TSHWANE NORTH FOUNDATION PHASE TEACHERS' VIEWS ON USING INTERACTIVE WHITE BOARDS (IWBS) AS A TEACHING TOOL

LESEGO MANTINA LORRAINE KHUTSOANE

222574429

A Dissertation submitted in fulfilment of the requirements for the Master of Education Degree

Supervisor: Prof E Jansen van Vuuren

Co-supervisor: Dr W Masondo

School of Education

Faculty of Education

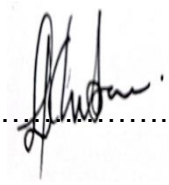
2026

DECLARATION BY RESEARCHER

I, Lesego ML Khutsoane (student number: 222574429), declare that this dissertation is entitled: Tshwane North Foundation Phase Teachers' Views on interactive white boards (IWBS) as a Teaching Tool.

To be submitted to the University of Mpumalanga in partial fulfilment of the requirements for the degree, Master of Education, is my work, and I have not submitted it before for any degree or examination at another higher education institution. All sources used and quoted in this study have been acknowledged as complete references.

Lesego ML Khutsoane
Student number: 222574429

Signature: ……  …… Date: ……2025/12/04……..

ACKNOWLEDGEMENTS

My sincere thanks go to **Prof. Eurika Van Vuuren**, the professor assigned to work with me, for being actively involved in the formative stages of this research. Your expertise in shaping the topic, outlining objectives, and formulating research questions provided this study with a solid foundation.

I would also like to acknowledge with appreciation **all the supervisors, such as Dr W Masondo, who guided me at different stages of this journey**. Though not mentioned by name, their contributions were no less significant. The way each supervisor handed over the “baton” to the next ensured a smooth transition, allowing me to adapt to the different coaching styles, which enriched my growth as a researcher.

I would like to express my heartfelt gratitude to **Dr. Lindiwe Jiyane**, my mentor, for her patience, wisdom, and unwavering guidance throughout this journey. Your encouragement and belief in my potential have been instrumental in helping me see this work through.

To my beloved **mother, Pallota Sethole, and my late father, Samuel Sethole**, I owe a deep debt of gratitude. You taught me that education is wealth that never depreciates and that I must seek, pursue, and run after it. This work is dedicated to your lessons and sacrifices.

A special thank you to my **husband, Maseka, and my son, Tshimologo Khutsoane**, for their patience, encouragement, and for giving me the space and support I needed to dedicate myself fully to this work. Your understanding carried me through long hours of study and reflection.

I am grateful to the **principals, teachers, and department heads from Tshwane North schools** who participated in this study and made their institutions available as research sites. Without your cooperation, this work would not have been possible.

To my dear brother, **Joshua Mbewu**, thank you for your time and effort in proofreading my work and ensuring it improved with every round of feedback from my supervisors. Your dedication has been invaluable.

Above all, I would like to thank **God Almighty** for restoring my health during a difficult period when I was hospitalized and had lost hope of ever completing these studies. His mercy and grace renewed my strength and gave me another chance to pursue this academic dream.

For all the love, encouragement, and unwavering support from those mentioned here, I remain forever grateful.

DEDICATION

To my husband, **Maseka Khutsoane**, your love, patience, and unwavering support carried me through this whole journey. Your encouragement, the sacrifices you made, and your steadfast belief in me gave me the strength to keep going in moments of doubt. You are my bedrock, my greatest blessing, and I want to say thank you for being right there with me every single step of the way.

And

To all my devoted family members and loved ones who stand behind us, offering that quiet strength and encouragement. It is because of you that we can even chase our dreams. Your sacrifices, often unseen, and your unconditional support are truly the bedrock upon which any success is built.

ABSTRACT

This study explored the perceptions and experiences of Foundation Phase teachers in the Tshwane North District regarding the use of Interactive Whiteboards (IWBs) as a pedagogical tool. IWBs are increasingly adopted to promote interactive, multimodal learning; however, their effectiveness depends on teachers' competence, contextual support, and the resources available in their schools. The study addressed the question: How do Foundation Phase teachers perceive and experience the use of IWBs in their teaching practice? There is limited research examining this phenomenon in South African early grade classrooms, where disparities in infrastructure, digital readiness, and teacher training influence technology adoption. This research addresses that gap by foregrounding teachers lived realities in a context characterized by unequal resourcing. A convergent parallel mixed-methods design was employed. Quantitative data were collected through structured questionnaires to measure patterns of IWB availability, frequency of use, and institutional support. Qualitative data were collected through semi-structured interviews to explore teachers' perceptions, classroom practices, and the challenges they face. The two data sets were analysed independently, using descriptive statistics and thematic analysis, and then integrated to identify converging and diverging findings. Teachers valued IWBs for enhancing learner engagement, enabling visual demonstrations, and supporting lesson revision. However, insufficient training in pedagogy, unreliable technical support, and infrastructural inequalities between urban and township schools impeded effective implementation. Teachers with ongoing professional development reported greater confidence and more sustained integration. The study concludes that IWBs can strengthen Foundation Phase teaching if systemic barriers are addressed. Targeted professional development, consistent technical support, and equitable resource allocation are recommended.

Keywords: digital learning, Foundation Phase, interactive whiteboards, mixed methods, teacher perceptions, Tshwane North District.

TABLE OF CONTENTS

Declaration By Researcher 2

Acknowledgements ..... **Error! Bookmark not defined.**

Dedication 4

Abstract ..... **Error! Bookmark not defined.**

CHAPTER 1 12

1.1 **Introduction** ..... **Error! Bookmark not defined.** 2

1.2 **Background to the study** ..... **Error! Bookmark not defined.** 2

1.3 **Rationale of the stud**y ..... **Error! Bookmark not defined.** 3

1.4 **Problem Statement of the study** 14

1.5 **The Purpose of the Stud**y 145

1.6 **Research Questions** 166

1.6.1 Primary Research Question ..... **Error! Bookmark not defined.** 6

1.6.2 Sub-Research Questions ..... **Error! Bookmark not defined.** 6

1.6.3 Research Objectives 16

1.7 **Limitations of the Study** 166

1.8 **Significance of the Stud**y 177

1.9 **Research Design** 18

1.10 **Data Collection** 19

1.10.1 Data Analysis 19

1.10.2 Trustworthiness and Credibility 19

1.10.3 Ethical Considerations 20

1.11 **Overview of Chapters** 21

1.12 **Conclusion** 21

CHAPTER 2: LITERATURE REVIEW..... 222

2.1 Introduction.....222

2.2. Theoretical Frameworks.....**Error! Bookmark not defined.**2

2.2.1 Technology Acceptance Model (TAM .....**Error! Bookmark not defined.**3

2.2.2 Bandura's Social Cognitive Theory (Self-Efficacy) …… **Error! Bookmark not defined.**4

2.3 Factors Influencing Technology Integration in Education.……**Error! Bookmark not defined.**5

2.3.1 School Context and Infrastructure.....**Error! Bookmark not defined.**5

2.3.2 Teacher Training and Professional Development.....25

2.4 Interactive Whiteboards (IWBs) in Education.....25

2.4.1 Benefits of using IWBs.....25

2.4.2 Challenges of using IWBs.....26

2.5 Teacher Attitudes and Perceptions towards IWBs.....26

2.5.1 Technological Competency in the use of IWBs 26

2.5.2 Technological Self-Efficacy and Teacher Confidence.…….....…….27

2.5.3 Technological Hesitancy and Lack of Confidence 27

2.5.4 Influence of Context on Technology Use 28

2.5.6 Perceived Ease of Use IWBs and Usefulness.....28

2.6. Empirical Studies on the Effectiveness of IWBs 29

2.7 Research Gap……. 29

2.8 Conclusion……..**30**

CHAPTER 3: RESEARCH METHODOLOGY

3.1 **Introduction**……31
3.2 **Research Paradigm**……...31
3.3 **Research Problem** 32
3.4 **Aim and Objectives**……33
3.5 **Alignment of research questions and methods**…….....34
3.6. **Research Design**……35
3.6.1 Convergent Parallel Mixed-Methods Design 36
3.6.2 Case Study Orientation..... …36
3.7 **Research Setting**…….. .37
3.8 Target Population & Sampling……37
3.8.1Target Population ……..37
3.8.2 Sampling Strategy……..38
3.9 **Case study approach**…….....40
3.9.1 Case Study Framework & Mixed Method Integration……..40
3.9.2 Definition of a case study…….....40
3.9.3. How this Research meets the characteristics of a Case Study ……40
3.9.3.1 Focus on specific context…….40
3.9.3.2 In-depth exploration……41
3.9.3.3 Analysis of real-life experiences……...41
3.9.3.4 Use of multiple perspectives……41
3.10 **Quantitative Component & Analysis**…….....41
3.11**. Qualitative Component & Analysis**…….....42
3.12 **Integration of methods & Analytical Triangulation** ……43
3.13 **Data Collection** ……..…….....43
3.14 **Data Collection Tools** ……44
3.14.1 Structured Questionnaires……44
3.14.2 Semi- Structured Interviews…….....44
3.15 **Interview Administration & procedures**……45
3.16. **Ethical Considerations** ……45
3.16.1 Informed consent..……..46
3.16.2 Confidentiality & anonymity……...46
3.16.3 Avoiding harm…….....……47
3.16.4 Voluntary Participation & Right to Withdraw.....47

3.17 **Data Protection**…… 47
3.18 **Fairness & respect for participant**……..48

3.19 **Trustworthiness**…… .48
3.20 **Credibility** ……49
3.21 **Transferability**……49
3.22. **Dependability**……49
3.23. **Conformability**…….....50
3.24 **Conclusion** …….....50

CHAPTER 4: DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.1 Introduction……51

4.2. Description of participants ……51

4.3. Organisation of the Presentation ……51

4.3.1 Demographic Profile of Participant……52

4.3.2 Frequency of IWB Use……53

4.3.3 Perceived Usefulness and Ease of Use……53

4.4 Theme 1: Perceived Usefulness and Value of IWBs in Foundation Phase Teaching……54

4.4.1 Pedagogical Alignment with Early Childhood Learning Needs……56

4.5 Theme 2: Professional Development, Training, and Institutional Support……58

4.5.1 Training Quality and Accessibility:……58

4.5.2 School Leadership and Technical Support……59

4.6 Theme 3: Frequency and Patterns of IWBs Use……61

4.6.1 Sporadic Use……61

4.6.2 Supplementary Use……63

4.6.3 Consistent and Pedagogically Embedded Use……64

4.6.4 Interpretation of Theme 3……64

4.7 Theme 4: Strategies for Effective Integration………65

4.7.1 Peer-Support Model……65

4.7.2 Lesson-Planning Integration……65

4.7.3 Differentiated Instruction……66

4.7.4 Leadership-Driven Professional Development……68

4.8. Theoretical Interpretation of Findings……70

4.8.1 The Technology Acceptance Model……70

4.8.2 Self-Efficacy Theory (Bandura)……71

4.9 Synthesis of Key Findings……72

4.10 Conclusion……74

CHAPTER 5: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction...……..76

5.2 Summary of Key Findings……. 76

5.2.1 Teachers value IWBs and understand their pedagogical potential…….. 77

5.2.2 Training and institutional support are insufficient or fragmented…….. 77

5.2.3 Patterns of use are uneven and heavily context-dependent…… 77

5.2.4 Teachers develop adaptive strategies in the absence of systemic support……. 78

5.3 Discussion of Findings in Relation to Literature...……. 78

5.3.1 Perceived Value of IWBs in Foundation Phase Classrooms……. 78

5.3.2 Training as a Determinant of Pedagogical Depth……. 79

5.3.3 Infrastructure and the Politics of Access…… 80

5.3.4 Professional Culture: Leadership and Peer Ecology……..... 80

5.4 Theoretical Implications…… 80

5.4.1 Application of the TPACK-XK Framework……. 81

5.5 Implications for Practice and Policy…….. 82

5.5.1 Teacher Professional Development……. 82

5.5.2 Leadership and Resource Governance……... 83

5.5.3 Classroom Pedagogy……. 84

5.6 Recommendations…… 85

5.6.1 Pedagogical Capacity-Building…….. 85

5.6.2 Professional Learning Communities (PLCs) as Digital Innovation Hubs…… 86

5.6.3 Establishing Reliable and Rapid Technical Support Ecosystems…… 87

5.6.4 Systemic Curriculum Integration and Normalization……. . 88

5.6.5 Policy-Aligned, Contextually Relevant Training Design……. 89

5.7 Limitations of the Study ……. 90

5.7.1 Contextual Specificity and Generalisability…….. 90

5.7.2 Scope of Stakeholder Perspectives ……. 9 1

5.7.3 Temporal Constraint of a Cross-Sectional Design …… 91

5.8 **Recommendations for future research** ……..... 92

5.9 **Conclusion** ……. 94

References…….. 96

Appendices…… 111

Chapter 1: Introduction

1.1 Introduction

Chapter 1 provides an overview of the study by outlining the problem statement, research purpose, research questions, and objectives. It also situates the study within existing literature, identifies the research gap, and presents the rationale for the investigation. The chapter concludes with an outline of the remaining chapters.

The global shift towards digital pedagogy has emphasised the role of technologies such as Interactive Whiteboards (IWBs) in creating dynamic and multimodal learning environments (Ibrahim, 2023). In the South African context, this shift has placed increasing demands on teachers to integrate such technologies effectively. Within the Foundation Phase, IWBs are associated with enhanced learner engagement, differentiated instruction, and improved conceptual understanding through visual and interactive features (Hendawi & Almamari, 2020; Mihai, 2020; Tsayang et al., 2020).

However, the potential of IWBs is often constrained by inadequate training, unequal resource distribution, and limited institutional support, particularly in under-resourced contexts. While educational technology forms part of the broader domain of Information and Communication Technology (ICT), which facilitates access to information and communication (Shaitu, 2022), its effectiveness depends largely on how it is integrated into teaching practice.

This study explores the perceptions and experiences of Foundation Phase teachers in the Tshwane North District regarding the use of IWBs as a pedagogical tool. By focusing on teachers' classroom experiences, the study seeks to understand both the opportunities and challenges associated with IWB integration in this specific context.

1.2 Background to the Study

The integration of technology in education is widely recognised as essential for modern teaching, with IWBs being among the most used tools. The Department of Basic Education acknowledges the potential of IWBs to enhance teaching and learning and promotes their use in schools (Karsenti & Collin, 2019). However, their implementation remains uneven, with significant variation across schools due to differences in infrastructure, teacher training, and institutional support (Ertmer & Ottenbreit-Leftwich, 2020).

This issue is particularly significant in the Foundation Phase (Grades R–3), where learners develop foundational cognitive, social, and literacy skills. Although IWBs have been shown to enhance engagement and support interactive learning (Higgins et al., 2022), their effectiveness depends on teachers' ability to integrate them meaningfully into classroom practice a requirement that is often not fully supported (Hennessy et al., 2021).

In the Tshwane North District, disparities in IWB use reflect broader inequalities within the education system. Schools with better infrastructure and funding are more likely to have access to functional technology and technical support (Pham & McNeill, 2021). In addition, school leadership plays a critical role in shaping technology integration. Leaders who prioritise professional development and foster collaborative environments contribute to more effective use of IWBs (Bower, 2020).

Teacher training is central to successful integration. Educators require both technical competence and pedagogical knowledge to use IWBs effectively (Fisser et al., 2020). While such competencies can enhance learner engagement and understanding (Twining et al., 2021), insufficient or inconsistent training often leads to underutilisation.

Beyond initial training, ongoing technical and instructional support is essential. Teachers need continuous assistance in accessing resources, resolving technical challenges, and collaborating with peers (Van der Linde et al., 2020). Without such support, even motivated teachers may struggle to sustain technology use. This highlights the need for a comprehensive approach to technology integration that combines infrastructure, training, and institutional support.

1.3 Rationale of the Study

This study is motivated by several interrelated factors. Firstly, teachers' perceptions and attitudes play a crucial role in shaping the success of technology integration. Positive attitudes encourage the use of tools such as IWBs, while resistance or uncertainty can hinder adoption (Venkatesh et al., 2020). Understanding teachers' perceptions is therefore essential for examining how IWBs are used in classroom practice.

Secondly, there is limited research focusing specifically on Foundation Phase teachers within the Tshwane North District. While the importance of educational technology is widely acknowledged, there is a need for context-specific studies that capture the realities of South African classrooms. This study addresses this gap by providing detailed insight into teachers' experiences within a particular educational context.

Thirdly, the study has practical significance. By identifying the challenges teachers face, the findings can inform the development of targeted policies, training programmes, and support systems aimed at improving technology integration (Ertmer & Ottenbreit-Leftwich, 2020). This is particularly relevant in light of the increased emphasis on digital learning following the COVID-19 pandemic (Hodges et al., 2020).

Finally, the study contributes to broader educational discourse by providing a foundation for future research. Documenting teachers' experiences in this context enables comparative studies in similar settings and supports the development of more contextually responsive approaches to technology integration in early education.

1.4 Problem Statement of the Study:

IWBs are acknowledged for their capacity to improve pedagogy and learning outcomes in educational institutions. For IWBs to function effectively in classrooms, particularly in the Foundation Phase, teachers must understand how to integrate technology into their lessons to optimise the use of IWBs. The researcher initially possessed a limited understanding of teachers' perceptions of IWBs in the Tshwane North District and the challenges they face in utilising these devices. Ertmer and Ottenbreit-Leftwich (2020) contend that integrating technology into educational institutions might be problematic due to inadequate training or support for teachers, as well as their reluctance to engage with new gadgets. Uncertainty over teachers' perspectives can impede the effective utilisation of IWBs in education.

In South Africa, the implementation of IWBs in educational institutions is part of a larger initiative to incorporate additional digital resources into classrooms, as observed by Karsenti and Collin (2019). The utilisation of IWBs can differ markedly between regions or schools, depending on the level of funding and assistance each institution receives (Hennessy et al., 2021). Understanding the perspectives of educators working with young learners in the Tshwane North District is crucial, particularly regarding their utilisation of IWBs to address disparities in resources and support, ensuring that IWBs enhance student results. Twining et al. (2021) illustrate that if these fundamental challenges remain unaddressed, IWBs may lack the capacity to significantly transform teaching and learning.

Moreover, several teachers possess technology in their classrooms that remains underutilised or utilised sparingly, attributable to factors such as technical challenges, inadequate training or support, or a lack of enthusiasm for technological integration (Twining et al., 2021). In South Africa, the implementation of IWBs is integral to a comprehensive strategy for incorporating digital tools into education, as observed

by Karsenti and Collin (2019). The effectiveness of IWBs is contingent upon the specific location and institution of employment, as certain schools possess greater resources and support than others (Hennessy et al., 2021). Understanding the perspectives of early-grade teachers in the Tshwane North District and their commitment to addressing disparities, as well as ensuring the optimal utilisation of IWBs to optimise learning, is crucial. Twining et al. (2021) indicate that failure to address these concerns will inhibit IWBs from realising their full potential to enhance teaching and learning.

It has been observed that primary school teachers in urban institutions utilise interactive whiteboards more efficiently than their counterparts in township schools. Teachers in urban schools perceive interactive whiteboards as user-friendly and seamlessly integrate them into their instruction. They assert that interactive whiteboards facilitate work preservation and enhance lessons by making them more dynamic, graphic, and engaging, hence promoting learner participation (Fisser et al., 2020). Conversely, teachers in township schools have significant obstacles, such as inadequate training and technical assistance, hindering their efficient use of interactive whiteboards (Higgins et al., 2022). This study sought to analyse these disparities and offer recommendations for addressing these problems, guaranteeing equitable access to technology-enhanced learning across all schools in the Foundation phase classrooms across Gauteng's Tshwane North District.

1.5 The Purpose of the Study:

The purpose of this study was to explore the perceptions and experiences of Foundation Phase teachers regarding the use of IWBs within these varied contexts. In doing so, the study focused on understanding how teachers perceive the value of IWBs, how they experience their use in classroom practice, and how contextual factors such as resource availability and technical support influence their utilisation. The study further sought to generate insights into the challenges encountered by teachers in integrating IWBs into their teaching.

The findings of the study were intended to provide a contextualised understanding of the realities shaping the use of IWBs in Foundation Phase classrooms. It is envisaged that these insights may inform the development of appropriate support structures, professional development initiatives, and policy considerations aimed at improving the use of IWBs in teaching and learning. Additionally, the study offers an evidence-based perspective on how IWBs are used in practice, highlighting areas of good practice as well as constraints that may influence their effectiveness.

1.6 Research Questions:

1.6.1 Primary Research Question

What are the perceptions and experiences of Foundation Phase teachers in the Tshwane North District regarding the use of Interactive Whiteboards (IWBs) as a pedagogical tool?

1.6.2 Sub-Research Questions

1. How do Foundation Phase teachers perceive the use of IWBs in their teaching practice?
2. How do Foundation Phase teachers experience the use of IWBs in classroom teaching and learning?
3. How do contextual factors, such as institutional support and resource availability, influence teachers' use of IWBs?
4. How do teachers suggest that the use of IWBs can be improved in Foundation Phase classrooms?

1.6.3 Research Objectives

The study was guided by the following objectives:

1. To explore Foundation Phase teachers' perceptions of the use of IWBs in teaching and learning.
2. To examine Foundation Phase teachers' experiences of using IWBs in classroom practice.
3. To identify contextual factors influencing the use of IWBs, including institutional support and resource availability.
4. To describe teacher-generated suggestions for improving the use of IWBs in Foundation Phase classrooms.

1.7 Limitations of the Study:

While the above limitations are acknowledged, several strategies were employed to minimise their impact on the study. Firstly, although the sample was limited to a specific geographic area, efforts were made to include participants from different schools within the Tshwane North District to enhance variation in experiences and perspectives. This provided a more nuanced understanding of the phenomenon within the selected context. In addition, the study does not aim for statistical generalisation but rather for contextual and analytical insights, which may be transferable to similar educational settings.

Secondly, to address the potential bias associated with self-reported data, the study utilised multiple data collection methods, including both questionnaires and semi-structured interviews. This allowed for triangulation of data, thereby enhancing the credibility and trustworthiness of the findings. Furthermore,

participants were assured of confidentiality and anonymity, which encouraged more honest and reflective responses.

Regarding the variation in IWB models and technological contexts, the study deliberately focused on teachers' perceptions and experiences rather than on measuring the effectiveness of specific devices. This approach reduced the impact of technological differences by foregrounding how teachers engage with IWBs within their own contexts, regardless of specific technical variations.

Finally, although not all contextual variables were examined, the study intentionally acknowledged key contextual factors—such as institutional support and resource availability—during data collection and analysis. This ensured that findings were interpreted within the realities of the teaching environment. It is therefore envisaged that future research could build on this study by incorporating a broader range of contextual variables, including socio-economic factors and infrastructure conditions, to provide a more comprehensive understanding of IWB integration.

1.8 Significance of the Study:

This study focuses on the Tshwane North District to gain a deeper understanding of the local situation and contribute to the broader conversation about the use of technology in education. The results will be helpful for individuals who make decisions, school leaders, and teachers seeking to enhance their use of interactive whiteboards in the early years of schooling (Ertmer & Ottenbreit-Leftwich, 2019). The knowledge gained from this research can inform specific actions and support systems that address the unique challenges faced by teachers in this area, ultimately leading to improved teaching methods and student outcomes.

This research is important because it can help schools and policymakers understand how to use technology in teaching young children. By examining what teachers think about IWBs, the study reveals what works well and identifies potential problems associated with using this technology in the classroom. This information can be used to develop more effective ways for teachers to utilize IWBs, ultimately leading to improved teaching and learning for learners (Hennessy et al., 2021).

This research contributes to the limited information available on the use of Interactive Whiteboards (IWBs) in the early school years, particularly in South Africa. Most studies look at higher grades or different countries. This research is significant because it provides valuable insights that can help enhance education in both South Africa and other parts of the region (Higgins et al., 2022). Additionally,

understanding what teachers think can help create training programs that address the specific needs and challenges teachers face (Ertmer & Ottenbreit-Leftwich, 2019).

Moreover, this research is important because it has the potential to make learning more engaging and enjoyable for learners. (IWBs) This can encourage learners to be more involved and participate more in class, which is very important for young children's education (Beauchamp & Kennewell, 2020). By looking at what teachers who work with young children think and feel about using these boards, this study can find out how to use IWBs in the best way. This knowledge can help design lessons that effectively utilize the interactive features of the boards and meet the needs of young learners, thereby creating a more engaging and effective learning environment (Higgins et al., 2021).

Additionally, the results of this research may influence how courses are structured and how teachers teach, not just in the specific area of study, but also in other areas. As schools use more technology, it is important to know how devices like IWBs can support learning goals and teaching methods. The information from this study can assist those who design courses and plan education to make better use of technology in their design (Hall & Higgins, 2022). This means ensuring that IWBs are deeply integrated into the teaching and learning process, rather than being added on, which can make education more consistent and effective for children (Smith, 2021).

In conclusion, the findings of this study may have implications for the training and development of teachers. As technology continues to become more central in education, there appears to be a growing need for continuous professional development that supports teachers in developing the skills and knowledge required to use IWBs effectively. The study envisaged that highlighting the challenges and needs experienced by Foundation Phase teachers could inform the development of more contextually relevant training programmes. Such programmes may contribute towards addressing gaps in teachers' technological competencies and providing ongoing support. It is therefore anticipated that these efforts could support the development of more confident and skilled teachers, which may, in turn, enhance the use of IWBs in teaching and learning contexts.

1.9 Research Design:

This study employed a qualitative, single-case study design to conduct an in-depth exploration of Foundation Phase teachers' perceptions and experiences with Interactive Whiteboards (IWBs) in the Tshwane North District. A case study approach was selected as it is ideal for investigating a contemporary phenomenon within its real-life context, particularly when the boundaries between the phenomenon and the context are not clear (Yin, 2018). This design allowed for a rich, contextualized understanding of the complexities surrounding IWB integration in this specific educational setting.

1.10 Data Collection

Data were collected using a mixed-methods approach to ensure comprehensive insights. Semi-structured interviews served as the primary qualitative instrument, providing in-depth data on teachers' challenges, perceived benefits, and recommendations (Creswell & Creswell, 2022). These were complemented by structured questionnaires, which gathered quantitative data on usage frequency and the perceived level of institutional support. A random stratified sampling and purposive sampling strategy was used to select twenty (20) Foundation Phase teachers from across the district, ensuring participants had direct experience with IWBs and could provide relevant, experience-based data.

1.10.1 Data Analysis:

Qualitative data from interviews were analysed using thematic analysis, following Braun and Clarke's (2021) six-step framework. This process involved familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Key themes such as “learner engagement,” “technical issues,” and “teaching effectiveness” were identified.

Quantitative data from questionnaires were analysed using descriptive statistics. These statistics were used to summarise participants’ responses regarding the use of IWBs.

1.10.2 Trustworthiness and Credibility:

The trustworthiness of the qualitative findings was ensured through the framework of credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Specific strategies included:

- **Credibility:** Triangulation of data sources (interviews and questionnaires) and member checking, where participants verified the accuracy of interview transcripts.
- **Transferability:** The provision of thick, detailed descriptions of the research context and participants to allow for judgment of applicability to other contexts.
- **Dependability:** Maintaining a detailed audit trail of all research decisions and processes.
- **Confirmability:** Practicing reflexivity through a research journal and grounding findings in participant quotes to minimize researcher bias.

