Inc.
- Miller, D. (2021). The Best Practice of Teach Computer Science Students to Use Paper Prototyping. *International Journal of Technology, Innovation and Management (IJTIM):Vol. 1 No. 2* .
- Moller, F., & Crick, T. (2018). A university-based model for supporting computer science curriculum reform. *Journal of Computers in Education*, 415–434.
- Msila, V. (2015). Teacher Readiness and Information and Communications Technology (ICT) use in Classrooms: A South African Case study. 1974-1981.
- Nair, P. R. (2020). Increasing Employability of Indian Engineering Graduates through Experiential Learning Programs and Competitive Programming: Case Study. *Procedia Computer Science: Volume 172*, 831-837.
- O’Leary, E. S., Shapiro, C., & Toma, S. (2020). Creating inclusive classrooms by engaging STEM faculty in culturally responsive teaching workshops. *International Journal of STEM Education:Volume 7*.
- Orama, J. O., Wanga, H. P., & Ngumbuke, F. (2012). Challenges of teaching and learning computer programing in developing countries: lessons from Tumaini university. *Proceedings of INTED2012 Conference*, (pp. 3020-3026). Valencia.
- Osei-Asiamah, J. (2019). An investigation of teaching and learning methods in Information Technology: a case study at a selected high school in Kwa-Zulu Natal. 1-169.
- Palinkas, L. K., Green , C., Wisdom, J., & Hoagwood, K. (2013). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Administration and Policy in Mental Health and Mental Health Services Research*.
- Papamitsiou, Z., Giannakos, M., & Luxton-Reilly, A. (2020). Computing Education Research Landscape through an Analysis of Keywords. *ICER '20: Proceedings of*

- the 2020 ACM Conference on International Computing Education Research*, 102–112.
- Paradis, E., O'Brien, B., Nimmon, L., & Bandiera, G. (2016). Design: Selection of data collection methods. *Journal of graduate medical education*, 263-264.
- Passey, D. (2017). Computer science (CS) in the compulsory education curriculum: Implications for future research. *Education and Information Technologies* 22(2).
- Porta, M., Maillet, K., & Gil, M. (2010). Dec-CS: Computer Science Declining Phenomena. *Proceedings of the World Congress on Engineering and Computer Science*.
- Rosen, Y., Wolf, I., & Stoeffler, K. (2020). Fostering collaborative problem solving skills in science: The Animalia project. *Computers in Human Behavior*.
- Roth, K. (2020). Technology in Education: The Ongoing Debate of Access, Adequacy and Equity.
- Royakkers, L., Timmer, J., Kool, L., & Van Est, R. (2018). Societal and ethical issues of digitization. *Ethics and Information Technology*, 127–142.
- Scott, W. R. (2013). Institutions and organizations: Ideas, interests, and identities. *Sage publications*.
- Smith, K., Maynard, N., Berry, A., Stephenson, T., Spiteri, T., Corrigan, D., . . . Smith, T. (2022). Principles of Problem-Based Learning (PBL) in STEM Education: Using Expert Wisdom and Research to Frame Educational Practice. *Education Sciences*.
- Sturman, A. (1997). Social Justice in Education. Australian Education Review. *Australian Council for Educational Research*.
- Syslo, M. M. (n.d.). Implementing Computer Science Curriculum in Schools in Poland Issues, challenges and Practices. *World conference on Computers in Education*. Dublin.
- Vinnervik, P. (2022). Implementing programming in school mathematics and technology: teachers' intrinsic and extrinsic challenges. *International Journal of Technology and Design Education* volume 32, 213–242.
- Wang, L. (2023). The Impact of Student-Centered Learning on Academic Motivation and Achievement: A Comparative Research between Traditional Instruction and Student-Centered Approach. *Journal of Education, Humanities and Social Sciences: Volume 22*.
- Webb, M., Davis, N., Katz, Y. J., Reynolds, N., Chamb, D., & Syslo, M. M. (2017). Computer science in K-12 school curricula of the 21st century: Why, what and when? *Education and Information Technologies* volume 22, 445–468.

- Yin, R. K. (2013). Validity and generalization in future case study evaluations. *Evaluation*, 321-332.
- Zakaria, N., & Yusof, S. A. (2020). Crossing Cultural Boundaries Using the Internet: Toward Building a Model of Swift Trust Formation in Global Virtual Teams. *Journal of International Management: Volume 26, Issue 1*.
- Zhou, X., & Tsai, C. W. (2023). The Effects of Socially Shared Regulation of Learning on the Computational Thinking, Motivation, and Engagement in Collaborative Learning by Teaching. *Education and Information Technologies* , 8135–8152.

Appendix A: Data collection instrument:

Interview guide.

Duration: 15-30 minutes

Participants profile:

1. Could you please elaborate on your relevant academic qualifications and professional experience?
2. What is the extent of your instructional experience, measured in years?
3. How long has your experience in teaching Information Technology curricula been?

Experience teaching IT

- Can you describe your experiences with learners dropping out of Information Technology (IT) in your classes?
- In your opinion, what are the main factors contributing to the high dropout rate of IT learners in South African township schools?
- Have you observed any specific challenges faced by learners from disadvantaged backgrounds in your IT classes?
- What are the biggest challenges you face in teaching IT in a township school environment?
- Are there any specific resource limitations (e.g., technology, infrastructure) that hinder effective IT instruction?
- Have you encountered any difficulties related to the students' access to technology outside of school?
- How do you adapt your teaching strategies to address the diverse learning needs and backgrounds of your students?
- In your experience, what role do school-based support systems (e.g., guidance counselors, career advisors) play in influencing learners to stay engaged with IT?
- How could school-based support systems be further strengthened to better support IT teachers and learners experiencing challenges?

Appendix B: Ethics clearance letter



SCHOOL OF EDUCATION ETHICS COMMITTEE

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

CLEARANCE CERTIFICATE

PROTOCOL NUMBER:

PROJECT TITLE

Experiences of teachers teaching Information Technology: a case study of South African Township Schools

INVESTIGATOR

SETHABILE DLADLA

SCHOOL/DEPARTMENT OF INVESTIGATOR

WSoE

DATE CONSIDERED

07 August 2023

DECISION OF THE COMMITTEE

Approved unconditionally

RISK LEVEL

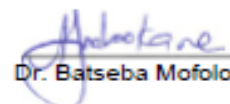
MINIMAL RISK

EXPIRY DATE

Date of submission of the Research Report

ISSUE DATE OF CERTIFICATE

CHAIRPERSON


Dr. Batseba Mofolo-Mbokane

cc: Dr. Alton Dewa



GAUTENG PROVINCE

Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/1/9

GDE RESEARCH APPROVAL LETTER

Date:	09 June 2023
Validity of Research Approval:	08 February 2023– 30 September 2023 2023/198
Name of Researcher:	Diadla S
Address of Researcher:	3924 Mondo Street Lawley Ext 3
Telephone Number:	074 688 7018
Email address:	sethablengabadeli@gmail.com
Research Topic:	Teaching experiences of teachers teaching Information Technology: a case study of South African township Schools
Name of University:	Wits
Type of qualification	Masters
Number and type of schools:	5Secondary Schools
District/s/HO	Ekurhuleni North, Johannesburg South

Re: Approval in Respect of Request to Conduct Research

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

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

Making education a societal priority

Office of the Director: Education Research and Knowledge Management

1st Floor, 17 Simmonds Street, Johannesburg, 2001

Tel: (011) 358 0488

Email: Fakh.Tshabakuku@gauteng.gov.za

Website: www.education.gpg.gov.za