1.10.3 Ethical Considerations:

The study received ethical approval from the University's Research Ethics Committee prior to data collection. Ethical clearance ensured that the study complied with institutional research standards and national ethical guidelines. Permission to conduct the study was also obtained from the relevant education authorities and participating schools.

Informed consent was obtained from all participants before their involvement in the study. Participants were provided with detailed information about the purpose of the research, the procedures involved, and their role in the study. They were informed that participation was entirely voluntary and that they had the right to withdraw from the study at any stage without any negative consequences.

The principles of confidentiality and anonymity were strictly upheld throughout the research process. Participants' identities were protected using pseudonyms, and no identifying information was included in the reporting of the findings. All data collected were treated as confidential and were used solely for research purposes.

Data management procedures were aligned with the Protection of Personal Information Act (POPIA). All electronic data was stored securely on password-protected devices, while any hard copies were kept in a locked and secure location. Access to the data was restricted to the researcher only. In addition, data will be retained for a specified period in line with institutional policy and thereafter securely destroyed.

Furthermore, care was taken to ensure that no harm, whether physical, psychological, or professional, came to participants because of their involvement in the study. The researcher maintained professional and ethical conduct throughout the research process to ensure respect, dignity, and integrity in all interactions with participants.

1.11 Overview of Chapters:

The structure of this study is as follows:

- *Chapter 1*: Introduction and Background The study's background, justification, problem statement, purpose statement, research questions, limitations, significance, research design, data collection, data analysis, trustworthiness and credibility; ethical considerations; and a summary of the chapters are all included in this chapter.
- *Chapter 2*: Literature review: The literature review covers teacher attitudes and perceptions, comparative research on IWB effectiveness, the advantages and difficulties of IWB implementation, and TPACK as the theoretical framework supporting the use of IWBs.
- *Chapter 3*: Research Methodology: This chapter describes the study's research design, qualitative methodological approach, data gathering methodologies, sampling plans, and data analysis methods.
- *Chapter 4*: Data analysis and Findings: This chapter presents and analyses the data collection results, emphasizing important themes and trends that arose from the teachers' answers.
- *Chapter 5*: Summary, discussion, and recommendations: This chapter summarizes the key findings of the study, highlighting how they respond to the research questions and illuminate the central phenomenon investigated. The discussion interprets these findings in relation to existing literature and the theoretical framework, identifying areas of alignment, divergence, and new contributions. Based on these insights, recommendations are provided to guide practice, inform policy, and shape future research.

1.12 Conclusion:

In summary, this chapter began with an introduction of the topic under investigation, before proceeding to the background of the study and the rationale thereof. The discussion them turned to the problem statement and the purpose of the study. Added to that, the research questions and objectives were presented, before the study’s limitations were highlighted. The discussion then turned to the significance of the study, the research design utilised and the data collection methods employed. Furthermore, the data analysis engaged in the study was presented, followed by how trustworthiness and credibility would be established in the study. This was followed by the ethical considerations adhered to in the study and the overview of the chapters to be presented in the research report.

The next chapter presents the literature review applicable to this study.

Chapter 2: Literature Review

2.1 Introduction

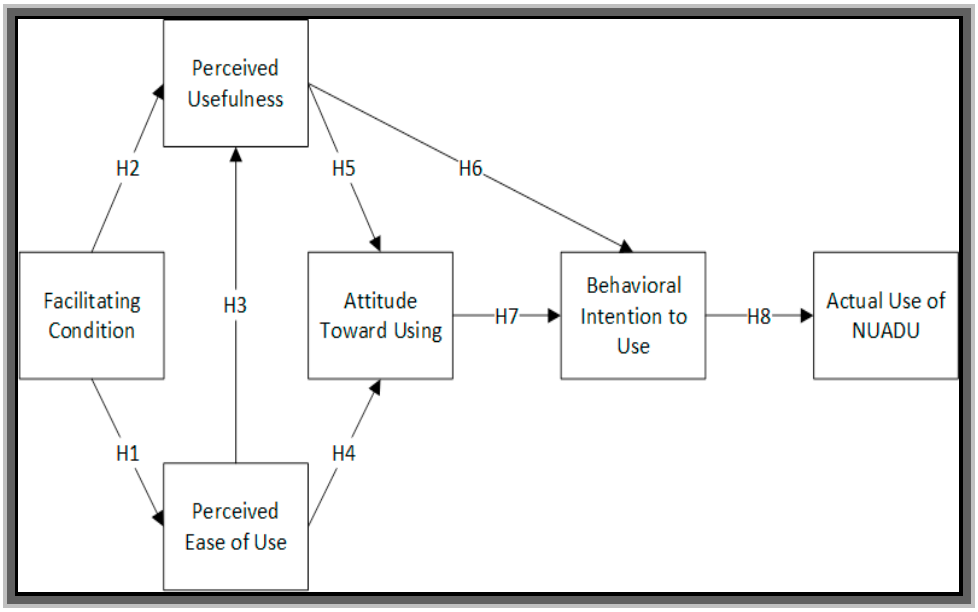
Chapter 1 provided the background for the study, outlining the research problem, its purpose, and the specific questions being explored. This chapter provides a review of literature that is pertinent to the research on the views of Tshwane North Foundation Phase teachers regarding the use of Interactive Whiteboards (IWBs) in their teaching practices. This chapter starts off by laying out the theory behind the research, specifically the Technology Acceptance Model (TAM) and Bandura's Social Cognitive Theory, with a particular focus on how confident teachers feel about their abilities (self-efficacy).

The chapter then takes a look at existing studies on how Interactive Whiteboards (IWBs) are used in education, covering the benefits, difficulties, and what teachers generally think about using technology in the classroom. The chapter also explores the situation of technology integration within South Africa. Finally, the section concludes by identifying gaps in the current research, to justify why this current study is necessary.

2.2 Theoretical Framework(s)

This research draws on two key theories: the Technology Acceptance Model (TAM), developed by Davis in 1989, and Bandura's Social Cognitive Theory (1986). These frameworks help us understand the reasons behind teachers' decisions to either embrace or avoid using technologies such as Interactive Whiteboards (IWBs). The TAM model is illustrated and elaborated below.

The TAM Model



Source: Sri Rahayu Natasia et al (2022)

Adopted from Davis (1989)

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), helps explain why users decide to accept and use new technologies (Malatji, Eck & Zuva, 2020). According to TAM, there are two main factors that determine whether teachers will actually use technology in their work. These are perceived usefulness (PU), and perceived ease of use (PEOU) (Maharani & Usman, 2021). Perceived usefulness (PU) is the idea that technology enhances teaching and learning. Perceived Ease of Use (PEOU), is the idea that technology is not difficult to use.

How teachers feel about digital tools and how comfortable they are using them really shapes how technology gets used in education. Primarily, the TAM model hints that people are ready to try some new technology when they think it will make their lives easier or better and when it is also easy to operate (Martín-García, Redolat, & Pinazo-Hernandis, 2022). So, in the classroom, that means teachers are more likely to bring Interactive Whiteboards into their lessons if they believe these tools help to simplify the teaching and learning process and requiring no complex skills to operate.

Teachers' belief in their own abilities really makes a difference too. As Bandura's Social Cognitive Theory points out, people are more willing to tackle tasks when they feel capable of succeeding (Schunk, 2023). When teachers get the right training and support, they become more confident in using technology effectively. Good experiences with interactive whiteboards (IWBs) tend to keep them using them, whereas constant technical problems can actually dampen their motivation. These theories together

suggest how teachers feel about technology and how confident they are both play a part in its use. When schools create supportive settings, teachers are much more likely to successfully integrate IWBs into their teaching (Samsonova, 2021).

Studies show that teachers are more inclined to use technology in their classrooms when they genuinely feel it makes their teaching more effective and when they are comfortable using it themselves (Huang, Teo, & Zhou, 2020). When it comes to Interactive Whiteboards (IWBs), teachers might decide to incorporate them if they believe these tools genuinely improve how lessons are delivered, how engaged learners become, and how well concepts are understood. Research also shows that IWBs let teachers use a variety of multimedia resources, like videos, pictures, and interactive activities, which can really support visual learning and get learners more involved in the lesson (Alkış, 2020).

The way teachers find interactive whiteboards (IWBs) easy to use is definitely shaped by factors like training, tech support, and having access to reliable equipment and internet (Belabcir, 2010). If teachers run into technical issues, like slow connections, broken equipment, or not getting the help they need, they might be less inclined to actually use the IWBs (Ndlovu, 2021). This highlights that how well technology gets adopted is not just about what teachers think; it is also heavily dependent on the support the school provides. Therefore, the Technology Acceptance Model (TAM) is a helpful tool for understanding teachers' perspectives on using IWBs at Foundation Phase level.

2.2.2 Bandura’s Social Cognitive Theory (Self-Efficacy)

Bandura’s Social Cognitive Theory (1986) highlights how crucial self-efficacy is. This is basically a person's belief in their own ability to successfully complete a task. When it comes to teachers and technology, self-efficacy matters a great deal. Teachers who feel confident using digital tools are much more likely to bring them into their classrooms (Bandura, 1997).

Teachers grow more confident in their abilities through hands-on experience, training, and the support they receive (Yildiz, 2021). Positive encounters with interactive whiteboards (IWBs), for instance, can increase their confidence and inspire them to keep integrating technology into their teaching (Luo et al, 2023). Conversely, negative experiences, like technical glitches or insufficient training, can shake their confidence and make them hesitant to use technology in the classroom.

Research shows that teachers who feel confident with technology are more open to trying out new teaching approaches and using digital tools effectively (Stumbrienė, Jevsikova, & Kontvainė, 2024). This suggests that Bandura’s theory helps explain how a teacher's confidence influences their readiness to use interactive whiteboards.

2.3 Factors Influencing Technology Integration in Education

Technology in education is shaped by various elements, such as the availability of resources, how well teachers are trained, the backing from the institution, and people's general feelings about technology (Cohen, 2024).

2.3.1 School Context and Infrastructure

The effectiveness of Interactive Whiteboards (IWBs) largely relies on a school's basic setup, including things like electricity, internet connectivity, and having technical support available (Department of Basic Education, 2020). Schools that have good infrastructure in place can usually bring technology into their teaching more smoothly, but schools that are struggling with resources might find it much harder to do so (Ahmad, 2021).

In South Africa, the uneven distribution of technology access continues to be a major barrier (Modise, 2025). Some schools are equipped with the latest digital tools, whereas others are really struggling with a severe lack of resources. These stark differences shape how teachers view technology and ultimately affect their capacity to effectively use interactive whiteboards (IWBs) in their daily lessons.

2.3.2 Teacher Training and Professional Development

It is really essential for teachers to be trained when it comes to using new technology. Omilabu, Olusanya, & Adebare, (2023), shows that teachers need ongoing professional development in order to make technology work well in their classrooms. These development programs help teachers build up their technical skills and feel more comfortable with digital tools. If teachers do not get the right training, they might just use interactive whiteboards, for example, to show notes instead of using them to create more engaging, interactive lessons (Giannikas, 2021)

2.4 Interactive Whiteboards (IWBs) in Education

Interactive whiteboards are flexible and handy digital teaching tools that let teachers and learners engage with lessons through touch, pictures, sound, and all sorts of multimedia, and their use is common to create interactive lessons (Uduak & Kasumu, 2022).

2.4.1 Benefits of Using IWBs

Studies suggest that interactive whiteboards (IWBs) can improve how engaged and motivated students are (Tp & Minh, 2021). Students tend to show more enthusiasm for lessons that incorporate multimedia features like animations and interactive activities.

Interactive Whiteboards (IWBs) also back visual learning by showing information in various ways, which aids learners in grasping abstract ideas (Ebrahim, 2022). Within the Foundation Phase, visual learning is really important because children thrive on tangible examples and hands-on activities.

2.4.2 Challenges of Using IWBs

Even though interactive whiteboards (IWBs) offer many advantages, there are still several problems that make their use in classrooms difficult. Some of these obstacles include teachers not getting enough training, technical glitches, and a shortage of resources (McLean, 2022). Problems like slow internet, broken equipment, and not having technical help available can make teachers hesitant to use IWBs often (Dube, 2024). Additionally, the cost is a big factor, schools need money to buy, keep up, and upgrade the technology (Department of Basic Education, 2020). Studies have also found that some teachers only use IWBs to show information, not as tools for interactive learning, which reduces how effective they can be (Pringle, 2021).

2.5 Teacher Attitudes and Perceptions towards IWBs

Teachers' feelings about technology play a big role in deciding if they will bring digital tools into their classrooms (Huang, 2021). According to the Technology Acceptance Model, teachers are more inclined to use interactive whiteboards if they think these tools are helpful and simple to operate.

A positive attitude towards interactive whiteboards (IWBs) is frequently linked to learners becoming more involved and teachers adopting more interactive ways of teaching (Mihai 2021). However, on the other hand, teachers might develop negative feelings towards IWBs if they struggle with technical issues or feel uncertain about using the technology (Dube, 2024).

Bandura’s idea of self-efficacy also suggests that teachers who feel comfortable using technology are more likely to include interactive whiteboards in their lessons (Bandura, 1997).

2.5.1 Technological Competence in the Use of IWBs

Teachers’ technological competence plays a significant role in shaping how Interactive Whiteboards (IWBs) are used in classroom practice. Technological competence refers to teachers’ ability to effectively operate and integrate digital tools into teaching and learning. Research indicates that teachers who possess higher levels of digital literacy and technical skills are more likely to integrate IWBs meaningfully into their teaching (Lewis, 2017; Wan, 2025).

Studies further suggest that technologically competent teachers are able to use a wider range of IWB features, including multimedia tools, interactive applications, and learner-centred activities, which can

enhance learner engagement and participation (Yang & Li, 2025). In contrast, teachers with limited technological skills may struggle to utilise IWBs effectively, often restricting their use to basic functions such as displaying content.

2.5.2 Technological Self-Efficacy and Teacher Confidence

In addition to technological competence, teachers' self-efficacy also plays a critical role in the adoption and use of IWBs. Technological self-efficacy refers to teachers' belief in their ability to use technology effectively in teaching and learning. Research shows that teachers with high self-efficacy are more likely to adopt innovative teaching practices, experiment with new technologies, and persist in the face of challenges (Pringle, 2021; Wan, 2025).

Self-efficacy is often developed through positive teaching experiences, such as successfully implementing IWB-based lessons, observing colleagues using technology effectively, and receiving support and encouragement from peers and school leadership. Teachers who feel confident in their abilities are more likely to integrate IWBs in ways that enhance learner engagement and interaction.

Conversely, low self-efficacy, which may result from inadequate training or negative experiences with technology, can lead to reluctance, anxiety, and limited use of IWBs in the classroom. This suggests that both confidence and competence are important in shaping how teachers engage with technology in practice.

2.5.3 Technological Hesitancy and Lack of Confidence

Technological hesitancy and lack of confidence are significant factors influencing teachers' use of Interactive Whiteboards (IWBs) in classroom practice. Technological hesitancy refers to teachers' reluctance or resistance to using digital tools, often arising from uncertainty, fear of failure, or limited familiarity with technology. Research indicates that teachers who lack confidence in their ability to use technology are less likely to integrate it effectively into their teaching (Pringle, 2021).

Teachers who experience technological hesitancy may revert to traditional teaching methods, even when IWBs are available. This can result in limited or superficial use of the technology, where IWBs are used only for basic functions such as displaying content rather than supporting interactive and learner-centred activities. Such practices reduce the potential of IWBs to enhance teaching and learning.

A lack of confidence is often linked to inadequate training, limited exposure to technology, and negative past experiences. When teachers do not feel adequately prepared or supported, they may develop anxiety towards using technology, which further discourages experimentation and innovation in their teaching. This highlights the importance of building teacher confidence alongside developing technological skills.

Addressing technological hesitancy, therefore, requires creating supportive environments where teachers can gradually build confidence through training, practice, and ongoing support. This may encourage greater willingness to use IWBs and promote more meaningful integration of technology in classroom practice.

2.5.4 Influence of Context on Technology Use

In addition to individual factors such as competence and confidence, teachers' use of Interactive Whiteboards (IWBs) is strongly influenced by contextual factors within the school environment. These contextual factors include the availability of resources, institutional support, school culture, time constraints, and curriculum requirements. Research has shown that such factors play a critical role in determining how and to what extent technology is integrated into teaching and learning (Ertmer & Ottenbreit-Leftwich, 2020; Tondeur et al., 2021).

For instance, access to functional equipment, reliable electricity, and technical support can significantly influence teachers' ability to use IWBs effectively. In contexts where these resources are limited or inconsistent, teachers may experience difficulties in incorporating IWBs into their lessons. Similarly, a lack of institutional support, including limited professional development opportunities and insufficient guidance from school leadership, can hinder the effective use of technology in classrooms.

Time constraints and curriculum demand also affect how teachers engage with IWBs. Teachers may feel pressured to complete the curriculum, leaving limited time to experiment with new technologies or develop interactive lessons. In such cases, IWBs may be underutilised or used in ways that do not fully support learner engagement.

2.5.5 Perceived Ease of Use IWBs and Usefulness:

Teachers' use of Interactive Whiteboards (IWBs) is often influenced by how easy they perceive the technology to be and how useful they believe it is in supporting teaching and learning (Kearney et al., 2018; Tondeur et al., 2021). When teachers view IWBs as easy to operate, they are more likely to integrate them into their daily classroom practices. Similarly, when teachers perceive IWBs as useful for enhancing learner engagement, supporting visual learning, and improving lesson delivery, they are more inclined to use them meaningfully (Gumede, 2024; Luo et al., 2023).

However, perceptions of ease of use are often shaped by contextual factors such as access to reliable equipment, availability of technical support, and the level of training received. In situations where teachers experience technical difficulties, limited support, or time constraints, IWBs may be perceived as difficult to use, which can reduce their adoption (Ertmer & Ottenbreit-Leftwich, 2020; Kearney et al.,

2018). At the same time, even when teachers recognise the potential usefulness of IWBs, challenges within the teaching environment may limit their consistent use.

Research indicates that contextual conditions such as school infrastructure, institutional support, and classroom realities play a significant role in shaping how teachers engage with technology in practice (Hew & Brush, 2017; Tondeur et al., 2021). This suggests that teachers' willingness to use IWBs depends on both their confidence in using the technology and the extent to which their teaching environment supports its effective use.

Much of the existing literature tends to position teachers either as adopters or as resisters of technology, often focusing on deficits such as a lack of skills or external barriers to integration. However, there is limited research that explores teachers' agency, particularly how they adapt, improvise, and develop strategies to use technology within constrained environments. Understanding how teachers navigate challenges, collaborate with peers, and develop contextually relevant practices is important for gaining a more nuanced understanding of technology integration in real classroom settings.

2.6 Empirical Studies on the Effectiveness of IWBs

Several studies have explored how interactive whiteboards (IWBs) help improve what children learn. Research suggests that IWBs can improve reading and mathematics skills, especially when learners get involved with the activities (Ebrahim, 2022). Learners seem to benefit from seeing things clearly, practicing repeatedly, and taking part in interactive tasks. Other research has found that IWBs can also get learners more involved and motivated to learn (Higgins et al., 2012).

It should be stressed that how well interactive whiteboards (IWBs) work depends a lot on how teachers use them. Technology alone without the users in the classroom does not translate to better results; it is also about the teacher using effective methods (Reich, 2020).

2.7 Research Gap

Even though there is an extensive coverage by research on technology in education, little has been done specifically on the experiences of Foundation Phase teachers using IWBs in South African classrooms (Pringle, 2021).

Much research is done in countries with plenty of resources, which makes it difficult to apply the findings directly to South African schools. These schools often face real challenges like not having enough infrastructure and unequal access to resources (Olusegun, 2023).

There seems to be limited qualitative research focusing on what teachers think and experience when they use IWBs in the Foundation Phase. Consequently, this study intends to add to available literature by looking into the perspectives of teachers who use IWBs in the Tshwane North District.

2.8 Conclusion

This chapter reviewed relevant literature on how Interactive Whiteboards are used in schools. It found that teachers' willingness to embrace new technology is shaped by how helpful they think it is, how easy they find it to use, and their own confidence in their ability to use it. These ideas were largely drawn from and interpreted from the Technology Acceptance Model and Bandura's Social Cognitive Theory.

Research shows that interactive whiteboards (IWBs) can increase learner involvement and encourage active learning. However, issues like insufficient training, technical glitches, and a shortage of resources might hinder their effective use.

The review also pointed out a void in the existing research about what Foundation Phase teachers in South Africa actually experience when they use Interactive Whiteboards (IWBs). These gaps show justify the need to conduct the current study. Not to lose track, this study is all about exploring the teachers' own opinions on using IWBs as a teaching tool in the Tshwane North District.

Chapter 3: Research Methodology

3.1 Introduction

Chapter 2 provides a critical review of the literature and theoretical frameworks that underpin this study. The integration of Interactive Whiteboards (IWBs) in Foundation Phase classrooms is shaped by a complex interplay of technological affordances, teacher beliefs, digital competence, infrastructural realities, and institutional support. This chapter, therefore, outlines the methodological framework adopted to investigate Foundation Phase teachers' perceptions, experiences, and use of IWBs. It explains the research paradigm, design, setting, population and sampling, data collection instruments and procedures, analytic strategies, measures to ensure quality, ethical considerations, and limitations. The overall intention is to demonstrate methodological rigour and coherence, thereby strengthening the credibility of the findings presented in the subsequent chapter.

3.2 Research Paradigm

This study is underpinned by the pragmatic research paradigm, which is grounded in the view that the value of research lies in its ability to address real-world problems and produce useful knowledge. Pragmatism rejects the notion that research must be confined to a single philosophical position and instead adopts a problem-centred approach, where the choice of methods is determined by their ability to effectively answer the research questions (Creswell & Creswell, 2022; Tashakkori & Teddlie, 2021).

From an ontological perspective, pragmatism assumes that reality is not fixed or singular but is continuously shaped by social, cultural, and contextual factors. In the context of this study, the use of Interactive Whiteboards (IWBs) does not represent a single objective reality; rather, it is experienced differently by teachers depending on their classroom environments, available resources, and individual experiences. This aligns with the study's focus on exploring teachers' perceptions and experiences within specific contexts.

Epistemologically, pragmatism views knowledge as both constructed and based on practical consequences. This means that understanding a phenomenon requires drawing on both subjective experiences and observable patterns. In this study, knowledge about IWB use is derived not only from teachers' reported experiences and perceptions but also from patterns identified through structured data. This dual approach allows for a more comprehensive understanding of how IWBs are used in practice.

Pragmatism is particularly appropriate for this study because the research problem itself is multifaceted. The study seeks to understand both how teachers experience the use of IWBs and how contextual factors influence their use. These aspects cannot be fully captured through a single methodological approach. A purely quantitative approach would overlook the depth of teachers' experiences, while a purely qualitative approach would not provide insight into broader patterns. Pragmatism therefore, justifies the integration of both approaches.

Furthermore, the study is oriented towards generating practical insights that may inform teaching practice, professional development, and policy within the Foundation Phase. Pragmatism emphasises the usefulness of research outcomes, making it well-suited for studies that aim to contribute to real-world educational improvement.

The pragmatic paradigm also provides the philosophical foundation for the use of a mixed-methods approach in this study. It supports the integration of quantitative and qualitative data, allowing the researcher to combine numerical patterns with detailed narratives to develop a richer and more contextualised understanding of IWB use. This alignment between paradigm, research problem, and methodology underpins the selection of a convergent parallel mixed-methods design.

3.3 Research Problem:

As outlined in Chapter 1, this study focuses on understanding how Foundation Phase teachers use Interactive Whiteboards (IWBs) within the Tshwane North District. While IWBs are increasingly introduced into classrooms, there remains a limited understanding of how teachers perceive and experience their use in everyday teaching practice, particularly within under-resourced contexts.

Although existing literature highlights the potential benefits of IWBs, such as enhanced learner engagement and interactive teaching, these findings are largely based on well-resourced settings. There is still insufficient insight into how contextual factors influence the use of IWBs in settings characterised by resource constraints, limited support, and diverse classroom conditions. As noted by Ertmer and Ottenbreit-Leftwich (2020), understanding teachers' experiences is critical for identifying challenges related to technology integration.

This study, therefore, addresses the need to explore the perceptions and experiences of Foundation Phase teachers regarding the use of IWBs within their specific teaching contexts. By doing so, it seeks to contribute to a clearer understanding of how technology is used in practice and the factors that shape its integration in classroom settings.

3.4 Aim and Objectives:

The purpose of this study was to explore the perceptions and experiences of Foundation Phase teachers in the Tshwane North District regarding the use of Interactive Whiteboards (IWBs) as a pedagogical tool.

The study was guided by the following objectives:

1. To explore Foundation Phase teachers' perceptions of the use of IWBs in teaching and learning.
2. To examine Foundation Phase teachers' experiences of using IWBs in classroom practice.
3. To identify contextual factors influencing the use of IWBs, including institutional support and resource availability.
4. To describe teacher-generated suggestions for improving the use of IWBs in Foundation Phase classrooms.

Mukerji and Tripathi (2014) emphasise that exploring teachers' experiences is essential to understanding how technologies shape learning environments. Similarly, Beauchamp and Kennewell (2020) emphasize the significance of teacher perceptions in determining the effectiveness of interactive technologies in early education. Teachers' experiences with technical challenges, inadequate training, and limited support have been documented as primary barriers to effective IWB integration (Ertmer & Ottenbreit-Leftwich, 2020).

Table 3.1 presents the alignment between specific objectives and research sub-questions.

Table 3.1 Alignment of objectives and questions:

Objective	Sub-Research Question
To explore Foundation Phase teachers' perceptions of the use of IWBs in teaching and learning.	How do Foundation Phase teachers perceive the use of IWBs in their teaching practice?
To examine Foundation Phase teachers' experiences of using IWBs in classroom practice.	How do Foundation Phase teachers experience the use of IWBs in classroom teaching and learning?
To identify contextual factors influencing the use of IWBs in Foundation Phase classrooms.	How do contextual factors influence the use of IWBs in Foundation Phase teaching?
To describe teachers' suggestions for improving the use of IWBs in Foundation Phase classrooms.	How do teachers suggest that the use of IWBs can be improved in Foundation Phase classrooms?

3.5 Alignment of research questions and methods:

The primary research question guided the formulation of the sub-questions, each addressing a specific component of IWB integration**.** The first sub-question explored usage frequency**,** the second assessed professional development and support, the third investigated challenges, and the fourth solicited teacher recommendations**.** By addressing each aspect of the research problem, the study aimed to generate valuable insights that can inform future practice and policy decisions related to educational technology (Johnson & Christensen, 2021).

These questions were matched with appropriate data collection tools to maximise the richness and relevance of the findings, as reflected in Table 3.2.

Table 3.2 Research Questions & Data Collection Tools:

Therefore, the study sought to answer the following questions.

Research Questions	Data Collection Tools
How do Foundation Phase teachers perceive the use of IWBs in their teaching practice?	Structured questionnaires; Semi-structured interviews
How do Foundation Phase teachers experience the use of IWBs in classroom teaching and learning?	Semi-structured interviews
How do contextual factors influence the use of IWBs in Foundation Phase teaching?	Semi-structured interviews; Document analysis
How do teachers suggest that the use of IWBs can be improved in Foundation Phase classrooms?	Semi-structured interviews

3.6 Research Design

This study utilised a convergent mixed-methods research methodology, effectively combining qualitative and quantitative approaches within a case study framework centred on the Tshwane North District. This methodological triangulation was employed to cultivate a thorough understanding of Foundation Phase teachers' experiences with Interactive Whiteboards (IWBs), utilising the statistical trends identified by quantitative data in conjunction with the nuanced, contextual insights derived from qualitative research (Creswell & Plano Clark, 2018). The design enabled the acquisition of various but complementary datasets, which were analysed independently and subsequently combined to yield a comprehensive understanding of the study subject.

3.6.1 Convergent Parallel Mixed-Methods Design

The study employed a convergent parallel mixed-methods design, in which qualitative and quantitative data were collected during the same phase of the research, analysed separately, and then integrated during interpretation (Creswell & Plano Clark, 2018). In practice, this meant that semi-structured interviews with teachers and structured questionnaires were administered within a similar timeframe. The design does not privilege one strand over the other; rather, both are considered equally important and complementary.

The rationale for using this design is threefold. Firstly, it facilitates triangulation, allowing the researcher to see whether quantitative trends (for example, the proportion of teachers who report having received training) are supported or contradicted by qualitative accounts of training experiences. Secondly, it promotes completeness, providing both breadth and depth: quantitative data summarise patterns across participants, while qualitative data provide detailed insight into individual experiences. Thirdly, the design enhances interpretive power by enabling the researcher to explore convergence, divergence and complementarity between datasets, thereby generating explanations that neither strand could achieve alone.

In this study, the quantitative strand focused on describing access to IWBs, frequency and purposes of use, and forms of support, while the qualitative strand explored how teachers experienced these conditions in everyday classroom practice. Integration of the strands is described in Section 3.10.

3.6.2 Case Study Orientation

The convergent parallel design was embedded within a bounded case study of Foundation Phase teachers using IWBs in the Tshwane North District. A case study is appropriate when the researcher seeks to understand a contemporary phenomenon in depth within its real-life context, particularly when the boundaries between the phenomenon and its context are not clear (Yin, 2018). The “case” in this study is defined as the experiences and practices of early-grade teachers working with IWBs in a specific district marked by resource inequalities, curricular demands, and policy expectations around digital learning.

This orientation made it possible to consider how contextual conditions—such as quintile status, infrastructure, leadership priorities, and staff development cultures—influence IWB use. It also facilitated the production of rich, contextually grounded descriptions, which are essential for analytic generalisation.

3.7 Research Setting

The study was conducted in the Tshwane North District of Gauteng Province, South Africa. The district includes a mix of urban, peri-urban, and township schools serving learners from diverse socio-economic backgrounds. Many of these schools have received IWBs as part of provincial or national ICT initiatives, yet their capacities to maintain and use these technologies vary substantially.

This setting was chosen for several reasons. Firstly, it reflects the structural inequalities highlighted in Chapter 2, making it a suitable context for examining how such inequalities affect digital teaching practices. Secondly, the district includes schools where IWBs have been in use for some time, as well as schools where implementation is relatively recent, allowing the study to capture both initial adoption and more established practices. Thirdly, district officials and school leaders were supportive of research on teaching and learning with technology, which facilitated access to and collaboration with resources.

By focusing on a single district, the study was able to explore in depth how local policies, leadership decisions, and resource distributions shape teachers' experiences of IWB use.

3.8 Target Population and Sampling:

This section introduces the population relevant to this study and explains the sampling strategy used to select participants. Additionally, this section explains why Foundation Phase teachers were the most suitable participants and justifies the sampling decisions.

3.8.1 Target Population:

The target population for this study consisted of Foundation Phase teachers (Grades R-3) in the Tshwane North District. This specific cohort was selected due to their pivotal role as primary agents of technology integration in early childhood classrooms. Their direct, practical experience with IWBs provided invaluable insights into both the pedagogical benefits and implementation challenges of this technology. The study specifically sought to recruit educators with active, regular experience using IWBs to ensure the data reflected authentic classroom practices.

To obtain comprehensive data, a dual-mode data collection strategy was employed. One cohort participated in face-to-face semi-structured interviews, allowing for in-depth exploration and clarification of responses. A second cohort completed parallel questionnaires administered online, ensuring consistency in the core questions posed to all participants while accommodating different response preferences. Below is a representation of the Tshwane North region where the study population is located.

Figure 2: Tshwane North region map

3.8.2 Sampling Strategy:

Because Interactive Whiteboards (IWBs) are unevenly distributed across schools, particularly in the South African context, the population cannot be assumed to be homogeneous (Spaull, 2013; Department of Basic Education, 2020). Some schools may have multiple functioning boards, access to technical support, and regular professional development opportunities, while others may have limited access to a single device or experience intermittent functionality. As a result, the sampling process needed to capture variation in school environments, resource availability, and teacher backgrounds. A single sampling strategy would not have adequately reflected this diversity. Instead, different sampling approaches were employed for the qualitative and quantitative components, in line with mixed-methods research principles (Creswell & Creswell, 2022; Tashakkori & Teddlie, 2021).

For the qualitative component, purposive sampling was used to select participants who were well-positioned to provide rich, reflective insights based on their classroom experiences (Patton, 2015). Teachers were required to have at least six months of exposure to IWB use. This criterion ensured that participants could speak from experience rather than initial exposure, having encountered both the benefits and challenges associated with the technology. Teachers who reported using IWBs infrequently were not excluded, as limited use itself provides valuable insight into contextual and pedagogical constraints. Purposive sampling therefore, supported the generation of in-depth, contextually grounded data, which is central to qualitative inquiry (Creswell & Poth, 2018).

For the quantitative component, a stratified sampling approach was adopted to ensure that the sample reflected the diversity of the study context. Stratified sampling involves dividing the population into distinct subgroups (strata) based on specific characteristics and then selecting participants from each group (Creswell & Creswell, 2022). In this study, Foundation Phase teachers were grouped according to school quintile, geographic context, and grade level. These criteria were selected because they are closely associated with differences in resource availability, infrastructure, and teaching conditions within the South African education system (Spaull, 2013; Department of Basic Education, 2020).

The use of stratified sampling was particularly important given the unequal distribution of resources across schools. Without stratification, the sample could have been skewed towards either well-resourced or under-resourced schools, which would limit the representativeness of the findings. By ensuring that participants were drawn from different strata, the study was able to capture a broader range of experiences related to access to IWBs, levels of professional support, and classroom realities. This approach enhanced the credibility of the quantitative findings by providing a more balanced and inclusive representation of the population.

In total, twenty (20) Foundation Phase teachers participated in the study. These participants completed the structured questionnaire and contributed to the qualitative component, allowing for the integration of both data strands. While the sample size is relatively small, the use of stratification ensured that key contextual variations were represented within the sample.

Taken together, the sampling strategies align with the convergent parallel mixed-methods design adopted in this study. The qualitative sampling approach prioritised depth and detailed understanding of teachers' experiences, while the stratified quantitative sampling approach provided descriptive breadth across different school contexts. This combination allowed the study to generate a more comprehensive understanding of the use of IWBs in the Foundation Phase.

3.9 CASE STUDY APPROACH

3.9.1 Case Study Framework and Mixed Methods Integration:

The study was conducted within a qualitative case study framework, focusing on the integration of IWB among Foundation Phase teachers in the Tshwane North District as a singular, bounded case. This approach was chosen for its ability to maintain the comprehensive and significant attributes of real-world events, facilitating a thorough investigation of intricate social phenomena in their natural context (Yin, 2018). The case study framework provided a structured approach to analyzing the complex interactions among teachers' perceptions, pedagogical practices, and contextual factors that affect technology adoption.

A convergent mixed-methods design was implemented, involving the simultaneous collection of quantitative and qualitative data. This design is especially useful for acquiring diverse yet complementary data on a single topic, thereby enhancing the understanding of the research problem (Morse & Niehaus, 2016). The quantitative component offered a broad overview and identified patterns within the sample, whereas the qualitative component contributed depth and context to these patterns, leading to a more comprehensive understanding than either method could achieve alone.

3.9.2 Definition of a Case Study:

A case study is a research approach that involves an in-depth, detailed examination of a specific instance or example within its real-life context. According to Yin (2020), case studies are instrumental when researchers seek to explore and understand complex issues within their natural settings, especially when the boundaries between the phenomenon and the context are not clearly defined. This approach enables a comprehensive examination of the subject, considering various factors and perspectives, which can provide nuanced insights into specific situations.

3.9.3 How This Research Meets the Characteristics of a Case Study:

This research aligns well with the characteristics of a case study for several reasons, as detailed below:

3.9.3.1 Focus on a Specific Context:

Case studies are beneficial for understanding events in clearly defined situations (Yin, 2020). This research focuses on Foundation Phase teachers in the Tshwane North District, situated within a specific geographical and educational context. As Stake (1995) pointed out, case studies enable researchers to

thoroughly investigate a limited system. This allows them to identify the unique aspects of this district that affect the use of Interactive Whiteboards (IWBs) in early education.

3.9.3.2 In-depth Exploration:

A key advantage of using case studies is their ability to thoroughly explore certain parts of a topic (Creswell & Poth, 2018). This research focuses on understanding teachers' views and experiences with Interactive Whiteboards (IWBs) in the Tshwane North District, providing a detailed examination of both the benefits and challenges in this area of study. According to Merriam and Tisdell (2016), case studies offer a thorough understanding of how a certain technique or practice functions in each setting, making them ideal for analyzing complex and varied issues.

3.9.3.3 Analysis of Real-Life Experiences:

Case studies focus on examining real-life situations and personal experiences, helping researchers understand genuine viewpoints and practical effects (Yin, 2018). In this research, the emphasis on the actual use and first-hand experiences of teachers with Interactive Whiteboards (IWBs) provides a link between theory and practice, as it demonstrates how this technology is applied in classrooms and its impact on early education. As Flyvbjerg (2011) points out, case studies help researchers to link theoretical ideas to specific examples, making the results more understandable and useful for those working in the field.

3.9.3.4 Use of Multiple Perspectives:

Case studies typically combine different viewpoints to provide a more comprehensive picture of the topic being studied (Baxter & Jack, 2008). By collecting information from various teachers in the Tshwane North District, this research gathers a variety of experiences and opinions, helping to create a comprehensive understanding of Interactive Whiteboard (IWB) use. As Stake (2006) explains, this method enables a detailed and thorough description of the situation, making it easier to identify common patterns and differences in teachers' experiences. Therefore, this research effectively employs the case study approach, providing a detailed and context-specific examination of teachers' views on IWBs. This method offers important insights into how IWBs are used and their perceived importance in the early stages of education, which can be directly applied to similar educational environments.

3.10 Quantitative Component and Analysis:

This research largely used qualitative approach to get in-depth data and partly employed a quantitative approach to answer Yes or No questions, utilizing a survey strategy with structured questionnaires distributed to twenty Foundation Phase teachers selected via stratified random sampling, and responded to by five of these teachers. This method produced quantitative data regarding the frequency of IWB

usage, perceived advantages, and levels of institutional support. The questionnaires primarily employed Likert-scale items to measure teachers' attitudes and experiences, facilitating the identification of trends and patterns across various school contexts within the district.

Descriptive statistics, such as frequencies and percentages, were used in the quantitative data analysis to summarize and characterize the central tendencies and distributions of the dataset. This analysis facilitated systematic comparisons among teacher subgroups, including those in different school types or with varying levels of technical support, to identify significant differences in the adoption and perception of IWBs. The statistical findings offered a comprehensive framework for contextualising and understanding the qualitative insights related to technology integration.

Qualitative research design aims to thoroughly investigate a range of phenomena and understand participants' experiences from their own perspective. Qualitative research aims to fully capture the breadth and richness of human experiences, in contrast to quantitative research, which attempts to measure variables and identify statistical relationships (Denzin & Lincoln, 2021). It places a strong emphasis on comprehending the context and significance of people's experiences, behaviours, and social relationships. Qualitative design involved holding conversations with the concerned teachers. These conversations were guided by questions that allowed the teachers to discuss their classroom experiences freely. In this way, the teachers gave detailed and thoughtful answers (Patton, 2022). This method gave teachers the freedom to explain their experiences and discuss how they use IWBs, which might not be fully understood through simple, fixed questions. Additionally, the researcher observed and made notes, especially during lesson deliveries, on specific practices of interest to the researcher.

3.11 Qualitative Component and Analysis:

The qualitative dimension employed semi-structured interviews with 15 teachers to investigate the lived experiences and nuanced perspectives of teachers in the Foundation Phase. This approach was crucial for understanding the depth and complexity of individual experiences with IWBs, encompassing challenges, adaptive strategies, and contextual factors that quantitative methods alone cannot sufficiently disclose (Braun & Clarke, 2021). The flexible nature of these methods allowed participants to articulate their experiences, yielding comprehensive data on technology integration in early childhood classrooms.

The qualitative data were subjected to a thorough thematic analysis in accordance with Braun and Clarke's (2021) six-phase framework: familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. This systematic approach ensured that identified themes—such as "technical infrastructure as a barrier," "professional

development inadequacies," and "enhanced student engagement" were firmly rooted in empirical data while upholding analytical rigour. The analysis focused on both expected themes, based on the research questions, and emergent themes that developed from the participants' narratives.

3.12 Integration of Methods and Analytical Triangulation:

The integration of quantitative and qualitative data took place during the interpretation phase, where the separate datasets were combined to create a unified understanding of the research questions. This integrative analysis employed a triangulation protocol, examining quantitative patterns in conjunction with qualitative explanations, while situating qualitative insights within the context of quantitative distributions (Creswell & Plano Clark, 2018). Questionnaire results indicating low usage frequencies were analysed in conjunction with interview transcripts that highlighted specific technical obstacles and training deficiencies, yielding a more nuanced explanation than either dataset could offer independently. This methodological approach, which integrates the generalisable trends of quantitative methods with the contextual depth of qualitative inquiry within a bounded case study framework, facilitated a thorough investigation of IWB integration that acknowledged both measurable patterns and the lived experiences that define this complex educational phenomenon. The analysis offers a comprehensive examination of district-wide trends, while also investigating the individual and contextual factors that shape these trends.

3.13 Data collection

Data for this study were collected using a mixed-methods approach, combining both quantitative and qualitative techniques. The purpose of using multiple methods was to obtain a comprehensive understanding of Foundation Phase teachers’ use of Interactive Whiteboards (IWBs) within their specific teaching contexts.

The data collection process was conducted in two parallel phases, consistent with the convergent parallel mixed-methods design. Quantitative data were collected through structured questionnaires, while qualitative data were collected through semi-structured interviews. Both forms of data were gathered within the same timeframe to allow for comparison and integration during analysis.

Before data collection, permission was obtained from the relevant authorities and participating schools. Participants were informed about the purpose of the study and their role in the research. Questionnaires were distributed to the selected teachers and completed within an agreed timeframe. Thereafter, semi-structured interviews were conducted with selected participants to gain deeper insight into their perceptions and experiences.

The use of both questionnaires and interviews allowed the study to capture both descriptive patterns and detailed, context-specific accounts of teachers' use of IWBs. This approach ensured that the data collected were both broad and in-depth, aligning with the objectives of the study.

3.14 Data Collection Tools:

This study utilised a carefully chosen set of data collection instruments to address the research questions via methodological triangulation. The combined application of structured questionnaires and semi-structured interviews facilitated the quantification of general trends in IWB usage while allowing for a qualitative examination of the underlying experiences and perceptions, thus offering a thorough evidentiary foundation for the study.

3.14.1 Structured Questionnaires:

A structured questionnaire was utilised as the primary tool for quantitative data collection, aimed at systematically obtaining numerical data regarding IWB usage patterns, perceived benefits, and the sufficiency of institutional support. The instrument primarily utilised Likert-scale items, facilitating the accurate assessment of teachers' attitudes and experiences through a standardised metric. The questionnaire underwent a pilot testing phase involving a small group of Foundation Phase teachers not included in the main study sample to ensure its robustness. Feedback regarding clarity, structure, and relevance was incorporated to enhance the final instrument, thereby improving its face validity and reliability (See Addendum A).

This tool primarily addressed Research Question 1 by quantifying the frequency and nature of IWB use, and Research Question 2 by assessing the perceived impact of professional development and institutional support on technology integration.

3.14.2 Semi-Structured Interviews:

Semi-structured interviews were conducted to gather detailed qualitative data regarding the complex and contextual experiences of teachers utilising interactive whiteboards (IWBs). This method was essential for examining the complexities of quantitative trends, identifying the specific challenges faced by teachers, and collecting their informed recommendations for improvement. A structured interview guide-maintained uniformity in addressing essential topics while permitting the exploration of emerging themes and personal narratives (Creswell & Creswell, 2022). This method effectively elucidates the 'why' and 'how' underlying the 'what' identified by the questionnaires, thereby enhancing the depth and context of the statistical results (Braun & Clarke, 2022). The interviews focused on Research Question 3, which examined barriers to integration, and Research Question 4, which sought teachers' suggestions

for improving IWB efficacy. To maintain data integrity, all interviews were audio-recorded with participants' consent, transcribed verbatim, and subjected to member checking, which allowed participants to verify the accuracy of their transcripts and thereby enhance the credibility of the findings.

3.15 Interview Procedure and Administration:

The semi-structured interviews were conducted in person to foster rapport and facilitate detailed discussions. Each session, lasting approximately 20 to 30 minutes, took place in private settings, such as vacant classrooms or school offices, to ensure confidentiality and minimize interruptions. The controlled environment allowed participants to express their professional experiences openly and honestly. The researcher utilised active listening and follow-up probing questions to clarify and expand on responses, thereby ensuring the collection of rich, relevant data aligned with the study's qualitative objectives.

3.15.1 Multi-Mode Questionnaire Administration:

To enhance response rates and meet participant preferences, the structured questionnaire was distributed through a multi-mode approach, including both online and hard-copy formats. The online survey facilitated efficient data collection and entry, while hard copies were made available to ensure accessibility for all selected participants. This strategy effectively reduced non-response bias and facilitated the achievement of a representative sample. Follow-up reminders were distributed to enhance participation, thereby reinforcing the robustness of the quantitative dataset utilised to address Research Questions 1 and 2.

3.16 Ethical Considerations:

This study was conducted under the formal approval of the UMP Research Ethics Committee for Human and Social Sciences (Ref: UMP/Khutsoane222574429/School of Early Childhood Development/MEd/2024/01) and adhered rigorously to established ethical protocols for research involving human subjects. Recognizing the sensitive nature of inquiring into professional practice, the researcher prioritized the principles of respect, justice, and beneficence throughout the investigation.

A comprehensive ethical framework was implemented to ensure the welfare and rights of participants were safeguarded. Before data collection, all participants received a detailed briefing on the study's purpose, procedures, and data usage, after which they provided written informed consent (Wiles, 2021). To ensure confidentiality, all identifying details were removed from the data; participants were assigned pseudonyms in transcripts and reports, and all records were stored securely with restricted access. The voluntary nature of participation was emphasized, including the unconditional right to withdraw at any time without prejudice.

These measures were essential not only for protecting participants' professional standing and dignity but also for upholding the integrity and trustworthiness of the research data by fostering an environment of transparency and mutual respect.

3.16.1 Informed Consent:

Informed consent, a cornerstone of ethical research, was secured before data collection. This process ensured that all participants fully understood the study's purpose, procedures, potential risks and benefits, and their rights before voluntarily agreeing to participate (Israel, 2017). A comprehensive written consent form (see Addendum B) was administered, detailing the study's focus on Interactive Whiteboards (IWBs), the specific data collection methods (e.g., interviews, questionnaires), the anticipated time commitment, and the protocols for data management, storage, and eventual destruction. In line with established guidelines (Wiles, 2016), the form explicitly stated that participation was entirely voluntary and that individuals retained the right to withdraw at any point without penalty or consequence to their professional standing. This transparent process was fundamental to establishing a relationship of trust and ethical integrity with the participants.

3.16.2 Confidentiality and Anonymity:

Maintaining strict confidentiality was a paramount ethical commitment in this study, crucial for protecting participant privacy and fostering a climate of trust. In a professional context where opinions on pedagogical tools like IWBs can be deeply personal, ensuring that responses could not be traced back to individuals was essential for securing candid feedback. This commitment was operationalized through a rigorous protocol of anonymity. All potentially identifying information, including participant names and school affiliations, was removed from the data. In its place, the researcher employed pseudonyms (e.g., Teacher 1, School A) in all transcripts, field notes, and the final research report (Gibson & Hugh-Jones, 2020). This systematic protection of identity was fundamental to building the rapport and trust necessary for participants to share their experiences and perspectives openly without fear of professional judgment or repercussion.

3.16.3 Avoiding Harm to Participants:

A fundamental ethical obligation in research is the principle of non-maleficence, which requires the researcher to proactively minimize any risk of harm to participants (Oliver, 2015). Within an educational context, potential harm extends beyond the physical to include psychological distress, emotional discomfort, or professional repercussions. For instance, if teachers' perceptions of their own technological proficiency were to be exposed in a way that could damage their professional reputation or cause embarrassment, this would constitute a significant ethical breach. Consequently, the researcher bears the responsibility to design and conduct the study with utmost sensitivity. This was operationalized by carefully refining the interview protocol to exclude any questions that could be perceived as probing for technological incompetence or that might provoke discomfort, thereby safeguarding participant dignity and well-being (Braun & Clarke, 2019). The phrasing of all questions was deliberately chosen to be non-judgmental and to encourage open discussion of challenges without implying personal deficiency.

3.16.4 Voluntary Participation and the Right to Withdraw:

Participation in this study was strictly voluntary, a fundamental ethical principle in research involving human subjects (Creswell & Poth, 2018). All participants were explicitly informed of their unconditional right to withdraw from the study at any point, without being required to provide a reason and without any negative consequences to their professional standing or relationship with the institution. This assurance was provided both in the written consent form and reiterated verbally before data collection sessions. Upholding this principle of autonomous choice was crucial for ensuring that participants did not feel coerced and that their continued involvement represented informed and willing consent.

3.17 Data Protection:

The management and security of research data were regulated by strict protocols to ensure compliance with ethical standards and information protection laws. Data collected in this study, including transcripts and questionnaire responses, were treated as confidential and accessible solely to the primary researcher and academic supervisor (Matthews & Ross, 2019). The research complied with the South African Protection of Personal Information (POPI) Act, which legally requires the protection of personal data and forbids its unauthorised disclosure.

All digital data was stored solely on a password-protected laptop, in accordance with the university's data security policy, and will be retained for five years prior to secure deletion. To maintain participant anonymity, all personally identifiable information was systematically eliminated from the dataset during

the transcription and coding processes. Participants received non-identifiable codes (e.g., T1, T2), and all potentially identifying information was excluded from the research records. The anonymization process was essential for safeguarding participant privacy and reducing risks associated with unauthorized data access (Heath, 2018), thereby maintaining the ethical integrity of the research process.

3.18 Fairness and Respect for Participants:

The principle of justice, which requires the equitable and respectful treatment of all research participants, was consistently maintained throughout this investigation (Cohen, Manion, & Morrison, 2018). This ethical commitment was implemented by ensuring equal participation opportunities for all eligible Foundation Phase teachers within the sampling frame, regardless of their technological proficiency, personal opinions on IWBs, or institutional affiliation. The researcher upheld professional impartiality, ensuring that all contributions received equal scholarly consideration. The principle of justice was further extended through reciprocal benefit; participants received a detailed briefing on the study's aims and significance, enhancing their professional understanding of technology integration. This approach respected the dignity of participants and ensured that their involvement in the research was a meaningful professional experience, thereby meeting the ethical requirement of equitable distribution of research benefits.

3.19 Trustworthiness

To ensure the qualitative data of this study are rigorous and thorough, the researcher employed a set of four checks developed by Lincoln and Guba (1985). These checks, known as trustworthiness criteria, included ensuring that the findings are credible, the study can be applied in other similar situations (transferability), the results are reliable and consistent (dependability), and that the conclusions were genuinely the researcher's and not influenced by external factors (confirmability). These steps are essential for this study, which examined what Tshwane North Foundation Phase teachers think about using IWBs in their teaching. Since the study relied heavily on the teachers' personal experiences and the specific conditions of their classrooms, these measures were key to ensuring the findings are meaningful and dependable.

3.20 Credibility:

Credibility refers to the assurance that the results are accurate and reliable (Bang, 2024). By taking several crucial steps, the researcher in this study ensured the validity of the results. To verify that the researcher had accurately recorded and understood the participants' answers, they first reviewed their interview transcripts, a process known as member checking. Second, the researcher employed a range of methods to gather information, such as semi-structured interviews, internet surveys, and structured questionnaires. Therefore, emphasis is placed on using multiple methods with triangulation to circumvent errors and understand what is happening as close as possible to the "truth" (Lincoln et al., 2011). Triangulation ensures that the researcher cross-checks the findings, making sure any patterns noticed are backed up by more than one source. Hence, triangulation also enhances the quality of the results. Finally, the researcher exercised prolonged engagement with participants, which included multiple interactions during both the pilot study and the main data collection. This extended engagement helped build trust and provided the researcher with more profound, more accurate insights into teachers' experiences with interactive whiteboards.

3.21Transferability:

Transferability refers to the extent to which the conclusions from a study can be applied to various situations (Drisko, 2025). To help with this, the researcher included detailed descriptions of the research environment, the backgrounds of the participants, and the educational and technological conditions in schools within the Tshwane North District. These detailed explanations enable readers and future researchers to evaluate whether the results of this study may also be applicable in other educational settings, particularly those with comparable infrastructure, opportunities for professional development, and technology integration.

3.22 Dependability:

Dependability focuses on the stability and consistency of research over time (Kopetz & Steiner, 2022). To prove this, an audit trail was maintained that logged every aspect of the research journey, from creating the data collection tools and identifying participants to the methods used for analysis and the decisions made along the way. The researcher also double-checked the work by using a code-and-recode method during the thematic analysis: she created initial codes. Then she reviewed them two weeks later to ensure their interpretations remained consistent. This careful approach meant that the

findings were reliable and could be reproduced if another researcher repeated the study under the same or similar conditions.

3.23 Conformability:

Conformability refers to ensuring that research findings are objective and unbiased (Ahmed, 2024). To achieve this, the researcher actively worked to cultivate self-awareness by keeping a reflective journal throughout the study, being mindful of and tracking any personal assumptions or preconceived notions she might have had about interactive whiteboards (IWBs). The researcher also maintained a detailed record of the methods (an audit trail) to demonstrate that the results are based on the participants' statements and actions, rather than the researcher's own opinions. Whenever the researcher interpreted the data, she supported her conclusions with direct quotes from the participants, ensuring that the conclusions remained closely linked to the actual evidence gathered.

3.24 Conclusion:

This chapter has detailed the methodological framework adopted for this research. The convergent parallel mixed-methods design, embedded within a case study, provided a robust structure for exploring the complex perceptions and experiences of Foundation Phase teachers regarding IWBs. The careful selection of data collection instruments and rigorous analytical procedures, grounded in a strong ethical foundation, were designed to ensure the production of valid, reliable, and insightful findings that directly address the research questions and contribute meaningfully to the body of knowledge on technology integration in early childhood education.

The next chapter centres on the presentation, analysis, and interpretation of the research findings.

Chapter 4: Data Presentation, Analysis, And Interpretation

4.1 Introduction:

Chapter 3 employed a convergent parallel mixed-methods research design, embedded in a case study approach to investigate Foundation Phase teachers' views on the use of Interactive Whiteboards (IWBs) in Tshwane North District. It outlined the sampling strategy, ethical considerations, and the use of questionnaires and semi-structured interviews for data collection. This chapter presents the findings, beginning with a descriptive overview of participants, followed by thematic analysis guided by the research questions, the Technology Acceptance Model (TAM), and Bandura's Self-Efficacy Theory.

The presentation follows the structure recommended by Braun and Clarke (2023), beginning with a descriptive presentation of raw data, followed by an interpretive categorization of findings into themes, and ultimately linking these themes to the conceptual frameworks of the study, namely the Technology Acceptance Model (TAM) and Bandura's Self-Efficacy Theory. Throughout the chapter, the findings are interpreted in relation to prior literature on IWB use at the primary level and contemporary reports on teachers' digital pedagogies.

4.2 Description of Participants:

The study purposefully engaged 20 Foundation Phase teachers from public schools in the Tshwane North District. Schools represented two contrasting contexts: City schools and Township schools, reflecting differences in infrastructure, technological support, and socioeconomic conditions. The teachers' teaching experience ranged from less than 3 years to more than 20 years, which enriched the data with diverse pedagogical perspectives. To protect confidentiality, each participant was assigned an alphanumeric code (FP–1 to FP–20).

4.3 Organisation of the Presentation

The findings of this study are organised in direct alignment with the four research objectives, with each objective presented as a corresponding analytical theme. These themes include: (1) Foundation Phase teachers' views on Interactive Whiteboards (IWBs) as a teaching tool, (2) professional development and institutional support for IWB integration, (3) frequency and patterns of IWB use in daily classroom practice, and (4) effective pedagogical strategies for integrating IWBs in Foundation Phase teaching. This thematic organisation ensures that the presentation of findings remains closely linked to the purpose of the study and allows for a structured and coherent analysis.

In line with the convergent parallel mixed-methods design, both quantitative and qualitative data are presented and integrated within each theme. Quantitative data derived from the questionnaires are analysed using descriptive statistics, specifically frequencies (n) and percentages (%), to summarise patterns in participants' responses. These statistics provide a general overview of trends within the sample. Qualitative data from semi-structured interviews are then used to provide deeper insight into these patterns by capturing teachers lived experiences and contextual realities.

Each thematic section, therefore, begins with the presentation of quantitative findings, followed by qualitative evidence in the form of illustrative excerpts, and concludes with an integrated interpretation of both data strands. This approach enables the study to move beyond simple numerical description and develop a more comprehensive understanding of teachers' use of IWBs. Interpretation of the findings is further informed by relevant theoretical perspectives, particularly concepts related to perceived usefulness, perceived ease of use, and teacher confidence, which help to explain how teachers engage with technology in practice.

4.3.1 Section A: Demographic Profile of Participants

Before presenting the main findings, a demographic overview of the participants is provided to contextualise the data. The study involved 20 Foundation Phase teachers drawn from public schools in the Tshwane North District. Participants were selected from both city and township schools, which differ significantly in terms of infrastructure, access to technology, and available support. This variation is important, as it allows the study to capture how contextual differences influence the use of IWBs in practice.

Participants also varied in their years of teaching experience, ranging from novice teachers with fewer than three years of experience to highly experienced teachers with more than twenty years in the profession. For analytical purposes, teaching experience was grouped into four categories: 0–3 years, 4–10 years, 11–20 years, and more than 20 years. This range of experience enriches the dataset, as it reflects diverse perspectives shaped by different levels of professional exposure and engagement with technology.

This demographic profile provides an important backdrop for interpreting the findings, as teachers' experiences of using IWBs are influenced by both their professional background and the contexts in which they teach.

4.3.2 Section B: Frequency of IWB Use

Teachers were asked to indicate how often they use IWBs in their daily teaching. The responses were analysed using descriptive statistics, with frequencies (n) indicating the number of teachers selecting each option and percentages (%) representing the proportion of the sample.

The findings show that only 3 out of 20 teachers (15%) reported using IWBs daily, while 5 teachers (25%) indicated that they use them two to three times per week. A further 3 teachers (15%) reported using IWBs once a week. Notably, 7 teachers (35%) indicated that they rarely use IWBs, and 2 teachers (10%) reported that they never use them.

These results indicate that regular use of IWBs is limited among participants. While some teachers incorporate IWBs into their teaching practices, a substantial proportion use them infrequently or not at all. This suggests that the presence of IWBs in schools does not necessarily translate into consistent classroom use. The findings point to possible underlying factors, such as limited confidence, insufficient training, or contextual challenges, which may influence teachers' ability to use IWBs regularly.

4.3.3 Section C: Perceived Usefulness and Ease of Use

Teachers' perceptions of IWBs were measured using a 4-point Likert scale, ranging from strongly disagree to strongly agree. The data were analysed descriptively by examining the frequency of responses across categories to identify general trends in perceptions.

The findings indicate that teachers generally perceive IWBs as useful for teaching and learning. For example, 10 teachers strongly agreed and 4 agreed that IWBs make lessons more engaging, while 9 strongly agreed and 5 agreed that IWBs improve learner understanding. These responses suggest a strong positive perception of the usefulness of IWBs in enhancing teaching and learning.

However, responses related to ease of use and confidence were more varied. Only 3 teachers strongly agreed that IWBs are easy to use, while 6 agreed and 6 disagreed. Similarly, responses to confidence in using IWBs were evenly distributed, indicating that many teachers do not feel fully confident in their ability to use the technology effectively.

In addition, a large proportion of teachers (9 strongly agree and 5 agree) reported experiencing technical issues. This highlights the role of contextual factors, such as equipment reliability and technical support, in shaping teachers' experiences.

Overall, the findings reveal a contrast between teachers' positive perceptions of the usefulness of IWBs and their challenges related to ease of use and confidence. This suggests that while teachers recognise the potential value of IWBs, their effective use is influenced by both individual capabilities and contextual constraints.

4.4 Theme 1: Perceived Usefulness and Value of Interactive Whiteboards in Foundation Phase Teaching

The analysis of the data reveals a strong and consistent perception among participants that Interactive Whiteboards (IWBs) are valuable instructional tools in Foundation Phase teaching. Teachers generally viewed IWBs as enhancing lesson delivery, improving learner engagement, and supporting understanding through interactive and visual methods. These perceptions reflect teachers' evaluation of the usefulness of IWBs in their daily teaching practice.

In the Foundation Phase, where learning is closely linked to sensory engagement, play, and active participation, teachers emphasised the importance of tools that make learning visible and interactive. IWBs were frequently described as enabling learners to see, hear, and interact with content simultaneously, thereby making learning more meaningful. This aligns with existing research suggesting that interactive technologies support multimodal learning and enhance engagement among young learners (Mihai, 2020).

Teachers consistently highlighted the role of IWBs in supporting visual and interactive learning. One participant explained:

"The IWB helps weaker learners recognise letters because they see them, hear the sound, and physically move them. They don't get left behind." (FP-05)

This response illustrates how IWBs support differentiated instruction by engaging multiple senses. The combination of visual, auditory, and kinaesthetic elements allows learners to interact with content in ways that suit their individual learning needs. The teacher's emphasis on "weaker learners" suggests that IWBs may contribute to more inclusive teaching practices by providing additional support to learners who struggle with traditional methods.

Similarly, another teacher described how IWBs support mathematical understanding:

"My Grade 2s enjoy maths on the IWB. When I drag apples or shapes across the screen, they immediately understand how to add or divide." (FP-03)

This example highlights the importance of visualisation and manipulation in developing conceptual understanding. By allowing learners to interact with concrete representations, IWBs help bridge the gap between abstract concepts and practical understanding. This suggests that IWBs can play a meaningful role in supporting foundational numeracy skills.

Another participant emphasised the role of IWBs in maintaining learner attention:

“When I use the board, all learners are focused. Even those who are usually distracted want to come to the front and participate.” (FP-07)

This response demonstrates the motivational value of IWBs. The interactive nature of the technology appears to increase learner participation and sustain attention, particularly among learners who may otherwise be disengaged. This supports the idea that IWBs can create more engaging and dynamic classroom environments.

In addition to learner-related benefits, teachers also described how IWBs enhance their own teaching practices. One participant noted:

“It gives me teaching confidence. When I use the board, I feel like I can show them the world in real time, not just describe it.” (FP-01)

This response highlights the role of IWBs in enhancing teacher confidence and instructional capability. The ability to access and present rich, real-time content allows teachers to expand their teaching strategies and provide more meaningful learning experiences. This suggests that the perceived usefulness of IWBs extends beyond learner outcomes to include benefits for teachers’ professional practice.

Another teacher reflected on the flexibility provided by IWBs:

“I can quickly change my lesson if learners don’t understand. I just search for another example or video and explain it differently.” (FP-09)

This statement points to the adaptability of IWBs in supporting responsive teaching. The ability to modify lessons in real time enables teachers to address learners’ needs more effectively, which is particularly important in diverse classrooms where learners may progress at different rates.

Overall, the findings indicate that teachers perceive IWBs as valuable tools that enhance both teaching and learning. IWBs are seen as supporting engagement, improving understanding, promoting inclusion, and strengthening teacher confidence. However, while these perceptions highlight the potential benefits

of IWBs, it is important to recognise that these benefits are not always fully realised in practice. As will be discussed in subsequent themes, factors such as training, confidence, and contextual constraints influence the extent to which these perceived advantages translate into consistent and effective use.

4.4.1 Pedagogical Alignment with Early Childhood Learning Needs

Participants emphasised that IWBs align strongly with the pedagogical demands of the Foundation Phase, where concrete visualisation, repetition, and multisensory exposure underpin learning. Teachers described IWBs as capable of supporting letter formation, phonics blending, vocabulary development, and early numeracy with images, sound, colour, and movement. These descriptions resonate with Platinum Copier Solutions Team (2017), which reports that IWBs consolidate visual, auditory, and tactile modalities into a unified learning experience.

Several teachers highlighted how IWBs facilitate inclusive, differentiated learning, especially for learners with slower cognitive processing or shorter attention spans:

FP-09: “When I do phonics with the IWB, the children who normally look away pay attention. They wait to press the button for the next sound.”

FP-07: “For counting, I use fruit pictures. Learners drag them into groups. They can see the numbers forming. It is easier than using counters on the desk.”

FP-11: “My autistic learner responds better to colour-based matching on the board than to the worksheets. It meets him where he is.”

These examples demonstrate that IWBs do more than simply decorate lessons—they facilitate conceptual development, provide sensory scaffolding, and accommodate diverse learner profiles. The multimodal nature of IWBs, as described by Aisyah (2021), supports kinaesthetic, auditory, and visual pathways, thereby enhancing cognitive retention and improving the accessibility of abstract concepts.

The findings indicate that teachers generally perceive Interactive Whiteboards (IWBs) as useful tools for teaching and learning. Participants described IWBs as helping to simplify complex content, motivate learners through interactive activities, and support both individual and collaborative learning. These perceptions are consistent with existing research, which suggests that IWBs can enhance learner engagement and support understanding through multimodal forms of instruction (Chae & Kim, 2017; Manny-Ikan et al., 2011).

In addition, teachers' positive classroom experiences with IWBs appear to influence their confidence in using the technology. When teachers are able to successfully implement IWB-based activities, they develop a sense of competence, which encourages continued use. For example, one participant stated:

"I feel like I can show them the world." (FP-01)

This response reflects how successful use of IWBs can strengthen teachers' confidence and willingness to integrate technology into their teaching. It suggests that confidence and experience are closely linked, with positive experiences reinforcing teachers' engagement with the technology.

From a TPACK-XK perspective, these findings indicate that teachers are able to integrate technological, pedagogical, and content knowledge in ways that support meaningful learning. At the same time, their use of IWBs is shaped by their understanding of the classroom context, including learners' needs and available resources. This highlights that the value of IWBs is not only determined by the technology itself, but also by how teachers apply it within their specific teaching environments.

This finding aligns with existing literature, which indicates that IWBs support multimodal learning and enhance learner engagement in early childhood classrooms (Mihai, 2020). Similarly, Kennewell et al. (2008) argue that interactive technologies promote active participation and improve conceptual understanding. However, some studies caution that these benefits are not automatic and depend on how the technology is used (Higgins et al., 2012). This suggests that while participants in this study perceive IWBs as beneficial, their effectiveness remains dependent on pedagogical application.

In relation to the broader field, these findings reinforce the view that technology integration in early education is most effective when it supports interaction, visualisation, and learner participation. The data, therefore, contributes to existing discussions by providing context-specific evidence from Foundation Phase classrooms, where such approaches are particularly critical.

From a TPACK-XK perspective, the findings indicate that teachers can integrate technological, pedagogical, and content knowledge to support meaningful learning. At the same time, their ability to do so is shaped by their understanding of the classroom context, including learner needs and available resources.

Based on the discussion above, it can be argued that IWBs are perceived not merely as technological tools, but as pedagogical resources that enhance both learner engagement and teacher practice. However, their effectiveness is contingent on how teachers integrate them within their specific teaching contexts.

4.5 Theme 2: Professional Development, Training, and Institutional Support

While the pedagogical potential of Interactive Whiteboards was widely acknowledged, the data revealed that this potential is critically mediated by the quality of professional scaffolding and the robustness of institutional support structures. This theme shifts the analytical focus from individual teacher perceptions to the systemic and organisational factors that either enable or constrain effective technology integration. It examines how training provision, leadership engagement, and technical support systems collectively shape the environment in which pedagogical innovation either flourishes or falters. Research indicates that factors such as institutional support, access to professional development, and school leadership play a critical role in influencing teachers' use of technology in classrooms (Ertmer & Ottenbreit-Leftwich, 2020; Tondeur et al., 2021). In addition, the availability of technical support and ongoing training has been identified as a key determinant of successful technology integration (Hew & Brush, 2017). These factors directly address the gap between technological access and meaningful pedagogical transformation, particularly in contexts where resources and support are unevenly distributed.

4.5.1 Training Quality and Accessibility:

Participants consistently identified insufficient and inconsistent professional development as one of the most significant barriers to the meaningful integration of Interactive Whiteboards (IWBs). Most teachers recalled receiving brief, installation-based training that focused on switching on the device, connecting the projector, and basic writing functions. However, this training lacked pedagogical depth, failed to demonstrate effective lesson design, and did not provide opportunities for teachers to practice independently under guided supervision. Several teachers described their initial induction as a "single event" rather than a developmental process. As a result, teachers were left to "figure things out" through trial and error, which contributed to frustration and negative early experiences.

Teachers in township schools reported more acute training gaps. In these sites, IWBs were described as "decorative screens", mounted in classrooms but rarely used because no one possessed the technical or pedagogical competence to facilitate lessons. The contrast in training access between city and township schools suggests an unequal digital literacy ecology, where the availability of resources is not accompanied by sustained capacity-building.

Interview excerpts illustrate this clearly:

FP-06: “They explained how to turn it on and off, but not how to teach with it. After that, we just guessed. If something went wrong, we left it.”

FP-10: “We begged for another workshop, but they said the trainer was only contracted for installation. So, teachers simply gave up.”

FP-02: “I know the board can do more, but nobody ever showed us. We use it like a normal screen for videos because that is all we know.”

The above sentiments align with those of Barbour et al. (2020), who warn that IWBs are frequently underutilized not because teachers reject technology, but because they lack continuous professional development that connects the tool to real classroom pedagogy. When training is episodic, highly technical, or supplier-driven, teachers become overwhelmed, revert to traditional chalkboard teaching, or use IWBs only as glorified projection screens.

This theme highlights a critical systemic issue: the lack of instructional mentorship and iterative digital coaching, which would enable teachers to contextualize IWB functionality for Foundation Phase learners. Rather than a deficiency in teacher willingness, the challenge reflects a structural deficit in developmental ecosystems.

4.5.2 School Leadership and Technical Support:

Participants repeatedly highlighted the role of leadership involvement in shaping sustained IWB utilisation. Schools where principals and ICT coordinators were actively engaged showed greater continuity in IWB use, even when individual teachers lacked confidence. In these settings, IWBs were: maintained regularly, supported through accessible technical troubleshooting, and embedded into expectations for lesson planning and curriculum delivery.

Teachers in these environments described a culture where technology was “normalised” rather than optional, and leadership actively encouraged experimentation, sharing of digital lesson plans, and collaborative problem solving. This aligns with Mihai (2020), who asserts that teacher readiness improves significantly when school management invests in competence building and provides consistent support for the adoption of technology.

In contrast, several teachers noted that where leadership was passive or absent, IWBs became liabilities. Instances of prolonged technical faults, calibration failures, pen malfunctions, or projector outages discouraged use. The absence of technicians meant that even minor technical problems lasted weeks or months, forcing teachers to abandon IWBs altogether. Township schools, again, reported disproportionately higher rates of hardware failure and slower maintenance response.

Interview data reflect the consequences of leadership disengagement:

FP-04: “The projector has been broken for three months. We reported it, but there is no follow-up. How can we plan lessons around something that doesn’t work?”

FP-08: “Our ICT person comes once a term. If the pen stops working, we wait until next term. In the meantime, we go back to the chalkboard.”

FP-13: “When a lesson fails because the board freezes, I lose credibility in front of learners. I would rather avoid the embarrassment.”

These statements align with those of Hennessy et al. (2005), who found that unresolved technical problems erode teachers’ confidence, hinder instructional momentum, and foster negative associations with technology. Teachers who experience repeated failure are more likely to disengage from digital pedagogies to protect their professional identity and maintain lesson continuity.

The findings suggest that institutional and contextual factors play a critical role in shaping teachers’ ability to integrate Interactive Whiteboards (IWBs) effectively in classroom practice. In particular, inadequate training and unreliable infrastructure limit teachers’ ability to use IWBs in meaningful ways, even when they recognise their potential value.

From a TPACK-XK perspective, these challenges reflect gaps in both technological knowledge (TK) and contextual knowledge (XK). Limited access to training restricts teachers’ development of the technological and pedagogical knowledge required to integrate IWBs effectively into teaching. At the same time, contextual constraints such as unreliable equipment, lack of technical support, and insufficient institutional resources hinder the application of this knowledge in practice.

These findings suggest that effective technology integration depends not only on teachers' understanding of how to use IWBs, but also on the conditions within which they operate. When teachers do not receive adequate support or are faced with recurring technical challenges, they are less likely to integrate IWBs into their teaching, despite recognising their potential benefits. This highlights the importance of aligning technological, pedagogical, and contextual factors to support meaningful use of IWBs.

Furthermore, the absence of sustained institutional support limits opportunities for teachers to develop and refine their practice over time. Without ongoing training, mentorship, and technical assistance, teachers may struggle to build confidence in using IWBs, which in turn affects their willingness to experiment with new teaching approaches. As a result, teachers may revert to familiar, traditional methods, not because they reject the value of IWBs, but because the conditions necessary for effective integration are not in place.

Overall, the findings emphasise that successful integration of IWBs requires a balanced interaction between teachers' knowledge and the context in which teaching occurs. The TPACK-XK framework therefore provides a useful lens for understanding how gaps in training, support, and infrastructure can constrain the practical use of technology in classroom settings.

4.6 Theme 3: Frequency and Patterns of Interactive Whiteboard Use:

The data revealed clear and differentiated patterns of Interactive Whiteboard (IWB) use among Foundation Phase teachers. These patterns reflect varying degrees of familiarity, institutional support, and confidence. Although most teachers acknowledged the pedagogical value of IWBs, their frequency and depth of use were influenced by both technical conditions and individual teacher dispositions.

4.6.1 Sporadic Use:

A notable proportion of teachers reported sporadic IWB use. These teachers often cited technical unreliability, lengthy boot times, projector bulb failures, low internet bandwidth, or misalignment between IWB performance and lesson pacing. Some teachers suggested that, in the event of a lesson being interrupted due to technical issues, they would revert to conventional chalkboard teaching to maintain instructional continuity.

FP-08: “When the IWB freezes during a numeracy lesson, I lose the learners’ attention. It is safer to just teach with the chalkboard and avoid frustration.”
FP-12: “The buttons work today and not tomorrow. I don’t have the time to troubleshoot when I am alone in class with 38 learners.”
FP-03: “If the projector is too dim or slow to start up, I abandon it. The delay wastes ten minutes, and the children become restless.”
From a TPACK-XK perspective, the sporadic use of Interactive Whiteboards (IWBs) observed in this study can be understood as a breakdown in the interaction between technological knowledge (TK) and contextual knowledge (XK). While teachers may possess basic technological and pedagogical knowledge, their ability to apply this knowledge is constrained by contextual factors such as unreliable equipment, limited technical support, and time pressures within the classroom environment.

The experiences described by participants indicate that the issue is not a lack of willingness to use IWBs, but rather the difficulty of integrating the technology into real-time teaching under unstable conditions. For example, delays caused by slow start-up times or equipment failure disrupt lesson flow, making it difficult for teachers to maintain learner engagement. Within the TPACK-XK framework, this reflects a misalignment between teachers’ knowledge and the context in which that knowledge must be applied.
Furthermore, the decision to revert to traditional teaching methods can be interpreted as a pragmatic response to contextual constraints. Teachers prioritise instructional continuity and classroom management over technological integration when the conditions are not supportive. This suggests that effective technology integration requires not only the development of teachers’ technological and pedagogical knowledge, but also a supportive and reliable context that enables the practical application of this knowledge.
Overall, the findings highlight that sporadic use of IWBs is not necessarily an indication of resistance to technology, but rather a reflection of contextual limitations that undermine the integration of technological, pedagogical, and content knowledge in practice.

4.6.2 Supplementary Use:

A second group of teachers used IWBs as supplementary tools, primarily for visual presentations, playing educational videos, displaying PowerPoint slides, or projecting worksheets. These teachers often possessed basic operational skills but lacked the confidence or training to apply IWBs interactively—e.g., to design digital learning tasks, annotate content, or allow learners to manipulate objects on the board. Instead, IWBs functioned as digital projectors rather than interactive pedagogical artefacts.

FP-01: “I mostly use it to show pictures of animals or play a song for Life Skills. It is not part of my core teaching—it is something extra.”
FP-15: “If I can find a YouTube video that explains something nicely, I show it. But after that, we work on the learner books.”
FP-10: “I don’t know how to use the tools beyond writing with the pen. So, I treat it like a big screen.”

Ertmer (2005) argues that in the absence of adequate pedagogical training, teachers tend to use technology in limited and traditional ways, often reducing tools such as IWBs to basic presentation devices. Similarly, Murphy and Greenwood (2018) emphasise that without appropriate instructional strategies, the interactive capabilities of IWBs remain underutilised. They note that teachers often struggle to incorporate elements such as learner movement, tactile engagement, and real-time interaction, resulting in the technology being used in a largely passive manner.
These perspectives are evident in the findings of the current study, where several participants reported using IWBs primarily for displaying content rather than facilitating interactive learning. This suggests that, despite access to technology, the absence of pedagogical training limits teachers’ ability to fully exploit the interactive potential of IWBs.
It can therefore be argued that the challenge is not merely technological but pedagogical in nature. The findings of this study support the view that effective use of IWBs depends on teachers’ ability to integrate technology with appropriate teaching strategies, rather than simply having access to the device. In this regard, the data reinforces the argument that without targeted professional development, IWBs are likely to remain underutilised in classroom practice.

4.6.3 Consistent and Pedagogically Embedded Use:

A smaller but significant group of teachers demonstrated high-frequency, high-depth use of IWBs. These teachers integrated the boards daily into lesson routines, lesson design, assessment, and collaborative learning. Their lessons featured interactive mathematics manipulatives, phonics blending exercises, reading annotations, digital story construction, and real-time learner participation.

FP-05: “Every morning, we start with phonics on the board. They drag sounds into words. It has become our classroom rhythm.”
FP-14: “I write a problem on the board and call learners to solve it. They enjoy being part of the lesson, not just watching.”

FP-02: “I prepare lessons in advance and save them. The children remember what we did last week because we can pull it up again.”

Teachers in this group demonstrated higher technological self-efficacy, stronger resilience when encountering technical issues, and confidence to experiment. Their practice aligns with Manny-Ikan et al. (2011), who found that IWBs facilitate interactive and collaborative learning when teachers take ownership of their pedagogical design. Likewise, Hendawi & Almamari (2020) note that consistent IWB integration develops learner agency and deeper comprehension through digital participation.

4.6.4 Interpretation of Theme 3:

The frequency and depth of IWB use correlate strongly with the interaction of self-efficacy, environmental reliability, and organisational support:

- Self-efficacy: Teachers who believed in their capacity to use IWBs confidently adopted high-frequency, high-engagement practices.
- Technical reliability: Teachers working with stable electricity, responsive troubleshooting, and well-maintained hardware used IWBs more consistently.
- Institutional support: Schools with technological mentorship, ICT champions, or ongoing workshops showed stronger usage cultures.

In essence, frequency of use is not merely a question of teacher preference; it is a symptom of structural investment and a reflection of the school’s digital ecosystem.

4.7 Theme 4: Strategies for Effective Integration

Although institutional barriers were prominent, teachers demonstrated adaptive agency, generating context-sensitive strategies to integrate IWBs into the Foundation Phase classroom. These strategies represent emergent practices developed "from the ground up," often independent of formal training.

4.7.1 Peer-Support Model:

Teachers reported forming informal micro-learning communities, where more technologically confident colleagues shared skills with others. These peer networks facilitated day-to-day problem-solving, collaborative brainstorming, and the creation of collective knowledge.

FP-11: "We teach each other. If I discover a new tool, I call other Foundation Phase teachers to show them."
FP-07: "When the board gives trouble, I don't log a ticket. I first ask a colleague. We solve it faster than waiting."
FP-03: "Our staff WhatsApp group is where we help each other with links, worksheets, and tools."
Such practices align with African communitarian pedagogies, where knowledge is relational and co-constructed. In these environments, the IWB becomes a community resource, not an isolated individual asset.

4.7.2 Lesson-Planning Integration:

Teachers emphasised that IWB use must be designed into the lesson, not attached as an optional add-on. Lessons planned with the board in mind resulted in a smoother instructional flow, fewer disruptions, and greater learner engagement.

FP-05: "When I plan the lesson around the board activities, pictures, writing it becomes natural. The board works as part of the lesson."
FP-14: "If I only decide in class to use it, I get confused, and it wastes time. Preparation is everything."
FP-10: "What changed for me was planning five minutes of IWB at the beginning. That structure helps manage attention."

From a TPACK-XK perspective, the emphasis on lesson planning highlights the integration of pedagogical knowledge (PK), technological knowledge (TK), and contextual knowledge (XK) in practice. Teachers who plan their lessons around the Interactive Whiteboard (IWB) demonstrate an ability to align technology with instructional goals, ensuring that the tool supports rather than disrupts the learning process. This reflects the effective blending of PK and TK, where teachers intentionally design activities that make use of the interactive features of the board.

At the same time, the need for structured planning also reflects the role of contextual knowledge (XK). Teachers must consider factors such as lesson time, learner behaviour, class size, and available resources when deciding how and when to integrate IWBs. The findings suggest that when these contextual elements are not taken into account, the use of IWBs becomes inefficient and disruptive.

The data therefore indicate that effective IWB integration is not simply dependent on access to technology, but on the teacher's ability to coordinate pedagogical strategies, technological tools, and contextual realities. In this way, planning serves as the mechanism through which TPACK-XK is operationalised in the classroom.

4.7.3 Differentiated Instruction:

Teachers reported using Interactive Whiteboards (IWBs) to accommodate diverse learning needs within the same classroom. The findings indicate that IWBs enable teachers to differentiate instruction by providing multiple entry points for learning through visual, auditory, and kinaesthetic modes. This is particularly important in the Foundation Phase, where learners develop at different rates and require varied forms of support.

For example, one participant explained:

"My faster learners do the digital matching while I help those who struggle with writing." (FP-12)

This response illustrates how IWBs support simultaneous engagement at different ability levels. The teacher is able to allocate tasks that keep advanced learners engaged while providing targeted support to those who require additional assistance. This suggests that IWBs can facilitate flexible grouping and

differentiated instruction within a single lesson, allowing teachers to manage diverse learner needs more effectively.

Similarly, another participant noted:

“The IWB allows three or four learners to work at once. They cooperate and correct each other.” (FP-02)

This highlights the collaborative potential of IWBs. The technology not only supports individual learning but also encourages peer interaction and shared problem-solving. The reference to learners “correcting each other” suggests that IWBs can promote active participation and peer-assisted learning, which are important in developing both cognitive and social skills in early childhood education.

A further example demonstrates how IWBs support multimodal learning:

“In Life Skills, I group pictures. Learners move them according to colour or category. It supports both visual and tactile learners.” (FP-09)

This response reflects the use of IWBs to engage learners through movement and interaction. By allowing learners to physically manipulate content, teachers create opportunities for kinaesthetic learning, which is essential in the Foundation Phase. This approach helps make abstract concepts more concrete and accessible.

These findings suggest that IWBs play an important role in supporting inclusive and differentiated teaching practices. By enabling teachers to present content in multiple ways and engage learners at different levels, IWBs help ensure broader participation in classroom activities. It can therefore be argued that IWBs contribute to more equitable learning opportunities, particularly for learners who may struggle in traditional, teacher-centred environments.

From a TPACK-XK perspective, the use of IWBs for differentiated instruction reflects the integration of technological knowledge (TK), pedagogical knowledge (PK), and contextual knowledge (XK). Teachers draw on their technological knowledge to use the interactive features of the IWB, while their pedagogical knowledge enables them to design activities that cater to different learning levels and styles.

At the same time, contextual knowledge (XK) plays a critical role in shaping how differentiation is implemented. Teachers must consider factors such as class size, learner diversity, and curriculum demands when using IWBs to support varied learning needs. The ability to manage multiple learners simultaneously, as reflected in the data, demonstrates how teachers adapt technology use to fit the realities of their classrooms.

The findings, therefore, indicate that effective differentiation using IWBs is not solely dependent on the availability of the technology, but on the teacher's ability to integrate technological, pedagogical, and contextual knowledge coherently and responsively. This highlights the value of the TPACK-XK framework in explaining how teachers operationalise technology to support inclusive teaching practices.

4.7.4 Leadership-Driven Professional Development:

Teachers have mentioned that having strong leadership in schools and ongoing professional development opportunities are important for successfully using Interactive Whiteboards (IWBs). The results show that when schools offer organized programs for training, working together, and technical help, teachers feel more confident about using IWBs well. When leaders support these efforts, it encourages teachers to try out new digital teaching methods and helps make sure technology is used regularly in their lessons.

For instance, one participant explained that:

"Our deputy runs IWB clinics once a month. We practice together. That helped us move beyond just showing videos." (FP-15)

This feedback highlights that regular training sessions give teachers chances to sharpen their technology skills and discover more engaging ways to use interactive whiteboards. The focus on practicing together suggests that team-based professional development builds teachers' confidence and encourages them to share effective teaching methods.

Similarly, another participant noted that:

"The principal expects us to present one lesson per term using the IWB. It pushes us, but in a good way." (FP-06)

This point drives home how important it is for leaders to set clear expectations if they want teachers to bring technology into their classrooms. Asking teachers to create lessons using an interactive

whiteboard, for example, helps hold them accountable and makes sure they are using digital tools as part of how they teach.

The following comment confirms the value of technical support in schools:
“We have a technician on site. When something breaks, it gets fixed the same day. That makes all the difference.” (FP-01)

This response suggests that getting technical help right away cuts down on interruptions and helps technology get set up smoothly. Having dependable technical support also makes teachers more at ease and familiar using IWBs since they know any issues can be fixed quickly.

These findings indicate that professional development guided by school leaders plays a big role in making interactive whiteboard (IWB) use effective. When school management fosters a supportive atmosphere through training, encouragement, and technical help, teachers are more likely to embrace new teaching methods and use technology meaningfully in their classes. This aligns well with what Mokoena (2019), argues that taking on new technology becomes stronger when the school's culture and continuous professional development work together.

From a TPACK-XK point of view, leadership-led professional development helps teachers integrate their skills with technology (TK), their understanding of teaching methods (PK), and their knowledge of the specific situation they are in (XK). These training opportunities let teachers build their technological know-how by learning how to use interactive whiteboard features effectively. At the same time, professional development helps them sharpen their teaching techniques (PK) by exploring new ways to use technology to make their lessons better and get students more involved.

Contextual knowledge (XK) is also at play, because school leadership sets the stage for how technology gets used. Factors like having enough technical support, what the management expects, and chances for teachers to work together all affect how comfortable educators feel bringing interactive whiteboards (IWBs) into their lessons. When the school's overall culture is supportive, it then encourages teachers to keep learning and trying out new digital tools.

The results show that making Interactive Whiteboards (IWBs) work well is not just about having the technology available. It is also about leadership that encourages continuous professional development, teamwork, and technical help. In this way, school leaders or managers play a crucial part in helping teachers effectively use TPACK-XK in their classrooms

4.8 Theoretical Interpretation of Findings:

Having presented the empirical data and thematic analysis, this section advances the interpretive framework by synthesizing the findings through the study's key theoretical lenses. It moves beyond description to a critical examination of *how* and *why* the observed patterns of IWB adoption and resistance emerged, providing a conceptual explanation grounded in established models of human behaviour and cognition. This theoretical interrogation is essential for transitioning from localized observations to broader, transferable insights about technology integration in complex educational ecosystems.

4.8.1 Technology Acceptance Model (TAM)

The results show that whether teachers use Interactive Whiteboards (IWBs), it boils down to how useful and easy they think this technology is to use it. Drawing from the Technology Acceptance Model (TAM), teachers are more inclined to adopt new technology when they see it genuinely enhances their teaching and learners' understanding (Perceived Usefulness). In addition, they are more likely to embrace it if they feel comfortable and capable using it (Perceived Ease of Use). The teachers in the study noted that IWBs really do make lessons more dynamic, flexible, keep learners more involved, and help enhance understanding through engaging, visual activities.

One participant had this to say:

“The IWB has a combination of sound and pictures which help the children to remain focused”. (FP-03)

This implies that teachers see Interactive Whiteboards (IWBs) as helpful for encouraging active learning. But, technical issues like slow internet or equipment troubles can sometimes make teachers less enthusiastic about using the technology.

Sometimes, it can take a while for the board to turn on, or the internet might be slow, which can delay the lesson. (FP-07)

Positive teaching experiences tend to boost teachers' motivation to keep using IWBs.

“When a lesson goes smoothly using the board, I feel inspired to use it again." (FP-11)

The insights from the responses show that teachers' willingness to embrace technology is shaped not just by their personal views, but also by the quality of technical support and training they get in their

schools. When educators receive sufficient assistance, they are far more likely to use interactive whiteboards in ways that genuinely enhance teaching and learning.

4.8.2 Self-Efficacy Theory (Bandura):

The second interpretive lens, Bandura's Self-Efficacy Theory, provides further insight into why some teachers persist in IWB use while others withdraw, even when both groups recognise its pedagogical value. Self-efficacy refers to the belief in one's capability to perform actions required to achieve desired outcomes. In digital pedagogy, this belief is shaped by four key sources: mastery experience, vicarious experience, social persuasion, and physiological/emotional responses.

For teachers who consistently integrated IWBs, mastery experiences played a pivotal role. Each successful IWB lesson, whether a phonics drag-and-drop activity or a collaborative counting game, strengthened their belief in their ability to facilitate digital learning. Over time, these successes accumulated, increasing confidence and fostering innovation. These teachers became comfortable experimenting with new tools, saving lessons, annotating digital worksheets, and allowing learners to interact directly with the board.

Teachers who cited repeated failures experienced the opposite trajectory. When a screen froze, a pen malfunctioned, or a lesson collapsed mid-execution, the experience registered as a psychological setback, reinforcing the belief that technology was risky, unreliable, or professionally destabilising. The result was a cycle of withdrawal: teachers reverted to chalkboards and workbooks—not because they doubted the educational potential of IWBs, but because they no longer trusted themselves to manage digital uncertainty. This pattern is supported by Ertmer and Ottenbreit-Leftwich (2020), who argue that negative experiences with technology can reduce teachers' confidence and willingness to integrate digital tools into their practice. Similarly, Kearney et al. (2018) note that technical disruptions and unreliable infrastructure often discourage sustained use of IWBs, leading teachers to rely on more familiar methods. In addition, Hew and Brush (2017) identify technical challenges and lack of support as key barriers that contribute to teachers' avoidance of technology, particularly in contexts where consistent functionality cannot be guaranteed.

Vicarious experience also emerged as important. Teachers who observed colleagues using IWBs confidently demonstrating new tools, showcasing saved activities, or modelling instructional strategies expressed increased willingness to try. Conversely, teachers in isolated or unsupportive

schools described having limited exposure to successful examples, leaving them to rely on guesswork or passively observing failures. Social persuasion took the form of peer mentorship and leadership-driven encouragement. Teachers in schools with digital champions or ICT coordinators reported feeling “supported” and “guided,” which reinforced self-belief. Others spoke of principals who normalised technology use by including it in departmental expectations, lesson planning, or internal workshops. This affirmation promoted risk-taking and sustained use.

Finally, emotional responses—such as anxiety, embarrassment, or fear of losing control—played a powerful inhibitory role. Teachers often described technology failures in terms of public vulnerability, especially in classes of young children who become restless quickly. In such high-pressure environments, the cost of failure outweighed the potential benefits. Thus, both personal and collective self-efficacy shape digital adoption. Individual teachers bring their own histories of success or failure, but those histories are continually influenced by the broader professional community in which they operate. IWBs, therefore, are not rejected because teachers are resistant to technology; they are resisted because teachers protect pedagogical authority, learner experience, and classroom order in contexts where digital tools threaten those priorities.

4.9 Synthesis of Key Findings:

This section presents an integrated interpretation of the qualitative and quantitative findings, as required by the convergent parallel mixed-methods design. The overall findings of this study reveal a dynamic interplay between teachers’ attitudes toward Interactive Whiteboards (IWBs), the conditions under which they operate, and the structural supports available to them. A convergence of quantitative and qualitative evidence suggests that IWBs are pedagogically powerful tools only when embedded within an enabling ecosystem.

Firstly, teachers consistently used IWBs when they could rely on stable hardware, predictable connectivity, and immediate troubleshooting. Under those conditions, IWBs were not merely instructional supplements but became central to lesson delivery, particularly in phonics, numeracy, and Life Skills. Teachers reported that learners displayed heightened excitement, improved concentration, and greater willingness to participate when lessons incorporated multimodal and tactile interaction. These outcomes demonstrate a strong alignment with the empirical literature, which positions IWBs as catalysts for learner engagement, collaboration, and cognitive anchoring in early childhood spaces.

Secondly, teachers themselves experienced enjoyment when lessons were successful, and this emotional reinforcement emerged as a key driver of continued use. Positive classroom outcomes

created mastery experiences that strengthened teacher confidence, stimulating experimentation and innovation in lesson planning. Conversely, insufficient or poorly designed training programmes created surface-level adoption, where IWBs were used only to display static presentations, educational videos, or worksheet images. When training lacked depth, teachers resorted to minimal integration because they had no framework for using IWBs as interactive pedagogical instruments.

Thirdly, technical breakdowns consistently undermined teacher confidence. Projector malfunctions, pen calibration failures, software freezes, or prolonged downtime resulted in disrupted lesson flow and a loss of learner attention. Teachers described these interruptions as professionally damaging, creating social embarrassment and eroding classroom authority. As a result, technology was perceived not as an enabler, but as a risk—one that threatened instructional momentum and learner discipline. Many teachers subsequently avoided IWBs, prioritising predictability and control over innovation.

Ultimately, the study highlighted the significance of peer-led and leadership-driven professional ecosystems in supporting effective IWB integration. Schools that cultivated informal peer mentorship structures, shared digital resources, or hosted regular IWB workshops demonstrated markedly higher levels of technology use. Teachers in these environments described themselves as part of collaborative learning communities, supported by colleagues and encouraged by management to explore new digital tools. This finding is consistent with Tondeur et al. (2021), who emphasise that school leadership and collaborative cultures are critical in fostering sustained technology integration. Similarly, Ertmer and Ottenbreit-Leftwich (2020) argue that ongoing professional support and peer collaboration play a key role in building teachers' confidence and competence in using technology.

Leadership involvement, particularly through training allocation, availability of technical support, and clear expectations regarding technology use, was repeatedly cited as a decisive factor in sustained adoption. In this regard, Hew and Brush (2017) identify institutional support, including leadership commitment and access to resources, as a central enabler of effective technology integration. In schools where such support structures were present, IWBs were not used sporadically but were embedded within everyday teaching practices. This suggests that when technology use is supported at both peer and leadership levels, it becomes institutionalised rather than incidental, resulting in a form of collective digital competence among teachers.

Taken together, these findings reveal a fundamental paradox: teacher enthusiasm is present, but systemic scaffolding is not. Interactive Whiteboards are not transformative by virtue of their presence; they become transformative only within supportive ecosystems that pair technology with pedagogy, mentorship, and capacity-building. As such, technology does not transform pedagogy—pedagogy transforms technology, provided the environment enables its development.

4.10 Conclusion:

This chapter presented a comprehensive interpretation of Foundation Phase teachers' experiences with Interactive Whiteboards within the Tshwane North District. Through thematic analysis, the chapter examined teachers' perceptions of the usefulness of IWBs, the quality and accessibility of training, the patterns and frequency of use, and the adaptive strategies that practitioners develop to navigate constraints. The chapter demonstrated that teachers overwhelmingly recognise the value of IWBs, but their ability to utilise them effectively is shaped by the interaction of technical reliability, organisational culture, and personal confidence.

The findings of this chapter indicate that recognising the value of Interactive Whiteboards (IWBs) is not sufficient to ensure their effective use in classroom practice. From a TPACK-XK perspective, teachers' ability to integrate IWBs depends on the interaction between technological knowledge (TK), pedagogical knowledge (PK), and contextual knowledge (XK). While many teachers demonstrate an understanding of the pedagogical value of IWBs, their use is often limited when they lack the technological skills required to operate the tools effectively or when contextual conditions do not support their use.

The findings further show that successful integration occurs when teachers are able to align the use of IWBs with lesson objectives and classroom realities. When IWBs are perceived as manageable and compatible with lesson flow, teachers are more likely to incorporate them into their teaching. However, when teachers experience technical challenges, a lack of support, or time constraints, the integration of IWBs becomes difficult, even when their potential benefits are acknowledged.

In addition, the findings suggest that teachers' continued use of IWBs is influenced by their experiences within their teaching contexts. Teachers who are able to use IWBs successfully over time are more likely to refine their practice and integrate the technology more meaningfully. In contrast, repeated negative experiences, such as technical failures or disrupted lessons, limit teachers' ability to develop and apply their technological and pedagogical knowledge. This often results in reduced use of IWBs and a return to more familiar teaching methods.

Overall, the findings highlight that effective IWB integration is not determined by perceived value alone, but by the extent to which teachers are able to integrate technological, pedagogical, and contextual knowledge in a coherent and supported manner. This reinforces the importance of the TPACK-XK framework in understanding how both knowledge and context shape the use of technology in classroom practice.

Ultimately, IWB adoption is not a question of teacher willingness, but rather a reflection of structural support, technological stability, and developmental investment. The board itself does not create pedagogical innovation; instead, innovation emerges through continuous professional development, peer collaboration, and leadership that legitimises digital experimentation.

Chapter 5 will extend this interpretation by situating the findings within the existing literature, national education policy frameworks, and practical recommendations. It will examine how schools, district structures, and teacher education programmes can cultivate technologically resilient ecosystems that move beyond sporadic or superficial use toward pedagogically meaningful integration of Interactive Whiteboards in the Foundation Phase.

Chapter 5: Discussion, Implications, And Recommendations

5.1 Introduction:

Chapter 4 presented a detailed analysis of the empirical findings, drawing on both questionnaire data and interview narratives to map how Foundation Phase teachers experience, interpret, and engage with Interactive Whiteboards (IWBs) in their daily practice. It highlighted teachers' perceptions of the pedagogical value of IWBs, the nature and quality of professional development available to them, the frequency and depth of IWB use across different classroom contexts, and the adaptive strategies teachers employ to navigate systemic challenges. The chapter draws on the TPACK-XK framework to explain why some teachers integrate Interactive Whiteboards (IWBs) consistently, while others restrict their use or abandon the tool altogether. Differences in teachers' ability to combine technological, pedagogical, and content knowledge, as well as the contextual conditions in which they work, help to explain variations in practice.

This chapter synthesises and interprets the findings presented in Chapter 4 in relation to existing scholarship, the TPACK-XK framework, and the broader South African educational context. The chapter moves beyond description to critically examine how and why Foundation Phase teachers adopt—or resist—the use of IWBs in their daily practice. It explores how teachers' knowledge, classroom experiences, and contextual realities influence the integration of technology, and how school environments either support or constrain pedagogical innovation.

Drawing on the TPACK-XK framework, this chapter positions IWB integration as a process shaped by the interaction between teachers' knowledge domains and the contexts in which they teach, rather than as an individual or isolated decision. The chapter concludes with recommendations for teacher education institutions, school leadership, district officials, and policymakers to support more effective and contextually responsive integration of IWBs in Foundation Phase classrooms.

5.2 Summary of Key Findings:

The analysis presented in Chapter 4 yielded a coherent and multi-layered understanding of the factors influencing Interactive Whiteboard (IWB) integration in the Tshwane North District. The findings coalesce around four principal trends that illuminate the complex interplay between teacher agency, pedagogical recognition, and systemic constraints. These trends move from an analysis of internal beliefs to the external structures that ultimately determine whether those beliefs translate into sustained classroom practice. The four major trends are outlined below:

5.2.1 Teachers value IWBs and understand their pedagogical potential

The findings indicate that Foundation Phase teachers generally recognise the pedagogical value of Interactive Whiteboards (IWBs). Teachers described IWBs as tools that enhance learner engagement, support multisensory instruction, and improve conceptual understanding, particularly through visual and interactive activities. Positive learner responses, such as increased participation and improved attention, reinforce teachers' perceptions of the usefulness of IWBs. From a TPACK-XK perspective, this suggests that teachers possess an awareness of how technology can support pedagogical goals (PK) and content delivery (CK). However, this recognition of value does not automatically translate into consistent or effective use, as other factors influence implementation.

5.2.2 Training and institutional support are insufficient or fragmented

Despite recognising the value of IWBs, teachers reported that training and institutional support are limited and often fragmented. Many participants described receiving once-off technical training focused on basic operation, with little emphasis on pedagogical integration. The absence of continuous professional development, mentoring, and technical support limits teachers' ability to develop their technological knowledge (TK) and integrate it meaningfully into teaching. In some schools, IWBs were described as "decorative screens," reflecting underutilisation due to a lack of skilled users. From a TPACK-XK perspective, this highlights a gap in the development of TK and PK, as well as insufficient contextual support (XK) to sustain effective use.

5.2.3 Patterns of use are uneven and heavily context-dependent

The findings further show that the use of IWBs is inconsistent and shaped by contextual conditions. Teachers reported sporadic or superficial use of IWBs in situations where equipment was unreliable, maintenance was delayed, or time for lesson preparation was limited. In contrast, a small number of teachers were able to integrate IWBs consistently and creatively into their teaching routines. This variation suggests that technology integration is not uniform across schools but is influenced by differences in infrastructure, support, and classroom conditions. Within the TPACK-XK framework, this reflects the critical role of contextual knowledge (XK), as teachers must adapt their use of IWBs to the realities of their teaching environments.

5.2.4 Teachers develop adaptive strategies in the absence of systemic support

In response to limited institutional support, teachers developed a range of adaptive strategies to sustain the use of IWBs. These included peer mentoring, collaborative sharing of resources, structured lesson planning, and informal troubleshooting networks. Teachers who worked within supportive peer environments were more likely to continue using IWBs despite challenges. These strategies reflect teachers' ability to navigate constraints and apply their knowledge creatively within their contexts. From a TPACK-XK perspective, this demonstrates how teachers draw on their technological, pedagogical, and contextual knowledge to adapt their practices, even in the absence of formal support structures.

Taken together, these findings reveal an important paradox: while teachers demonstrate a strong appreciation of the pedagogical value of IWBs, the structural conditions required for sustained and effective integration are often lacking. This suggests that successful technology integration depends not only on teachers' knowledge and perceptions but also on the extent to which their working environments support the application of that knowledge. The TPACK-XK framework, therefore, provides a useful lens for understanding how both knowledge and context interact to shape the use of IWBs in Foundation Phase classrooms.

5.3 Discussion of Findings in Relation to Literature:

Having established the empirical contours of the study's findings, this section critically positions them within the broader scholarly conversation on technology integration in education. By systematically comparing and contrasting the emergent themes with established literature, the discussion moves beyond the specific context of the Tshwane North District to examine the alignment, nuance, and unique contributions of this research to existing theoretical and empirical knowledge. This interpretive synthesis highlights where the findings confirm prevailing academic discourse, where they expose localised complexities, and where they may suggest a need to refine current models of technology adoption for early childhood contexts.

5.3.1 Perceived Value of IWBs in Foundation Phase Classrooms:

The results support global research that demonstrates IWBs have a positive influence on learner engagement, particularly at early developmental stages. Kennewell et al. (2008) and Mihai (2020) argue that IWBs stimulate attention, deepen comprehension, and enable children to interact physically with digital content.

Teachers in this study echoed these views, describing IWBs as tools capable of “bringing lessons to life,” especially for phonics and numeracy. This aligns with Aisyah (2021), who found that multisensory digital environments enhance decoding skills and early literacy.

What is particularly notable in this study is how teachers equate engagement with dignity and inclusion. Several described how quieter or weaker learners participate more actively when using the IWB. This finding supports the claims by Manny-Ikan et al. (2011) that digital tools democratize the classroom space. Learner participation is not only instructional—it is also socio-emotional, fostering a sense of belonging and identity development. However, teachers were clear that the benefits were conditional, not inherent. IWBs enhance learning only when functioning reliably. This contradicts the belief that technology is “transformative” by default. As many ICT scholars argue, digital tools are not solutions in themselves—they are mediating instruments shaped by context and teacher agency (Ertmer, 2005; Cuban, 2001). Here, the board acted as a pedagogical amplifier, not a replacement for teacher expertise.

5.3.2 Training as a Determinant of Pedagogical Depth:

Across both city and township contexts, teachers pointed to training deficiencies as the most significant obstacle to meaningful integration. Their descriptions reflect a training model that is technician-driven, supplier-driven, or event-driven, rather than pedagogically oriented. Once-off demonstrations focused on hardware activation rather than instructional scaffolding.

Barbour et al. (2020) warn that when teachers lack developmental training, technology remains peripheral. This was clearly visible in this study. Teachers who lacked real pedagogical coaching restricted IWBs to passive functions—displaying videos or projecting worksheets. Their “use” was superficial because their understanding was shallow.

Conversely, teachers who had informal or sustained exposure to IWB practice (peer workshops, trial-and-error, continuous usage) developed deeper integration. This matches Mishra & Koehler’s (2006) argument that meaningful digital adoption requires TPACK—the intersection of Technological, Pedagogical, and Content Knowledge. Without training at this intersection, the technology becomes a digital chalkboard.

5.3.3 Infrastructure and the Politics of Access:

A striking finding is the role of material conditions. Teachers from township schools consistently described broken projectors, damaged pens, poor calibration, or weeks-long maintenance delays. Their experience reflects the historical inequalities that are now reproduced in digital form. Access to IWBs does not necessarily equate to access to working IWBs.

The literature on ICT adoption in developing contexts (Hennessy et al., 2005) warns that technical failure is not neutral—it accumulates emotional and pedagogical consequences. Every breakdown introduces embarrassment, wasted time, and learner disruption. Teachers retreat to conservative methods not because they lack vision, but because they protect classroom authority and instructional continuity.

This mirrors Cuban's (2001) argument: teachers are pragmatists, not technophobes. They adopt digital tools when they can trust them to work. When tools undermine their authority, they are abandoned.

5.3.4 Professional Culture: Leadership and Peer Ecology:

One of the most important insights from this study is that teachers thrive when they work in collaboration. Informal peer networks—such as WhatsApp groups, shared lesson files, and classroom demonstrations—allowed teachers to bypass systemic failures. These decentralised support structures show that teachers are not resistant; they are resourceful.

This aligns with research on professional learning communities (PLCs), which emphasise collective learning as a key driver of classroom innovation (Hargreaves & Fullan, 2012). Leadership also emerged as decisive. Schools with active ICT champions, competent technicians, or digital expectations displayed stronger integration. This aligns with Mokoena (2019), who demonstrates that digital uptake is not correlated with individual teacher skill, but rather with institutional culture.

5.4 Theoretical Implications:

This study's findings extend beyond their immediate empirical context to offer meaningful contributions to the theoretical understanding of technology integration in education. The data necessitate a critical engagement with how the TPACK-XK framework operates within complex and often resource-constrained educational environments.

The findings highlight that technology integration cannot be fully understood by focusing solely on teachers' knowledge or skills in isolation. Instead, they demonstrate the importance of examining the dynamic interaction between technological, pedagogical, and content knowledge, as well as the contextual conditions in which teaching and learning take place. In this regard, the study reinforces the relevance of the TPACK-XK framework as a context-sensitive model for understanding teachers' use of technology.

At the same time, the findings suggest that the practical application of TPACK-XK is significantly influenced by contextual realities such as infrastructure, institutional support, and classroom conditions. This indicates that even when teachers possess the necessary knowledge domains, their ability to integrate technology effectively may be constrained by factors beyond their control.

The analysis, therefore, points towards a more situated and contextually grounded understanding of technology integration, where teachers' practices are shaped by both their knowledge and the environments in which they operate. In this way, the study contributes to strengthening the explanatory power of the TPACK-XK framework by emphasising the central role of context in mediating the relationship between knowledge and practice.

5.4.1 Application of the TPACK-XK Framework

The findings of this study highlight the relevance of the TPACK-XK framework in explaining teachers' use of Interactive Whiteboards (IWBs) in classroom practice. The data show that while teachers generally recognise the pedagogical value of IWBs, their ability to integrate the technology effectively is shaped by the interaction between technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), and contextual knowledge (XK) (Mishra & Koehler, 2006; Koehler, Mishra, & Cain, 2013; Tondeur et al., 2021).

The findings suggest that teachers' challenges are not primarily rooted in a lack of awareness of the usefulness of IWBs, but rather in their ability to apply their knowledge in real classroom settings. In many cases, teachers demonstrated an understanding of how IWBs could support teaching and learning; however, limitations in technological skills and pedagogical integration reduced their ability to use the tool effectively. This indicates that the integration of TK and PK is not always sufficiently developed, which is consistent with research showing that effective technology integration requires the meaningful blending of knowledge domains (Koehler et al., 2013).

More importantly, the study highlights the critical role of contextual knowledge (XK). Factors such as unreliable infrastructure, lack of technical support, limited training opportunities, and time constraints significantly influenced teachers' use of IWBs. Even when teachers possessed the necessary knowledge domains, these contextual barriers limited the practical application of that knowledge. This supports the argument that context is a central determinant of technology integration, particularly in under-resourced environments (Ertmer & Ottenbreit-Leftwich, 2020; Hew & Brush, 2017; Tondeur et al., 2021).

Furthermore, the findings show that sustained use of IWBs is associated with teachers' ability to continuously develop and apply their knowledge across these domains. Teachers who were able to align technological tools with pedagogical strategies and classroom realities were more likely to integrate IWBs consistently. In contrast, teachers who experienced repeated challenges struggled to maintain this integration, often reverting to more familiar teaching methods. This reflects the dynamic nature of TPACK, where effective integration evolves through practice and experience (Mishra, 2019).

Overall, the study demonstrates that the effectiveness of IWB integration depends on the interaction between knowledge and context. The TPACK-XK framework therefore provides a comprehensive lens for understanding how teachers' knowledge, skills, and environmental conditions collectively shape the use of technology in Foundation Phase classrooms.

5.5 Implications for Practice and Policy:

The findings of this study reveal that IWB adoption is not simply a matter of teacher preference or individual competence. Instead, it is shaped by systemic conditions, school culture, professional identity, and access to supportive learning communities. Accordingly, the implications for practice and policy must address teacher development, leadership responsibility, and classroom pedagogy as interconnected rather than isolated domains.

5.5.1 Teacher Professional Development:

The results strongly suggest that professional development must move beyond traditional "installation-training" events that teach teachers how to switch on or calibrate the IWB. Teachers repeatedly expressed that technical demonstrations without a pedagogical context are ineffective, as they fail to bridge the gap between technological capability and classroom application. Therefore, training needs to be iterative, developmental, and situated within authentic classroom environments.

Training should include modelling of actual lessons—such as phonics blending, Life Skills categorization tasks, or Grade 1 number recognition—so that teachers can observe how IWBs scaffold learner engagement, manage classroom behaviour, and support differentiated instruction. These sessions should enable teachers to practice in real-time, make mistakes in a safe space, and receive feedback

that strengthens their self-efficacy. Such mentorship-based models align with Vygotskian principles of guided participation and Ubuntu's collective learning ethic, where educators grow through shared experiences rather than isolated struggles.

Furthermore, ongoing mentoring is essential. One-off workshops do not produce pedagogical transformation. Teachers require opportunity for dialogue, reflection, and continuous hands-on experimentation. Peer coaching should be institutionalised as part of digital teacher induction, enabling novices to learn from experienced ICT users. This ensures that knowledge is socially distributed rather than concentrated in a single "tech expert," aligning with Bandura's idea that self-efficacy is developed through vicarious experience and social reinforcement.

5.5.2 Leadership and Resource Governance:

School leadership emerged as a decisive factor in whether IWBs are sustained or abandoned. Principals and senior management teams cannot treat technology adoption as a discretionary teacher activity; they must actively cultivate enabling conditions. This includes formally designating ICT champions or digital coaches, who can lead internal training sessions, coordinate troubleshooting, and mentor staff. These roles help to normalize IWB use and reduce anxiety associated with experimentation.

The study also shows that maintenance policies are critical. Teachers' confidence collapses when devices break, and no one is accountable for repairs. Schools should implement maintenance protocols with clearly defined response times, record-keeping systems, and escalation procedures. When technical support is prompt and reliable, teachers feel secure in planning lessons around IWBs, knowing their professional credibility will not be compromised.

At a systemic level, district and provincial policies must address the persistent infrastructural inequities that shape technology integration in South African schools. Participants in township contexts frequently reported malfunctioning IWBs, limited internet connectivity, and delayed technical support, all of which constrained effective use. These findings align with Spaull (2013) and the Department of Basic Education (2020), who highlight how resource disparities continue to influence educational quality and access to technology across schools.

Scholars further argue that technology integration initiatives must be accompanied by equitable resource distribution to avoid reinforcing existing inequalities (Ertmer & Ottenbreit-Leftwich, 2020; Tondeur et al., 2021). In this regard, the findings of the current study suggest that digital innovation cannot be implemented uniformly across unequal contexts. Rather, resource allocation should prioritise high-need schools to ensure that all learners benefit from technology-enhanced teaching. This position is supported by Hew and Brush (2017), who emphasise that access, support, and infrastructure are foundational conditions for meaningful technology use.

From a TPACK-XK perspective, these inequities directly affect teachers' contextual knowledge (XK), limiting their ability to apply technological and pedagogical knowledge effectively. It can therefore be argued that addressing infrastructural disparities is not only a matter of access, but a necessary condition for enabling teachers to operationalise their knowledge in practice.

5.5.3 Classroom Pedagogy

The findings of this study suggest that the pedagogy of IWB integration should be intentional and carefully structured rather than improvised. Teachers reported that when IWBs were deliberately embedded into lesson planning, classroom instruction became more coherent, efficient, and engaging. This is consistent with Schmid and Whyte (2012), who argue that sustained technology integration is more likely when it is aligned with curriculum objectives and incorporated into lesson design. Similarly, Koehler, Mishra, and Cain (2013) emphasise that effective technology use requires the integration of pedagogical and technological knowledge within specific teaching contexts.

The study further indicates that IWBs are most effective when used to support interactive and learner-centred approaches. Foundation Phase learners benefit from multisensory learning experiences that involve movement, visual engagement, and active participation. Research suggests that such approaches enhance understanding and engagement, particularly in early childhood education (Mihai, 2020; Tondeur et al., 2021). IWBs can support this by enabling activities such as drag-and-drop tasks, visual categorisation, phonics interaction, and collaborative problem-solving.

However, the findings also show that IWBs are often reduced to display tools when teachers lack the pedagogical strategies required for meaningful integration. This supports Ertmer (2005), who argues that without appropriate pedagogical knowledge, technology is likely to be used in superficial ways. It can therefore be argued that effective IWB use depends not only on access to the technology, but on teachers' ability to design learning experiences that actively engage learners.

From a TPACK-XK perspective, this highlights the importance of integrating technological knowledge (TK) with pedagogical knowledge (PK) in ways that are responsive to the needs of Foundation Phase learners. At the same time, teachers must consider contextual factors (XK), such as time constraints, class size, and available resources, when designing IWB-based activities. This reinforces the idea that meaningful technology integration requires deliberate planning, pedagogical alignment, and sensitivity to classroom realities.

5.6 Recommendations:

Based on the synthesis of findings and their theoretical implications, the following recommendations are proposed for policymakers, school leaders, teacher training institutions, and future researchers. These are structured to address the core disjuncture identified in this study: the gap between the recognized pedagogical potential of technology and the systemic conditions required to realize it. The recommendations move from immediate, practice-focused interventions to broader, systemic changes aimed at fostering a sustainable, pedagogically grounded culture of technology integration in the Foundation Phase.

5.6.1 Pedagogical Capacity-Building:

The most urgent priority is to fundamentally restructure teacher professional development, shifting the paradigm from technical training to pedagogical empowerment. Current workshops that focus on switching devices on and off or using basic annotation tools are insufficient and misdirected. Future training must be designed and facilitated by pedagogical experts—not just ICT technicians—who can explicitly model and deconstruct how the unique affordances of an IWB can serve specific Foundation Phase learning objectives. Facilitators must demonstrate, for instance, how drag-and-drop manipulatives can concretize abstract number sense, how interactive story mapping can scaffold narrative comprehension, or how visual sorting games can teach phonics and classification. Crucially, these sessions must move beyond demonstration to collaborative construction. Workshops should be structured as design studios where teachers, working in grade-level teams, use curriculum documents like the CAPS to build, critique, and refine their own interactive IWB lesson sequences. This hands-on, curriculum-anchored approach ensures that technological skill is developed in direct service of pedagogical intent, transforming the IWB from a novel projection screen into a deliberate instrument for literacy development, numeracy pathway creation, multimodal engagement, and responsive differentiated instruction.

5.6.2 Professional Learning Communities (PLCs) as Digital Innovation Hubs

To combat the isolation and anxiety that often accompany technology integration, schools must intentionally cultivate structured and formalised Professional Learning Communities (PLCs) focused on digital pedagogy. Research shows that collaborative professional learning environments play a critical role in supporting sustained technology integration and teacher development (Tondeur et al., 2021; Ertmer & Ottenbreit-Leftwich, 2020). These PLCs should be deliberately scheduled, adequately resourced, and recognised as core professional work rather than informal or optional activities. Within such spaces, digital adoption becomes a shared and collaborative process, where teachers collectively engage in learning and problem-solving.

PLCs provide opportunities for peer coaching and collaborative practice, where more experienced or confident teachers support others in integrating technology into their teaching. This aligns with findings by Koehler, Mishra, and Cain (2013), who emphasise that teachers develop technological and pedagogical knowledge more effectively through collaborative engagement and shared practice. In this context, co-teaching and demonstration lessons can support the practical application of IWBs, allowing teachers to learn through observation and participation.

In addition, PLCs can function as collective spaces for troubleshooting technical and pedagogical challenges. Hew and Brush (2017) highlight that access to support systems significantly reduces barriers to technology use, particularly in environments where teachers may otherwise struggle individually. By shifting problem-solving from an individual responsibility to a shared endeavour, PLCs help reduce the pressure and uncertainty associated with technology integration.

Furthermore, PLCs can serve as repositories for shared teaching resources, including IWB-based lesson plans, activities, and templates. This reduces the burden on individual teachers to develop materials independently and supports more efficient and consistent use of technology. Such collaborative resource development is particularly important in under-resourced contexts, where time and access to materials are often limited (Ertmer & Ottenbreit-Leftwich, 2020).

From a TPACK-XK perspective, PLCs support the development and integration of technological knowledge (TK) and pedagogical knowledge (PK), while also strengthening contextual knowledge (XK) through shared experiences and collective problem-solving. By framing technology integration as a collaborative rather than individual process, PLCs contribute to building collective capacity and sustaining meaningful use of IWBs in classroom practice.

5.6.3 Establishing Reliable and Rapid Technical Support Ecosystems

To combat the isolation and anxiety that often accompany technology integration, schools must intentionally cultivate structured and formalised Professional Learning Communities (PLCs) focused on digital pedagogy. Research shows that collaborative professional learning environments play a critical role in supporting sustained technology integration and teacher development (Tondeur et al., 2021; Ertmer & Ottenbreit-Leftwich, 2020). These PLCs should be deliberately scheduled, adequately resourced, and recognised as core professional work rather than informal or optional activities. Within such spaces, digital adoption becomes a shared and collaborative process, where teachers collectively engage in learning and problem-solving.

PLCs provide opportunities for peer coaching and collaborative practice, where more experienced or confident teachers support others in integrating technology into their teaching. This aligns with findings by Koehler, Mishra, and Cain (2013), who emphasise that teachers develop technological and pedagogical knowledge more effectively through collaborative engagement and shared practice. In this context, co-teaching and demonstration lessons can support the practical application of IWBs, allowing teachers to learn through observation and participation.

In addition, PLCs can function as collective spaces for troubleshooting technical and pedagogical challenges. Hew and Brush (2017) highlight that access to support systems significantly reduces barriers to technology use, particularly in environments where teachers may otherwise struggle individually. By shifting problem-solving from an individual responsibility to a shared endeavour, PLCs help reduce the pressure and uncertainty associated with technology integration.

Furthermore, PLCs can serve as repositories for shared teaching resources, including IWB-based lesson plans, activities, and templates. This reduces the burden on individual teachers to develop materials independently and supports more efficient and consistent use of technology. Such collaborative resource development is particularly important in under-resourced contexts, where time and access to materials are often limited (Ertmer & Ottenbreit-Leftwich, 2020).

From a TPACK-XK perspective, PLCs support the development and integration of technological knowledge (TK) and pedagogical knowledge (PK), while also strengthening contextual knowledge (XK) through shared experiences and collective problem-solving. By framing technology integration as a collaborative rather than individual process, PLCs contribute to building collective capacity and sustaining meaningful use of IWBs in classroom practice.

5.6.4 Systemic Curriculum Integration and Normalization

For Interactive Whiteboards (IWBs) to shed their status as “special event” technology, their use must be systematically normalised and embedded into the everyday practices of schools. Research indicates that sustainable technology integration is more likely when it is aligned with institutional expectations, planning processes, and evaluation systems (Tondeur et al., 2021; Ertmer & Ottenbreit-Leftwich, 2020). School leadership and subject advisors, therefore, play a critical role in leading this integration by ensuring that IWB-supported strategies are deliberately incorporated into departmental planning, curriculum delivery, and work schedules.

In addition, the inclusion of digital pedagogy within teacher appraisal systems and professional development portfolios can signal its importance as a core component of teaching practice. As Koehler, Mishra, and Cain (2013) argue, effective technology integration requires deliberate alignment between pedagogical goals and technological tools, which is strengthened when institutions formally recognise and support such practices. Similarly, Schmid and Whyte (2012) emphasise that structured and planned use of digital tools, rather than ad hoc implementation, leads to more sustainable adoption.

Furthermore, incorporating IWBs into teaching demonstrations, peer observations, and formal lesson evaluations can reinforce their pedagogical value. Hew and Brush (2017) note that institutional expectations and accountability structures influence teachers’ willingness to adopt and sustain technology use. When digital pedagogy is consistently embedded within planning, evaluation, and daily classroom practice, it shifts from being an optional enhancement to a standard expectation of effective teaching.

From a TPACK-XK perspective, this process of normalisation supports the integration of technological knowledge (TK) with pedagogical knowledge (PK) within specific teaching contexts (XK). By embedding IWBs into routine instructional practice, teachers are more likely to develop confidence and fluency in their use, reducing the cognitive and emotional burden associated with technology integration. In this way, IWBs transition from being perceived as complex add-ons to becoming familiar instructional tools that support everyday teaching and learning.

5.6.5 Policy-Aligned, Contextually Relevant Training Design

Finally, all training and resource development for Interactive Whiteboards (IWBs) must be consciously aligned with overarching national education policy priorities. In the South African context, the Department of Basic Education (2011; 2020) emphasises inclusive education, early childhood development (ECD) principles, and the promotion of multilingualism as central to effective teaching in the Foundation Phase. Accordingly, the design of IWB activities should explicitly support these priorities by ensuring that learning tasks are accessible, developmentally appropriate, and responsive to diverse linguistic contexts. This includes incorporating kinaesthetic and play-based approaches that are consistent with early childhood pedagogy, as well as providing multilingual options that support learners' home languages (Makoe & McKinney, 2014; DBE, 2020).

In addition, teacher training must bridge the gap between technological capability and pedagogical practice. Research indicates that technology integration is most effective when it supports learner-centred and constructivist approaches to teaching, rather than reinforcing traditional teacher-centred methods (Ertmer & Ottenbreit-Leftwich, 2020; Tondeur et al., 2021). This requires training programmes to move beyond technical skills and focus on how IWBs can be used to promote active learning, collaboration, and critical thinking.

Facilitators should therefore guide teachers to critically reflect on their use of technology by asking whether IWB-based activities support learner engagement and knowledge construction. As Koehler, Mishra, and Cain (2013) suggest, effective technology integration involves aligning technological tools with pedagogical intentions and curriculum goals.

From a TPACK-XK perspective, this alignment ensures that teachers integrate technological knowledge (TK) with pedagogical knowledge (PK) and content knowledge (CK) in ways that are responsive to their specific contexts (XK). By grounding IWB integration within policy priorities and pedagogical principles, the technology becomes a tool for enhancing teaching and learning rather than a superficial addition. In this way, IWBs can support the broader goals of the Foundation Phase, ensuring that technology use remains meaningful, inclusive, and educationally relevant.

5.7 Limitations of the Study

While this research provides a detailed and contextually grounded exploration of IWB integration, it is important to delineate the boundaries of its methodological scope and acknowledge the constraints that shape its findings. A critical appraisal of these limitations is essential for accurate interpretation and for informing future research.

5.7.1 Contextual Specificity and Generalisability

This study was intentionally designed as an exploratory qualitative case study to generate in-depth insight within the bounded system of the Tshwane North District. Engaging sixteen Foundation Phase teachers through purposive sampling yielded rich, contextually embedded data. However, this methodological choice inherently limits the generalisability of the findings. Qualitative case studies prioritise depth over breadth and are not intended for statistical generalisation (Creswell & Creswell, 2022; Yin, 2018).

The South African education system is characterised by significant inequalities across provinces, school quintiles, and community contexts. Schools in urban, peri-urban, and rural areas operate under markedly different infrastructural and socio-economic conditions, which shape technology integration in diverse ways (Spaull, 2013; Department of Basic Education, 2020). As such, the findings of this study should be understood as context-specific rather than universally applicable. They provide valuable insight into similar contexts but cannot be assumed to represent all educational settings.

5.7.2 Scope of Stakeholder Perspectives

The study focused exclusively on the perspectives of classroom teachers, offering a detailed view from the pedagogical frontline. However, this focuses necessarily excluded other key stakeholders within the educational ecosystem. The absence of district officials limits insight into policy implementation and resource allocation processes, which influence school-level practices. Similarly, not including school principals or ICT coordinators restricts understanding of leadership dynamics and institutional decision-making that shape technology use (Tondeur et al., 2021).

Most notably, the study did not incorporate learners' perspectives. As the primary beneficiaries of IWB integration, learners' experiences of engagement, understanding, and participation remain underexplored. Existing research highlights the importance of including multiple stakeholder perspectives to develop a more holistic understanding of technology integration (Ertmer & Ottenbreit-Leftwich, 2020). This represents an important area for future research.

5.7.3 Temporal Constraint of a Cross-Sectional Design

The study employed a cross-sectional design, capturing teachers' perceptions and practices at a single point in time. However, technology integration is a dynamic and evolving process influenced by experience, training, and contextual changes. Teachers' confidence, knowledge, and instructional strategies develop over time through ongoing practice and exposure to technology (Mishra, 2019; Tondeur et al., 2021).

A cross-sectional approach does not allow for the examination of how teachers' practices evolve or how sustained integration is achieved. Longitudinal research, which follows participants over an extended period, would provide deeper insight into the developmental nature of technology adoption and the factors that support or hinder long-term integration (Creswell & Creswell, 2022). This limitation suggests that the findings represent a snapshot rather than a complete trajectory of IWB integration.

In acknowledging these limitations, the study does not diminish its value but rather clarifies its contribution. It offers a deep and contextually grounded analysis of teachers' experiences, providing insight into the complex interaction between knowledge and context in technology integration. At the same time, it highlights the need for broader, multi-stakeholder, and longitudinal research to further develop understanding in this field. In this way, the study serves as both a contribution to current knowledge and a foundation for future inquiry.

5.8 Recommendations for Future Research

While this study provides a critical, situated analysis of the factors influencing IWB integration in the Foundation Phase, its findings also delineate clear and compelling pathways for further scholarly inquiry. To advance both theoretical understanding and practical efficacy in educational technology, future research must adopt more ambitious, nuanced, and multi-perspective approaches. The following recommendations outline a progressive research agenda designed to address the complexities and gaps identified in this study, moving the field from diagnostic analysis towards transformative, evidence-based praxis.

First, there is a profound need for longitudinal, ethnographic research that transcends the limitations of cross-sectional case studies. A multi-year investigation tracking a cohort of Foundation Phase teachers would yield unparalleled insights into the *process* of technological adoption and pedagogical transformation. Such a study could document the non-linear journey from initial apprehension and mechanical use to eventual confidence and creative integration, mapping the critical incidents, mentorship interactions, and reflective moments that catalyse this evolution. It would illuminate how teachers' professional identities are reconstituted in relation to digital tools, how their classroom management epistemologies adapt to interactive, student-centred learning, and how sustainable digital pedagogical routines become institutionalized within school culture. This longitudinal lens is essential for understanding technology integration not as an event but as a developmental trajectory, with profound implications for the design of sustained, rather than episodic, professional support.

Second, the scholarly conversation remains disproportionately focused on the teacher as the primary agent, largely overlooking the central experiential reality: the learner. Future research must make a decisive epistemological shift to centre the voices, perceptions, and lived experiences of children**.** Employing participatory and child-friendly methodologies—such as digital storytelling, photo-elicitation, and structured observation—research should investigate how young learners cognitively decode and emotionally engage with IWBs. Key questions include: Do these tools genuinely foster a sense of agentic autonomy or merely choreographed interaction? How do they mediate peer collaboration and conflict in group tasks? What is their impact on language acquisition and conceptual development in multilingual, heterogeneous classrooms? Understanding technology through the child's lens is not merely additive; it is fundamental to designing pedagogies that are ethically sound, developmentally appropriate, and truly empowering.

Third, at the macro level, a rigorous program of critical policy sociology research is urgently required to dissect the persistent chasm between grand technological ambitions and classroom-level implementation. Studies should employ policy trajectory analysis to follow ICT directives from their formulation in national and provincial departments through the layers of district bureaucracy to their ultimate enactment—or abandonment—in individual schools. This research must interrogate the material and discursive practices that translate policy into practice, examining the allocation (and misallocation) of resources, the interpretation of accountability metrics, and the on-the-ground labour of school leaders tasked with implementation. Without such scrutiny, expensive technology initiatives risk remaining symbolic capital—displayed in policy documents and school inventories—rather than becoming functional capital that actively enhances teaching and learning. This line of inquiry is vital for holding systems accountable and ensuring that equity is engineered into the very infrastructure of digital education.

Finally, the foundation for sustained change is laid in the formative years of professional preparation. A comprehensive, nationwide audit and redesign of pre-service teacher education is warranted. Research must evaluate whether current university programs are equipping future Foundation Phase educators with more than superficial digital literacy. Do graduates possess the pedagogical technological content knowledge (TPACK) to make discerning choices about when and how to use technology? Have they developed the reflective and adaptive competencies necessary to troubleshoot failures and iterate on practice? Are they grounded in a critical socio-technical understanding that allows them to navigate issues of access, equity, and digital citizenship? Research-practice partnerships between universities and schools can create design-based research cycles to prototype and evaluate new models of pre-service training, ensuring the next generation of teachers is not merely prepared to use technology, but to lead its thoughtful and transformative integration.

In conclusion, advancing the field requires a commitment to research that is longitudinal rather than snapshot, child-centred rather than tool-focused, critically policy-aware rather than techno-optimistic, and foundational in addressing teacher preparation. By pursuing this multi-pronged agenda, researchers can provide the robust evidence needed to transform Interactive Whiteboards and similar technologies from enigmatic classroom fixtures into powerful, reliable engines of pedagogical innovation and equitable learning.

5.9 Conclusion

This chapter aimed to interpret the study's findings within the broader context of digital pedagogy and teacher development in South African schools. The evidence demonstrated that Interactive Whiteboards (IWBs) hold significant pedagogical potential in Foundation Phase classrooms. Teachers consistently associated IWBs with increased learner engagement, multisensory participation, and improved conceptual understanding in phonics, numeracy, and Life Skills. Importantly, these benefits were grounded in teachers lived classroom experiences, where lessons became more interactive, responsive, and engaging when IWBs were used effectively.

However, the study also revealed a critical structural contradiction: while teachers recognise the value of IWBs, the conditions required for sustained integration are often absent. Challenges such as fragmented training, unreliable infrastructure, limited technical support, and lack of pedagogical mentoring were not reflections of teacher resistance but indicators of systemic constraints. Teachers' reluctance to use IWBs was therefore not rooted in negative attitudes towards technology, but in repeated experiences of disruption, failure, and professional vulnerability.

From a TPACK-XK perspective, these findings highlight that effective technology integration depends on the interaction between technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), and contextual knowledge (XK). While many teachers demonstrated an understanding of how IWBs could support teaching and learning (PK and CK), their ability to apply this knowledge was constrained by contextual factors such as infrastructure, support systems, and classroom realities (XK). This reinforces the argument that knowledge alone is insufficient; it must be supported by enabling conditions that allow for its practical application.

The findings further show that successful integration is not an individual act of competence, but a collective outcome shaped by school culture, leadership, and collaboration. Teachers working within supportive environments—characterised by peer collaboration, leadership involvement, and access to technical support—were more likely to integrate IWBs meaningfully into their teaching. In contrast, those operating in unsupported contexts experienced what can be described as digital fatigue, leading to avoidance and superficial use of technology.

This study, therefore, challenges simplistic views of technology integration as a matter of individual skill or motivation. Instead, it demonstrates that integration is a situated practice, shaped by the dynamic interaction between teacher knowledge and contextual conditions. Within the TPACK-XK framework, this means that technological (TK), pedagogical (PK), and content knowledge (CK) can only be effectively enacted when contextual knowledge (XK) is supportive and enabling.

A critical synthesis of the findings leads to an important reconceptualization: technology does not transform pedagogy; rather, pedagogy transforms technology. The Interactive Whiteboard, as a tool, holds potential, but this potential is activated only through intentional pedagogical design and contextual responsiveness. The teacher remains central in this process, drawing on their knowledge domains to create meaningful learning experiences. However, this agency is not exercised in isolation—it is either enabled or constrained by the ecosystem within which the teacher operates.

From a TPACK-XK perspective, this highlights that technology integration must be understood as both a knowledge-based and context-dependent process. Teachers require not only the skills to use technology, but also the support structures, resources, and institutional conditions that enable them to integrate it effectively. Without these conditions, even well-designed technologies remain underutilised.

The implications for practice are therefore clear. Efforts to improve technology integration must move beyond the procurement of devices and focus on strengthening the conditions that support their use. This includes investing in continuous, pedagogy-focused professional development, establishing collaborative communities of practice, ensuring reliable technical support, and addressing infrastructural inequalities across schools.

Ultimately, this study contributes to the discourse on educational technology by demonstrating that integration is not primarily a technical issue, but a contextual and pedagogical one. Sustainable IWB use depends on the alignment between teacher knowledge and the environments in which teachers work. Teachers are not passive users of technology, but active agents whose capacity to innovate is shaped by the systems that surround them.

In conclusion, the study underscores the importance of creating enabling ecosystems that support the integration of technology in meaningful and sustainable ways. Within the TPACK-XK framework, this means recognising that effective teaching with technology is achieved not through tools alone, but through the complex and interdependent relationship between knowledge, pedagogy, and context.

References:

References

Adams, W. C. (2020). Conducting semi-structured interviews. In *Handbook of practical program evaluation* (4th ed.). John Wiley & Sons.

Ahmad, M. (2021). Management of facilities and infrastructure in schools. *Jurnal Teknologi Pendidikan*, *10*(1).

Ahmed, S. K. (2024). The pillars of trustworthiness in qualitative research. *Journal of Medicine, Surgery, and Public Health*, *2*, 100051.

Ahmed, S., & Peters, L. (2022). Multimedia learning in early education: Bridging the gap between theory and practice. *Journal of Digital Learning and Teaching*, *38*(2), 145–160. https://doi.org/10.xxxx

Ahmed, S., Peters, L., & Brown, T. (2022). Enhancing teacher motivation through technology integration: A case study of interactive whiteboards. *Journal of Educational Technology Research*, *37*(1), 89–102. https://doi.org/10.xxxx

Akoh, J., & Oki, M. O. J. TEACHER READINESS AND RESISTANCE TO EDTECH INTEGRATION IN DEVELOPING NATIONS. *Chief Editor*, 35.

Alhumsi, M. H. (2024). Revolutionizing EFL Instruction: Jordanian Teachers' Perspectives on Interactive Whiteboards for Word Identification Enhancement. *Journal of Intercultural Communication*, 24(2), 70–81. Bilkent Universitesi (Turkey).

Alkış, Y. (2020). *The Lived Experiences of High School Teachers with Different Subject Matters Pertaining to the use of Interactive Whiteboard (IWB): A Phenomenological Study* (Doctoral dissertation, Middle East Technical University (Turkey)).

Belabcir, S. (2010). The Usefulness of Interactive Whiteboards in EFL Language Centers: A Technology Acceptance Model Approach.

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2020). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, *30*(2), 198–206.

Bourbour, M. (2023). Using digital technology in early education teaching: learning from teachers' teaching practice with interactive whiteboard. *International Journal of Early Years Education*, *31*(1), 269–286.

Braun, V., & Clarke, V. (2022). Thematic Analysis: A Practical Guide (2nd ed.). SAGE Publications.

Breen, P. (2018). Blended learning's consistent presence. In *Developing educators for the digital age: A framework for capturing knowledge in action* (pp. 127–142). London: University Of Westminster Press

Brown, K., & Taylor, R. (2023). *Interactive Whiteboards and Constructivist Learning in the Foundation Phase: A Review*. Educational Technology Journal, 25(2), 101–115.

Brown, T., & Taylor, J. (2023). *Enhancing learning through interactive whiteboards: A study of primary education*. Educational Technology Journal, 28(2), 115–130.

Busher, H. (2017). Researching the vulnerable: A guide to sensitive research methods. Routledge.

Chand, V. S., Kuril, S., & Deshmukh, K. S. (2022). Teacher Development in India: Building on Grassroots Innovations and Technology*. Routledge India.*

Chee, S. Y. (2024). Age-related digital disparities, functional limitations, and social isolation: unraveling the grey digital divide between baby boomers and the silent generation in senior living facilities. *Aging & mental health*, *28*(4), 621–632.

Chikasha, S., & Makanza, M. (2021). The Role of Continuous Professional Development in Overcoming Technological Barriers in South African Classrooms. *Education and Technology Journal*, 12(3), 49–65.

Clark, T., Wilson, A., & Brown, R. (2021). Interactive whiteboards and student achievement: Exploring the benefits in diverse learning environments. *Educational Technology Research Journal*, *46*(3), 287–304. https://doi.org/10.xxxx

COHEN, D. (2024). *Contextual issues of technology integration in teacher practice* (Doctoral dissertation, RMIT University).

Cohen, L., Manion, L., & Morrison, K. (2018). Research methods in education (8th ed.). Routledge. Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design: Choosing among five approaches (4th ed.). SAGE Publications.

Cox, M. J., Marshall, G., & Abbott, C. (2003). The impact of ICT on teaching and learning in primary schools: A review of research. Research Papers in Education, 18(2), 153–168.

Cox, M. J., Webb, M. E., Abbott, C., Blakeley, B., Beauchamp, T., & Rhodes, V. (2021). A review of the research literature relating to ICT and attainment. British Educational Communications and Technology Agency.

Creswell, J. W., & Creswell, J. D. (2022). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). SAGE Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.

Curles, A. (2024). *A Case Study of Educational Context Influencing High School English Teachers' Knowledge, Perceptions, and Uses of Technology* (Doctoral dissertation, Kennesaw State University).

D.D. Olivares, R.R., & Castillo, ICT in the classroom: Primary education student teachers' perceptions of the interactive whiteboard during the teaching practicum, Educ. Inf. Technol. 23 (6) (2018) 2309–2321.

Davis, F. D. (1989). Technology acceptance model: TAM. *Al-Suqri, MN, Al-Aufi, AS: Information seeking behavior and technology adoption*, *205*(219), 5.

Denzin, N. K., & Lincoln, Y. S. (2021). The SAGE Handbook of Qualitative Research (5th ed.). SAGE Publications.

Drisko, J. W. (2025). Transferability and generalization in qualitative research. *Research on Social Work Practice*, *35*(1), 102–110.

Dube, T. (2024). *Grade 10 Mathematics Teachers' Dispositions Towards Using Interactive Whiteboards when Teaching Euclidean Geometry*. University of Johannesburg (South Africa).

Dube, T. (2024). *Grade 10 Mathematics Teachers' Dispositions Towards Using Interactive Whiteboards when Teaching Euclidean Geometry*. University of Johannesburg (South Africa).

Dube, T. (2024). Grade 10 Mathematics Teachers' Dispositions Towards Using Interactive Whiteboards when Teaching Euclidean Geometry*. University of Johannesburg (South Africa).*

Ebrahim, A. (2022). Teachers' Experiences with Using Interactive Whiteboards for Teaching and Learning. University of Johannesburg.

Ebrahim, A. (2022). *Teachers' experiences when using interactive whiteboards for teaching and learning*. University of Johannesburg (South Africa).

Ebrahim, A. (2022). *Teachers' experiences when using interactive whiteboards for teaching and learning*. University of Johannesburg (South Africa).

Ebrahim, A. (2022). *Teachers' Experiences with Using Interactive Whiteboards for Teaching and Learning*. University of Johannesburg (South Africa).

Ebrahim, A. (2022*).* Teachers' Experiences with Using Interactive Whiteboards for Teaching and Learning*. University of Johannesburg (South Africa).*

Ebrahim, A. (2023). Teachers' Experiences when Using Interactive White Boards for Teaching and Learning (Doctoral dissertation, University of Johannesburg).

Ebrahim, A. (2023). *Teachers' Experiences when Using Interactive Whiteboards for Teaching and Learning* (Doctoral dissertation, University of Johannesburg).

ElAtia, S., Gomez, L. N., & Corsi, E. (2024). If teaching is a female-dominated profession, why are so few women leading it? *Journal of research on leadership education*, *19*(1), 102–121.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2020). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. Journal of Research on Technology in Education, 44(3), 255–284.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2020). Teacher technology change: How knowledge, beliefs, and culture intersect. In H. N. Borko & L. A. M. Wong (Eds.), Handbook of research on teacher education (pp. 194–211). Springer.

Esen, Ö. (2024). *An Evaluation of Expert and Novice Teachers' Behaviors in a Smartboard-Equipped Classroom Using Eye Tracking* (Doctoral dissertation, Middle East Technical University (Turkey).

Field, A. (2022). Discovering Statistics Using IBM SPSS Statistics (5th ed.). SAGE Publications.

Fink, A. (2022). How to Conduct Surveys: A Step-by-Step Guide (6th ed.). SAGE Publications.

Fisser, P., Sligte, H., & De Vries, S. (2020). Supporting teachers in integrating technology into their practice. Journal of Technology in Education and Learning, 14(2), 88–102.

Fisser, P., Voogt, J., van Braak, J., & Tondeur, J. (2020). Exploring the relationship between school-level ICT integration factors and teachers' use of ICT for teaching and learning. Educational Technology Research and Development, 68(4), 1997-2016.

Flyvbjerg, B. (2011). Case study. In *The Sage handbook of qualitative research* (4th ed., pp. 301-316). Sage Publications.

García, M., & Muñoz, R. (2019). *Interactive Whiteboards and Student Engagement: A Case Study in Early Childhood Education*. Journal of Educational Research, 37(4), 213–228.

Giannikas, C. N. (2021). Interactive whiteboards in EFL from the Teachers' and students' perspective. *Research Papers in Language Teaching & Learning*, *11*(1).

Gibson, W., & Hugh-Jones, S. (2020). Research ethics in human research: A handbook of principles and practice. Open University Press.

Gizaw, M. & Tessema, T. (2020). The role of technology in enhancing classroom learning: A review of recent studies. Educational Technology & Society, 23(3), 73–85.

Gizaw, M. E., & Tessema, G. W. (2020). Role of information and communication technologies in educational systems: a systematic review. International Journal, 6(7), 272–282.

Glover, D., Miller, D., & Gough, J. (2005). Interactive whiteboards: An evaluation of their impact on teaching and learning. Journal of Computer Assisted Learning, 21(2), 82–93.

Gumede, N. E. (2024). Teachers' Utilisation of Smartboards as Digital Tools in Teaching Grade 12 Genetic Concepts *(Master's thesis, University of Johannesburg (South Africa).*

Gumede, N. E. (2024). *Teachers' Utilisation of Smartboards as Digital Tools in Teaching Grade 12 Genetic Concepts* (master's thesis, University of Johannesburg (South Africa).

Hall, K., & Higgins, S. (2022). Effective use of technology in education: Lessons learned. Educational Technology Research and Development, 70(4), 1205–1224.

Hannaway, D. M., & Steyn, M. G. (2017). Teachers' experiences of technology-based teaching and learning in the Foundation Phase. *Early Child Development and Care*, *187*(11), 1745-1759.

Harendita, M. E., Oakley, G., & Pegrum, M. (2025). Teacher Contextual Knowledge (XK) Development: The Case of Yogyakarta, Indonesia. *Computer-Assisted Language Learning Electronic Journal*, *26*(4), 98–122.

Harrison, C., Stokes, S., & D'Angelo, C. (2002). Evaluating the effectiveness of interactive whiteboards in primary education. Technology, Pedagogy and Education, 11(3), 233–247.

Heath, M. A. (2018). Data security in research and education. Journal of Information Security, 9(2), 56–63.

Hennessy, S., Harrison, D., & Wamakote, L. (2021). Teacher factors influencing the use of technology in the classroom. Computers & Education, 158, 103–120.

Hennessy, S., Haßler, B., & Hofmann, R. (2021). Challenges and Opportunities for Teacher Professional Development in the Interactive Use of Technology. Technology, Pedagogy and Education, 30(1), 7–28.

Higgins, S., Beauchamp, G., & Miller, D. (2022). Evaluating the impact of interactive whiteboards on teaching and learning in schools. Educational Technology & Society, 25(4), 34–45.

Higgins, S., Xiao, Z., & Katsipataki, M. (2022). The impact of interactive whiteboards on learning: A review of the evidence. Journal of Educational Research, 115(1), 12–25.

Hirsch-Pasek, K., & Golinkoff, R. M. (2020). The science of early childhood development. Oxford University Press.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. Educause Review, 27(1), 1–12.

House, C. E. (2025). *An In-Depth Examination of Professional Adjunct Faculty's Integration of Technology, Pedagogy, Content Knowledge, and Contextual Factors in Higher Education* (Doctoral dissertation, The George Washington University).

Huang, F., & Teo, T. (2021). Examining the role of technology-related policy and constructivist teaching belief on English teachers' technology acceptance: A study in Chinese universities. *British Journal of Educational Technology*, *52*(1), 441-460.

Huang, F., Teo, T., & Zhou, M. (2020). Chinese students' intentions to use the Internet-based technology for learning. *Educational Technology Research and Development*, *68*(1), 575-591.

Ibrahim, A. (2023). Interactive whiteboards and their impact on teaching practices. Journal of Modern Education Technology, 9(1), 34–45.

Israel, M. (2017). Research ethics and integrity for social scientists: Beyond regulatory compliance. SAGE Publications.

Itai, M. W., & Modise, M. A. (2025). Educational technology for equity in South Africa: Promise and challenge. *International Journal of Research in Business and Social Science*, *14*(7), 437-446.

Johari, A., Abdul Wahat, *N. W., & Zaremohzzabieh, Z. (2021). Innovative work behavior among teachers in Malaysia: The effects of teamwork, principal support, and humor.* Asian Journal of University Education (AJUE)*, 7(2), 72–84.*

Johnson, A. (2022). *Challenges and Opportunities in the Use of Interactive Whiteboards in Early Education*. International Journal of Educational Research, 47(1), 75–89.

Johnson, M. (2022). *Enhancing Social Learning through Interactive Whiteboards in Early Childhood Education*. Journal of Educational Technology Research, 18(3), 203–219.

Johnson, P. (2022). *Challenges in Integrating Interactive Whiteboards into Classroom Teaching*. Educational Review Quarterly, 47(1), 65–78.

Johnson, P. (2022). *Evaluating the Impact of Interactive Whiteboards on Student Participation in Foundation Phase Education*. Educational Technology and Society, 25(2), 78–92.

Johnson, P., & Brown, T. (2022). The impact of interactive whiteboards on student learning outcomes in primary education. *Journal of Educational Technology Research*, *45*(2), 123–135. https://doi.org/10.xxxx

Johnson, P., & Lee, C. (2023). Promoting active learning with interactive whiteboards: A case study in primary education. *International Journal of Educational Innovation*, *52*(1), 34–49. https://doi.org/10.xxxx

Johnson, P., & Lee, S. (2023). *Digital Literacy and the Effective Use of Interactive Whiteboards in the Classroom*. Educational Technology Research Journal, 45(1), 88–101.

Johnson, P., & Taylor, S. (2022). *The Digital Divide in Education: Costs and Consequences of Technology Access*. Journal of School Economics, 29(3), 204–219.

Johnson, P., & Williams, S. (2023). *Differentiated Instruction with Interactive Whiteboards: A Teacher's Guide*. Education Today, 37(1), 89–102.

Johnson, P., Smith, A., & Lee, C. (2023). Collaborative learning and technology integration: The role of interactive whiteboards. *International Journal of Educational Research*, *55*(1), 45–60. https://doi.org/10.xxxx

Jones, A. (2021). *Constructivism in the Digital Age: The Role of Interactive Whiteboards in Modern Classrooms*. Journal of Constructivist Education, 17(4), 145–159.

Jones, M. (2021). *Constructivism and technology in the classroom: A critical analysis*. Journal of Educational Theory, 34(4), 205–219.

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2021). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, *77*(3), 1164-1177.

Karsenti, T., & Collin, S. (2019). The integration of interactive whiteboards in classrooms: A South African perspective. South African Journal of Education Technology, 8(2), 45–58.

Karsenti, T., & Collin, S. (2019). The Role of Interactive Whiteboards in Educational Reform. International Journal of Educational Technology in Higher Education, 16(1), 27–39.

Karthigesu, K., & Mohamad, M. (2020). Primary School Teachers' Perceptions of Integrating Interactive Whiteboards (IWBs) in Reading Instruction. *International Journal of Academic Research in Business and Social Sciences*, *10*(2), 722–741. https://doi.org/10.xxxx

Kearney, M., Schuck, S., Aubusson, P., & Burke, P. F. (2018). Teachers' technology adoption and practices: Lessons learned from the IWB phenomenon. *Teacher Development*, *22*(4), 481–496.

Kearney, M., Schuck, S., Aubusson, P., & Burke, P. F. (2018). Teachers' technology adoption and practices: Lessons learned from the IWB phenomenon. *Teacher Development*, *22*(4), 481–496.

Kopetz, H., & Steiner, W. (2022). Dependability. In *Real-Time Systems: Design Principles for Distributed Embedded Applications* (pp. 143–175). Cham: Springer International Publishing.

Kutluca, T., Karakuyu, Y., & Yigit, N. (2020). The role of ICT in education: Perspectives from teachers and learners. Educational Technology Insights, 11(2), 77–92.

Lee, D. (2021). *Vicarious Learning and Interactive Technologies in the Classroom: A Case Study on IWBs*. Technology in Education Review, 29(1), 33–47.

Lee, H. (2021). *Interactive whiteboards and student achievement: A case study in foundation phase education*. Journal of Educational Psychology, 45(3), 301–316.

Lee, M. (2021). *Support Systems for Teachers in Implementing Interactive Whiteboards*. Journal of Modern Education, 39(3), 132–145.

Lee, M. (2021). *The Role of Interactive Whiteboards in Enhancing Literacy and Numeracy*. Foundation Phase Studies, 22(3), 217–229.

Lewis, K. (2017). *Teachers' Perceptions of Using Interactive Whiteboards in Early Years Classrooms* (Doctoral dissertation, Queensland University of Technology).

Luo, Y. F., & Yang, S. C. (2016). The effect of the interactive functions of whiteboards on elementary students' learning. *Journal of Educational Computing Research*, *54*(5), 680-700.

Luo, Z., Tan, X., He, M., & Wu, X. (2023). The seewo interactive whiteboard (IWB) for ESL teaching: How useful it is?. *Heliyon*, *9*(10).

Luo, Z., Tan, X., He, M., & Wu, X. (2023). The Seewo Interactive Whiteboard (IWB) for ESL Teaching: How Useful Is It? *Heliyon*, *9*(10).

Madzikanda, S. (2024). *Primary School Teachers' Experiences of Teaching Mathematics Using Smartboard Technology*. University of Johannesburg (South Africa).

Maharani, M. R., & Usman, O. (2021). The effect of perceived usefulness and perceived ease of use on the use of e-learning with TAM model in faculty of economics student of Jakarta State University. *Jurnal Pendidikan Ekonomi, Perkantoran, Dan Akuntansi*, *2*(3), 55-67.

Malatji, W. R., Eck, R. V., & Zuva, T. (2020). Understanding the usage, modifications, limitations and criticisms of technology acceptance model (TAM). *Advances in Science, Technology and Engineering Systems Journal*, *5*(6), 113-117.

Martinez, R., & Cole, D. (2023). Overcoming barriers to technology adoption in classrooms: A case study on interactive whiteboards. *Educational Technology Research and Practice*, *29*(4), 455–468. https://doi.org/10.xxxx

Martín-García, A. V., Redolat, R., & Pinazo-Hernandis, S. (2022). Factors influencing intention to technological use in older adults. The TAM model aplication. *Research on aging*, *44*(7-8), 573-588.

Matthews, B., & Ross, L. (2019). Research methods: A practical guide for the social sciences. Pearson.

McLean, T. C. (2022). *Technology integration in the classroom: Barriers affecting teacher implementation of technology in daily instruction*. Wingate University.

McNeill, K. L., & Waddington, D. (2022). Advances in stratified random sampling: Theory and practice in educational research. Educational Research Review, 36, 101–115.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.

Mihai, E. (2020). Engaging learners through interactive whiteboards: A comparative study. Teaching and Learning Technologies Journal, 15(3), 101–116.

Mihai, M. A. (2020). The use of interactive whiteboards in urban Gauteng classrooms.

Mihai, M. A. (2020). The Use of Interactive Whiteboards in Urban Gauteng Classrooms.

Mokoena, M. M., Simelane-Mnisi, S., & Mji, A. (2022). Challenges and Solutions for Teachers' Use of Interactive Whiteboards in High Schools. *Universal journal of educational research*, *10*(1), 36–47.

Mouza, C. (2009). Challenges and opportunities in integrating technology in schools: Case studies from diverse settings. Journal of Research on Technology in Education, 41(2), 167–185.

Moyo, A., & Moyo, T. (2023). Overcoming barriers to effective technology integration in classrooms: A mixed-methods study in Zimbabwe. *International Journal of Educational Technology*, 18(2), 134-150.

Ndlovu, P. P. (2021). *Life Sciences teachers' experience in the use of Interactive Whiteboard (IWB) when teaching Grade 10 cell division*. University of Johannesburg (South Africa).

Ndlovu, P. P. (2021). *Life Sciences teachers' experience in the use of Interactive Whiteboard (IWB) when teaching Grade 10 cell division*. University of Johannesburg (South Africa).

Ngwenya, R. (2022). *Teacher attitudes towards technology in the classroom: A survey of South African primary schools*. African Journal of Education, 39(5), 223-238.

Ngwenya, T. (2022). *Differentiated Instruction and Technology: The Impact of IWBs on Early Learning*. African Journal of Education, 36(2), 77-90.

Ngwenya, T. (2022). *Interactive Whiteboards and Differentiated Instruction: Meeting the Needs of Diverse Learners*. Journal of Modern Education, 40(4), 312-325.

Ngwenya, T. (2022). *Teacher Perceptions of Interactive Whiteboards: A Study on Technological Savviness and Classroom Integration*. International Journal of Educational Research, 46(2), 78-92.

Ngwenya, T., & Patel, R. (2023). *Professional Development for Teachers in the Digital Age: A Focus on Interactive Whiteboards*. Journal of Modern Education, 41(1), 45–60.

Nicolopoulou, A. (2018). The importance of early childhood education: The foundational years of learning and development. Early Childhood Research Quarterly, 44, 50–58.

Nkosi, M. (2020). Exploring Teachers' Perceptions of Interactive Whiteboards in South African Classrooms. *Journal of Educational Technology*, 25(3), 45-60.

Oliver, P. (2015). The learner's guide to research ethics (3rd ed.). Open University Press.

Olusegun, R. A. (2023). *Public-private partnerships in managing the ICT infrastructure in public secondary schools in Tshwane West district* (Doctoral dissertation, University of Pretoria).

Omilabu, A. A., Olusanya, O. O., & Adebare, A. O. (2023). Enhancing educational technology integration: A Comprehensive framework. *Journal of Speacialised and Professional Education*, *7*(1), 1-6.

Oshowole, S. A. (2024). Barriers Impacting the Integration of Classroom Technology in Primary Schools in Lagos, Nigeria (Doctoral dissertation, Saint Leo University).

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2020). Purposeful sampling for qualitative data collection and analysis in mixed-method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, *47*(2), 202–214.

Patel, R., & Green, L. (2022). *Effective Strategies for Reinforcement and Review Using IWBs*. Primary Education Review, 19(2), 56–69.

Patel, R., & Green, T. (2022). *The Role of Professional Development in the Adoption of Interactive Whiteboards by Teachers*. Journal of Educational Leadership, 34(4), 203–217.

Patel, R., & Johnson, M. (2022). *Technical Challenges in the Implementation of Interactive Whiteboards in Schools*. Primary Education Technology Review, 21(4), 78–89.

Patton, M. Q. (2022). Qualitative Research & Evaluation Methods (5th ed.). SAGE Publications.

Patton, M. Q. (2022). Qualitative Research & Evaluation Methods (5th ed.). SAGE Publications.

Pham, T., & McNeill, M. (2021). The influence of school-level factors on teachers' implementation of ICT integration in teaching. Computers & Education, 160, 104031.

Pillay, D., & Visser, M. (2021). The interplay between traditional and digital teaching methods: A study of effective pedagogies in South African classrooms. *Journal of Educational Research and Innovation*, 32(1), 21–38.

Pringle, J. (2021). Innovative teaching practices with interactive whiteboards. Journal of Educational Innovation, 18(1), 56–72.

Pringle, K. (2021). The Acceptance of Interactive White Boards in Intermediate Phase Educators' Teaching Practice (Master's thesis, University of Pretoria (South Africa).

Pringle, K. (2021). *The acceptance of interactive whiteboards in intermediate phase educators' teaching practice* (Master's thesis, University of Pretoria (South Africa).

Pringle, K. (2021). *The acceptance of interactive whiteboards in intermediate phase educators' teaching practice* (Master's thesis, University of Pretoria (South Africa)).

Pringle, K. (2021). The Acceptance of Interactive Whiteboards in Intermediate Phase Educators' Teaching Practice *(Master's thesis, University of Pretoria (South Africa).*

Reich, J. (2020). *Failure to disrupt: Why technology alone can't transform education*. Harvard University Press.

Research also shows that interactive whiteboards (IWBs) encourage teamwork among learners, as they can all join in on activities that are shown on the board (Ebrahim, 2022).

Ritella, G., & Sansone, N. (2020). Transforming the space-time of learning through interactive whiteboards: the case of a knowledge creation collaborative task. *QWERTY-Interdisciplinary Journal of Technology, Culture and Education*, *15*(1), 12-30.

Samsonova, O. (2019). Exploring Elementary Teachers' Practices in Response to IWBS. *PUPIL: International Journal of Teaching, Education and Learning*, *3*(1), 130–145.

Samsonova, O. (2021). Educational technology in Abu Dhabi public schools: teaching with interactive whiteboards (IWBs). *International Journal of Technology Enhanced Learning*, *13*(1), 60-77.

Sanjari, M., Bahramnezhad, F., Fomani, F. K., Shoghi, M., & Cheraghi, M. A. (2020). Ethical Challenges of Researchers in Qualitative Studies: The Necessity of Developing a Specific Guideline. *Journal of Medical Ethics and History of Medicine*, *13*, 14–22.

Santos, L. M., Pereira, M. A., & Silva, P. T. (2021). Sampling methods and their impact on educational research outcomes. Journal of Educational Statistics, 46(2), 234–251.

Saville, M. (2016). *Teaching with interactive whiteboards: is teacher education up to it?: a study of pre-service primary school teachers' education with interactive whiteboards* (Doctoral dissertation, University of Tasmania).

Schlebusch, G., Bhebhe, S., & Schlebusch, L. (2024). Technology Integration in Teacher Education Practices at Two Southern African Universities. *Open Education Studies*, *6*(1), 20220223.

Schunk, D. H. (2023). Self-regulation of self-efficacy and attributions in academic settings. In *Self-regulation of learning and performance* (pp. 75-99). Routledge.

Shaitu, H. (2022). Assessment of Effect on ICT Adoption in Small and Medium Enterprises Performance: A Case of Tanga District (Doctoral dissertation, The Open University of Tanzania)

Shaitu, M. (2022). Understanding ICT in education: Theoretical and practical perspectives. Technology in Education Review, 19(4), 211-226.

Shenton, A. K. (2021). Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information*, *39*(1), 63–75.

Smeets, E. (2005). Does ICT contribute to powerful learning environments in primary education? Computers & Education, 44(3), 343–355.

Smith, H. (2021). Integrating Interactive Whiteboards into Early Childhood Education. Early Childhood Education Journal, 49(2), 161–171.

Smith, H. J., Higgins, S., Wall, K., & Miller, J. (2005). Interactive whiteboards: Boon or bandwagon? Journal of Computer Assisted Learning, 21(2), 91–101.

Smith, J. (2021). Technology-enhanced education: The role of interactive whiteboards. Contemporary Education Review, 14(2), 90–104.

Smith, J. A. (2020). Evaluating the reliability and validity of qualitative research. *Research Methods for Education*, *5*, 139–158.

Smith, J., & Green, T. (2021). *The Financial Implications of Interactive Whiteboard Implementation in Education*. Journal of Educational Finance, 32(2), 123–135.

Smith, J., & Green, T. (2021). *The Financial Implications of Interactive Whiteboard Implementation in Education*. Journal of Educational Finance, 32(2), 123–135.

Smith, J., & Green, T. (2021). *The Impact of Interactive Whiteboards on Literacy and Numeracy Achievement in Early Grades*. Journal of Educational Technology, 33(4), 102–114.

Smith, J., & Green, T. (2021). *The Impact of Interactive Whiteboards on Literacy and Numeracy Achievement in Early Grades*. Journal of Educational Technology, 33(4), 102–114.

Smith, J., & Taylor, L. (2022). Gender dynamics in Foundation Phase teaching: Trends and implications. *International Journal of Education Research*, *48*(3), 234–245. https://doi.org/10.xxxx

Smith, J., Brown, K., & Taylor, L. (2021). Multimedia in early childhood education: Enhancing learner engagement and comprehension. *Early Childhood Education Journal*, *49*(4), 300–315. https://doi.org/10.xxxx

Smith, K. (2022). *Interactive Learning: How Technology is Changing the Classroom*. Journal of Early Childhood Education, 34(1), 45–58.

Smith, K. (2022). *Interactive Learning: How Technology is Changing the Classroom*. Journal of Early Childhood Education, 34(1), 45–58.

Smith, L., & Green, P. (2021). *The impact of interactive whiteboards on student learning outcomes: A meta-analysis*. Journal of Educational Research, 52(7), 721–735.

Smith, L., & Green, P. (2021). *The impact of interactive whiteboards on student learning outcomes: A meta-analysis*. Journal of Educational Research, 52(7), 721–735.

Smith, P., & Green, L. (2021). *Interactive Whiteboards in Foundation Phase Classrooms: A Social Learning Perspective*. Journal of Teaching and Learning Technology, 19(3), 121–134.

Smith, P., & Green, L. (2021). *Interactive Whiteboards in Foundation Phase Classrooms: A Social Learning Perspective*. Journal of Teaching and Learning Technology, 19(3), 121–134.

Smith, R., & Green, T. (2021). *Comparative Analysis of Interactive Whiteboards and Traditional Teaching Methods in Early Education*. International Journal of Educational Research, 53(1), 88–101.

Smith, R., & Green, T. (2021). *Comparative Analysis of Interactive Whiteboards and Traditional Teaching Methods in Early Education*. International Journal of Educational Research, 53(1), 88-101.

Stake, R. E. (1995). *The art of case study research*. Sage Publications.

Stake, R. E. (2006). *Multiple case study analysis*. Guilford Press.

Stumbrienė, D., Jevsikova, T., & Kontvainė, V. (2024). Key factors influencing teachers' motivation to transfer technology-enabled educational innovation. *Education and information technologies*, *29*(2), 1697-1731.

Tamang, S. (2022). Integration of ICT in Schools of Kathmandu: A Case Study of Public School (Doctoral dissertation, Kathmandu University School of Education).

Thompson, S. K. (2023). Stratified Sampling: Applications and Best Practices. Wiley Encyclopaedia of Operations Research and Management Science.

Tosuntaş, Ş. B., Çubukçu, Z., & Beauchamp, G. (2021). A new model for the factors that affect interactive whiteboard usage of teachers and its effect on performance. *Education and Information Technologies*, *26*(3), 3575-3592.

Tp, T., & Minh, H. (2021). Interactive whiteboard as a means to enhance learners' engagement in language learning. *Science*, *18*(11), 1999-2009.

Twining, P., Raffaghelli, J. E., Albion, P., & Knezek, G. (2021). Critical Issues in Integrating Technology into Education. Educational Technology Research and Development, 69(5), 189–203.

Twining, P., Raffaghelli, J., Albion, P., & Knezek, G. (2021). Moving education into the digital age: The contribution of teachers' professional development. Journal of Computer Assisted Learning, 37(6), 1457–1468.

Uduak, I., & Kasumu, R. O. (2022). The use of interactive whiteboards for teaching and learning in tertiary institutions. *International Journal of Trendy Research in Engineering and Technology*, *6*(6), 28-33.

Van der Merwe, A., & Du Plessis, A. (2021). Professional development for technology integration: Addressing the challenges of IWB usage in schools. *South African Journal of Education*, 41(2), 112–128.

Vanderlinde, R., & van Braak, J. (2020). The impact of teacher training on the use of interactive whiteboards. Teaching and Teacher Education, 92, 103-116.

Vanderlinde, R., Aesaert, K., & van Braak, J. (2020). Institutional support for ICT integration in education: A multilevel analysis. Computers & Education, 143, 103682.

Venkatesh, V., Thong, J. Y., & Xu, X. (2020). Unified theory of acceptance and use of technology: A synthesis and the road ahead. Journal of the Association for Information Systems, 17(5), 328-376.

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press.

Wan, X. (2025*).* Examining the Integration of Instructional Technology and Pedagogical Strategies Into K-12 Technology Education Classrooms *(Master's thesis, North Carolina State University).*

Wang, L., Johnson, T., & Smith, R. (2022). Addressing technical challenges in technology-enhanced learning: Insights from teachers' experiences with interactive whiteboards. *Journal of Digital Learning in Teacher Education*, *38*(2), 91–102. https://doi.org/10.xxxx

Warwick, P., & Kershner, R. (2021). Interactive White Boards: An effective tool in early childhood education? Early Years, 41(4), 413–427.

Wilde, N., & Hsu, A. (2019). The influence of general self-efficacy on the interpretation of vicarious experience information within online learning. *International Journal of Educational Technology in Higher Education*, *16*(1), 1–20.

Wiles, R. (2016). What are qualitative research ethics? Bloomsbury.

Wiles, R. (2021). *What are qualitative research ethics?* Bloomsbury Academic.

Williams, A., & Morrow, S. (2021). Practical considerations in sample size determination for educational research. Research in Education, 95(1), 74–89.

Williams, D., & Patel, S. (2023). *Interactive whiteboards: A boon or bane for student-centered learning?* Educational Practice and Research, 19(1), 45–58.

Williams, L., & Johnson, M. (2023). *Perceived Ease of Use and Usefulness of Interactive Whiteboards: Impact on Teacher Adoption*. Teaching and Learning Technology Today, 41(2), 56–70.

Williams, L., & Patel, R. (2023). *Interactive Whiteboards and the Risk of Teacher-Centered Pedagogy: A Critical Analysis*. Teaching and Learning Today, 38(3), 112–126.

Williams, L., & Patel, R. (2023). *Teaching Approaches and the Effectiveness of Interactive Whiteboards in the Classroom*. Teaching and Learning Technology Review, 48(2), 56–70.

Williams, S., & Green, L. (2021). *The Impact of Technical Issues on Classroom Learning: A Study on Interactive Whiteboards*. Journal of Educational Technology Research, 46(2), 99–113.

Wilson, J., & Harris, P. (2021). Interactive whiteboards as a tool for teacher creativity: Exploring the impact on lesson delivery. *Journal of Educational Innovation*, *48*(3), 215–230. https://doi.org/10.xxxx

Y. Abuhmaid, Teachers' perspectives on interactive whiteboards as instructional tools in four Jordanian Schools, Contemporary Educational Technology 5 (1) (2014) 73–89.

Y.K. Türel, T.E. Johnson, Teachers' belief and use of interactive whiteboards for teaching and learning, Journal of Educational Technology & Society 15 (1) (2012) 381–394.

Yang, Y., & Li, J. (2025). Unleashing English Learning in Chinese Primary Schools: How IWBs Transform the Classroom. The Educational Review, USA, 9(5).

Yildiz Durak, H. (2021). Preparing pre-service teachers to integrate teaching technologies into their classrooms: Examining the effects of teaching environments based on open-ended, hands-on and authentic tasks. *Education and Information Technologies*, *26*(5), 5365-5387.

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage Publications.

Zhao, Y., Chen, X., & Zhao, L. (2020). *Interactive Whiteboards in Primary Education: An Evaluation of Their Impact on Student Performance*. Journal of Early Childhood Education, 42(1), 66–79.

APPENDICES

Research Ethics Clearance Letter *UMP REC-HSS*

Office 206. Building 4. C/o R40 & D725. Private Bag X11283. Riverside, Mbombela, South Africa 1200.
Website: www.ump.ac.za □ *Tel*: (013) 002 0196 □ **E***mail***:** Estelle.Boshoff@ump.ac.za

---

RESEARCH ETHICS CLEARANCE LETTER

Ref: UMP/Khutsoane222574429/School of Early Childhood Development/MEd/2024/01 **Date:** 22 June 2024

Student: Lesego Mantina Lorraine Khutsoane

Student number: 222574429

Supervisors: Dr Severino Machingambi

School / Department: School of Early Childhood Development **Faculty:** Faculty of Education

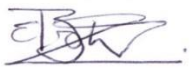
RE: APPROVAL FOR ETHICAL CLEARANCE FOR THE PROJECT:

Tshwane North Foundation Phase Teachers' Views on using Interactive Whiteboards (IWBs) as a teaching tool.

Reference is made to the above application.

The UMP Research Ethics Committee for Human and Social Sciences has provided **conditional ethical clearance** for the above-mentioned study, given that the researcher provides information as requested below:

1. **A copy of the consent form, which will be completed by the teachers who will participate in the study (the consent form should also have a section where participants give permission that the interviews can be recorded).**
2. **The letters of consent by the Principals of the schools, which will be included in the study.**
3. **Clearance Letter from the Faculty Research and Innovation Committee (FRIC)**



Prof Estelle Boshoff

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

Enquiries: Dr Musa Hlongwane / Sandra de Bruyn
Sub-Directorate: Information Systems & Strategic Planning (ISSP)
Unit: Policy and Planning
Office no. 128
Email: Musa.Hlongwane@gauteng.gov.za
Sandra.DeBruyn@gauteng..gov.za
Tel: 012 543 4315/060 752 4048
Ref: 31/08/18

DISTRICT MEMO No. 443 OF 2024

TO : **THE PRINCIPAL**
SELECTED PRIMARY SCHOOLS

FROM : **MS T COETSER**
DISTRICT DIRECTOR: TSHWANE NORTH

DATE : **16 JULY 2024**

SUBJECT : **PERMISSION TO CONDUCT RESEARCH**

Dear Principal

It is our pleasure to inform you that the District Office grants Ms Khutsoane permission to conduct research at selected schools in Tshwane North District as requested and approved by Head Office on the topic: ***"Tshwane North Foundation Phase Teachers' views on using Interactive Whiteboards (IWB's) as a teaching tool"***

Research may only be conducted after contact time to protect teaching and learning activities. The principal must be consulted regarding an appropriate time to conduct the research.

The researcher is personally responsible for providing and utilising their own research resources. Participants names must not appear in the research report and all appropriate ethical measures must be implemented to protect them.

The principals of the selected schools will be contacted to make the necessary arrangements.

Tshwane North District expects the researcher to submit, upon completion, a summary of their research findings as stipulated in **Clause No. 14 of the GDE letter of approval received.**

The district appreciates your contribution towards the enhancement of education in the province.

Regards

MS THEA COETSER
DISTRICT DIRECTOR: TSHWANE NORTH

DATE: 16/07/2024

DISTRICT: TSHWANE NORTH
Tel: (012) 543 4302, Cell: 066 487 2743 | Email: Thea.Coetser@gauteng.gov.za
Wonderboom Junction Mall, 1st Floor, Corner Lavender & West Road, Wonderboom, 0184, Private Bag X946, Pretoria, 0001
https://education.gauteng.gov.za/Pages/Index.aspx | Call Centre: 0800 000 175

Enquiries: Dr Musa Hlongwane / Sandra de Bruyn
Sub-Directorate: Information Systems & Strategic Planning (ISSP)
Unit: Policy and Planning
Office no. 136
Email: Musa.Hlongwane@gauteng.gov.za
Sandra.DeBruyn@gauteng.gov.za
Tel: 012 543 4315/060 752 4948
Ref: 31/08/18

SUBJECT: PERMISSION TO CONDUCT RESEARCH (KHUTSOANE

The following Primary Schools have been approved:

LEBELO	TIAMOKO
UBUHLE BEZWE	RENEILWE
ROBERT HICKS	RIVIERA
RIETONDALE	NORTHRIDGE
VUKANI	NCHA-PEU
SEKAMPANENG	RAMOTSE
EBEN SWEMMER	HAAKDOORN
DOORNPOORT	WONDERBOOM

Letter to the School Principal

Building 4. C/o R40 & D725.
Private Bag X11283.
Riverside Mbombela 1200

Faculty of Education

(Ethics Committee of the Faculty of Education)

Tel: (013) 002 0196
Email: Estelle.Boshoff@ump.ac.za

Date: July 2024

The principal

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN THE SCHOOL

I hereby request your permission to conduct research at your institution.

Approval has already been obtained from the Gauteng Department of Education (Tshwane North District). Kindly see the attached copy of the approval letter.

The details of the research are as follows:

TITLE OF THE RESEARCH PROJECT:

Tshwane North Foundation Phase Teachers' Views on using Interactive Whiteboards (IWBs) as a teaching tool.

PROJECT SUPERVISOR: Dr Severino Machingambi
ADDRESS: University of Mpumalanga, Cnr R40 & D725 Roads Mbombela, South Africa
CONTACT NUMBER: 013 002 0152

MEMBER OF PROJECT TEAM MEd-Student: Ms. Lesego M.L. Khutsoane
ADDRESS: 184 Camellia Avenue, Murrayfield,0184
CONTACT NUMBER: 0826896388

FACULTY OF EDUCATION RESEARCH ETHICS COMMITTEE
Contact person: Prof Estelle Boshoff, E-mail: Estelle.Boshoff@ump.ac.za, Tel. (013) 002 0196

This study has been approved by the Research Ethics Committee for Human and Social Sciences of the UNIVERSITY OF MPUMALANGA and will be conducted according to the ethical guidelines of this committee.
Permission was also asked from the Gauteng Department of Education

Dissemination of findings

After the successful completion of the study, the results can be emailed to you upon request.

Your cooperation to this regard will be highly appreciated.

Yours sincerely

_____

Lesego M.L Khutsoane

DECLARATION

As the principal of the school, I understand that I am not being forced to grant Lesego Khutsoane permission to undertake her research in my school.

I hereby grant permission for research to be conducted at our school.

_____
Principal

UNIVERSITY OF MPUMALANGA
Creating Opportunities

Faculty of Education

(Ethics Committee of the Faculty of Education)

Date: July 2024

PARTICIPANT INFORMATION AND CONSENT FORM

I hereby request your consent to participate in this research, which involves teachers from primary schools. Before giving your consent, please review the information below.

The details of the research are as follows:

TITLE OF THE RESEARCH PROJECT:

Tshwane North Foundation Phase Teachers' Views on using Interactive Whiteboards (IWBs) as a teaching tool'.

PROJECT SUPERVISOR: Dr Severino Machingambi
ADDRESS: University of Mpumalanga, Cnr R40 & D725 Roads Mbombela, South Africa
CONTACT NUMBER: 013 002 0152

MEMBER OF PROJECT TEAM MEd-Student: Ms. Lesego M.L. Khutsoane
ADDRESS: 184 Camellia Avenue, Murrayfield,0184
CONTACT NUMBER: 0826896388

FACULTY OF EDUCATION RESEARCH ETHICS COMMITTEE
Contact person: Prof Estelle Boshoff, E-mail: Estelle.Boshoff@ump.ac.za, Tel. (013) 002 0196

This study has been approved by the Research Ethics Committee for Human and Social Sciences of the UNIVERSITY OF MPUMALANGA and will be conducted according to the ethical guidelines of this committee. Permission was also asked for from the Gauteng Department of Education as well as the school principal.

What is this research about?

The aims of this research are:

- To determine the Foundation Phase teachers' views about the use of IWB as a teaching tool in the Foundation Phase.
- To establish the frequency at which foundation phase teachers use IWBs as teaching and learning tools.
- To determine the level of professional development support offered to Foundation Phase teachers with regard to the use of IWB as a teaching tool.
- To identify and propose solutions to constraints that Foundation Phase teachers face when using IWBs as a teaching tool.

Participants

Only teachers will be considered.
Only participants working at schools with access to IWB will be considered.

Only participants working in public primary schools within the Tshwane North District of the Gauteng Province of South Africa will be considered.

What is expected of you as participant?

You will be expected to complete a questionnaire, and you will also be interviewed on the views of using IWB as a teaching tool for teaching and learning and both will be recorded.
The researcher will visit your school and explain the procedures in detail, and you will have the opportunity to ask any questions after which you will receive the opportunity to give informed consent to take part in the study. You will receive one week to complete the questionnaires and will be expected to post the completed questionnaires in a sealed box, which the researcher will provide to your school. The whole process will take place as follows:

- ✓ Interview will take approximately 2 - 3 hours of your time.
- ✓ To complete a questionnaire will take approximately 45 - 60 minutes of your time.

Benefits to you as participant

No remuneration will be offered to you as participant. The benefit of the study is to provide teachers with new knowledge through the results of the current study regarding the **views of using Interactive Whiteboards (IWBs) as a teaching tool in primary school'.**
Teachers will become successful technology adopters and will develop the competencies needed for the 21st century. The results are expected to influence policy decisions on the digital school curriculum on the usage of Technology in schools, not only in the Tshwane North district of Gauteng but also in the entire country.

Risks involved for participants.

None.

Confidentiality and protection of identity

Sealed boxes are provided to schools to ensure that your privacy is respected through anonymity. Furthermore, the researcher ensures confidentiality only gathering information and no identifying details requested. Hard and electronic copies of all data will be stored in the supervisors' office in a locked cabinet and password protected computer. Only the researcher and the supervisor will have access to the data. Once the study is completed, the data will be transferred to a USB and deleted from the supervisors' computer and the Researcher. The data will be stored in a safe place for seven years, after which it will be destroyed.

Dissemination of findings

After the successful completion of the study, the results can be e-mailed to you upon request.
If you have any further questions or enquiries regarding your participation in this research, please contact the researchers for more information.

If you have any further questions or enquiries regarding your participation in this research, please contact the researchers for more information.

DECLARATION BY PARTICIPANT:

By signing below, I ……..……. agree to take part in a research study entitled:

Tshwane North Foundation Phase Teachers' Views on using Interactive Whiteboards (IWBs) as a teaching tool'.

I declare that:

- I have read this information and consent form and understand what is expected of me in the research.
- I have had a chance to ask questions to the researcher and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary, and I have not been pressured to participate.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the research process before it is completed, if the researcher feels it is in my best interests, or if I do not follow the research procedures, as agreed to.

Signed at (place)_____on (date) _____/_____/20____

_____ _____

Signature of participant **Researcher**

Letter to the School Governing Body

Building 4. C/o R40 & D725.
Private Bag X11283.
Riverside Mbombela 1200

Faculty of Education

(Ethics Committee of the Faculty of Education)

Tel: (013) 002 0196
Email: Estelle.Boshoff@ump.ac.za

Date: July 2024

The School Governing Body

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH AT THE SCHOOL

I herewith wish to request your permission to conduct research at your school.

Approval has already been obtained from the Gauteng Department Of Education (Tshwane North District). Kindly see attached copy of the approval letter.

The details of the research are as follows:

TITLE OF THE RESEARCH PROJECT:

Tshwane North Foundation Phase Teachers' Views on using Interactive Whiteboards (IWBs) as a teaching tool'.

PROJECT SUPERVISOR: Dr Severino Machingambi
ADDRESS: University of Mpumalanga, Cnr R40 & D725 Roads Mbombela, South Africa
CONTACT NUMBER: 013 002 0152

MEMBER OF PROJECT TEAM MEd-Student: Ms. Lesego M.L. Khutsoane
ADDRESS: 184 Camellia Avenue, Murrayfield,0184
CONTACT NUMBER: 0826896388

FACULTY OF EDUCATION RESEARCH ETHICS COMMITTEE
Contact person: Prof Estelle Boshoff, E-mail: Estelle.Boshoff@ump.ac.za, Tel. (013) 002 0196

This study has been approved by the Research Ethics Committee for Human and Social Sciences of the UNIVERSITY OF MPUMALANGA and will be conducted according to the ethical guidelines of this committee. Permission was also asked from the Gauteng Department of Education, as well as the school principal.

Your cooperation in this regard will be highly appreciated.

Yours sincerely

_____

Lesego M.L Khutsoane
Med student

DECLARATION

As the School Governing Body of the school, I understand that I am not being forced to grant Lesego Khutsoane permission to undertake her research in my school.

I hereby grant permission for research to be conducted at our school.

_____
SGB Member

UNIVERSITY OF MPUMALANGA
Creating Opportunities

Interview Guide for Foundation Phase Teachers: Tshwane North Foundation Phase Teachers' Views on Interactive Whiteboards (IWBs) as a Teaching Tool

Section A: Demographic Data

1.1 Demographic Information:
Please start by providing some basic information about yourself.

- ***Gender:***

  Male ☐

  Female ☐

- ***Age between:***

  20-29 ☐

  30-39 ☐

  40- 49 ☐

  50+ ☐

- ***Grade teaching:***

  Grade R ☐

  Grade 1 ☐

  Grade 2 ☐

  Grade 3 ☐

- ***Highest qualification:***

  Diploma ☐

  Bachelor ☐

  Master ☐

  Doctorate ☐

- Number of years exposed to IWBs: _____
- Years of teaching experience: _____

Section B: The use of IWBs as a teaching tool.

2.1 IWB Usage:
How often do you currently use Interactive Whiteboard as part of your learning experience?
Instructions: tick (✓)your response.

Rarely ☐

Frequently ☐

Always ☐

None ☐

2.2 Professional Development Support:

Do you feel adequately supported in using the Interactive Whiteboard as a teaching tool?

Yes ☐

No ☐

2.3 The use of an Interactive Whiteboard enhances learners' engagement in my classroom.

Agree ☐

Strongly Agree ☐

Disagree ☐

Strongly Disagree ☐

2.4 Do you feel confident using the Interactive Whiteboard in your teaching practices?

Agree ☐

Strongly Agree ☐

Disagree ☐

Strongly Disagree ☐

2.5 The frequency of using the Interactive Whiteboard has positively impacted learners' performance.

Yes ☐

No ☐

Section C: Perception of teachers

Please provide detailed responses in the spaces provided for each question:

3.1 Views on IWB Usage:

- What are your views about the use of an Interactive Whiteboard as a teaching tool in your classroom, and what do you like or dislike about the IWB?

_____

_____

_____

_____

3.2 Frequency of IWB Usage (Details):

- If you indicated that you use IWB frequently, could you please share specific examples or instances when you find it most helpful as an effective teaching tool?

_____
_____
_____
_____

3.3 What specific benefits have you observed in using an Interactive Whiteboard as a teaching tool?

_____
_____
_____
_____

3.4 Professional Development Support (Details):

- Can you provide more information about any support or training you have received to use Interactive Whiteboards? How effective was it?

_____
_____
_____

3.5 Constraints and Challenges:

- Are there any challenges or difficulties you face when using Interactive Whiteboard as part of your teaching? Please elaborate.

_____
_____
_____
_____
_____

3.6 Proposed Solutions:

- If you have identified any constraints, do you have any suggestions or ideas on how these challenges could be addressed?

_____
_____
_____

_____

Closing:

- Thank you for sharing your insights! Your input is vital for our research. If you have any additional comments or thoughts, please feel free to share them.

Additional Comments

Participant's signature_____ Date:_____

Completed Questionnaires

UNIVERSITY OF MPUMALANGA
Creating Opportunities

Interview Guide for Foundation Phase Teachers: Tshwane North Foundation Phase teachers' Views on Interactive Whiteboards (IWBs) as a Teaching Tool

Section A: Demographic Data

1.1 Demographic Information:

Please start by providing some basic information about yourself.

- *Gender:*

Male ☐
Female ☒

- *Age between:*

20-29 ☐
30-39 ☐
40-49 ☐
50+ ☒

- *Grade teaching:*

Grade R ☐
Grade 1 ☐
Grade 2 ☒
Grade 3 ☐

- *Highest qualification:*

Diploma ☐
Bachelor ☒
Master ☐
Doctorate ☐

- Number of years exposed to IWBs: 7
- Years of teaching experience: 26

1

Section B: The use of IWBs as a teaching tool.

2.1 IWB Usage:

How often do you currently use Interactive Whiteboard as part of your learning experience?
Instructions: tick (✓)your response.

Rarely ☐

Frequently ☒

Always ☐

None ☐

2.2 Professional Development Support:

Do you feel adequately supported in using Interactive Whiteboard as a teaching tool?

Yes ☒

No ☐

2.3 The use of Interactive Whiteboard enhances learners' engagement in my classroom.

Agree ☒

Strongly Agree ☐

Disagree ☐

Strongly Disagree ☐

2.4 Do you Feel confident using Interactive Whiteboard in my teaching practices.

Agree ☒

Strongly Agree ☐

Disagree ☐

Strongly Disagree ☐

2.5 The frequency of using Interactive Whiteboard has positively impacted learners' performance.

Yes ☒

No ☐

Section C: Perception of teachers

Please provide detailed responses in the spaces provided for each question:

3.1 Views on IWB Usage:

- What are your views about the use of Interactive Whiteboard as a teaching tool in your classroom and what do you like or dislike about IWB?

It is a great resource to use making lessons more visual and auditive. More effective learning because some concepts are not in the learner's frame work they need to see and hear to understand.

3.2 Frequency of IWB Usage (Details):

- If you indicated that you use IWB frequently, could you please share specific examples or instances when you find it most helpful as an effective teaching tool.

Learners are more involved in the lessons and they want to participate, making discipline better.

3.3 What specific benefits have you observed in using Interactive Whiteboard as a teaching tool?

Learners are more involved. They are excited to learn. Making certain concepts more understandable to learners

3.4 Professional Development Support (Details):

- Can you provide more information about any support or training you have received to use Interactive Whiteboards? How effective was it?

None

3.5 Constraints and Challenges:

- Are there any challenges or difficulties you face when using Interactive Whiteboard as part of your teaching? Please elaborate.

Hardware eg. globe of projector that needs to be replaced are expensive. Electricity (load shedding) — then boards

can not be used.

3.6 Proposed Solutions:

- If you have identified any constraints, do you have any suggestions or ideas on how these challenges could be addressed?

Closing:

- Thank you for sharing your insights! Your input is vital for our research. If you have any additional comments or thoughts, please feel free to share them.

Additional Comments

The whiteboards are really effective and makes teaching more fun for learners. Concepts can easily be shown to learners to understand better.

Participant's signature _____ Date: 11/09/2024

WINTERTON CONSULTING

PEOPLE.RELATIONSHIPS.
PERFORMANCE.

CERTIFICATE OF LANGUAGE AND TECHNICAL EDITING

EDITING OF THESIS: KHUTSOANE L. (STUDENT NO: 22257 4429)

This is to certify that I have thoroughly read and professionally edited Mrs Lesego Khutsoane's thesis submitted for the Master of Education Degree entitled:

Tshwane North Foundation Phase Teachers' Views on Using Interactive Whiteboards (IWBs) as a Teaching Tool

The following aspects of the thesis were systematically edited and refined:

- Spelling and vocabulary usage
- Grammar, syntax, and sentence structure
- Coherence, clarity, and logical flow of ideas
- Academic style and tone
- Formatting and presentation in accordance with institutional requirements
- Consistency and accuracy of the referencing method

The thesis was technically edited, language refined, and formatted to enhance readability, academic rigor, and overall quality.

Dr Sean Zimunya

02 December 2025

lesego khutsoane

LESEGO KHUTSOANE DISSERTATION 2 (1) Research report

Document Details

Submission ID trn:oid:::2945:331242542

Submission Date

Nov 28, 2025, 9:56 AM GMT+2

Download Date

Dec 2, 2025, 3:52 PM GMT+2

File Name

LESEGO KHUTSOANE DISSERTATION 2 (1).docx

File Size 1.1

MB

119 Pages

30,021 Words

178,708 Characters

11% Overall Similarity

The combined total of 1matches, including overlapping sources, for each database.

Filtered from the Report

Bibliography Quoted Text

Cited Text

Small Matches (less than 10 words)

Match Groups

17 Not Cited or Quoted 11%
Matches with neither in-text citation nor quotation marks

0 Missing Quotations 0%
Matches that are slvery similar to source material

0 Missing Citation 0%
Matches that have quotation marks, but no in-text citation

0 Cited and Quoted 0%
Matches with in-text citation present, but no quotation marks

Top Sources

8% Internet sources 5%

Publications

8% Submitted works (Student Papers)

Integrity Flags

0 Integrity Flags for Review

Our system's algorithms look deeply at a document for any inconsistencies that would set it apart from a normal submission. If we notice something strange, we flag it for you to review.

A Flag is not necessarily an indicator of a problem. However, we'd recommend you focus your attention there for further review.

Submission ID trn:oid:::2945:331242542

Match Groups

17 Not Cited or Quoted 11%
Matches with neither in-text citation nor quotation marks

0 Missing Quotations 0%
Matches that are slvery similar to source material

0 Missing Citation 0%
Matches that have quotation marks, but no in-text citation

0 Cited and Quoted 0%
Matches with in-text citation present, but no quotation marks

8%

Top Sources

Internet sources 5%

Publications

8%

Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources wlnot be displayed.

1 Internet

repository.nwu.ac.za 3%

2 Student papers

North West University on 2022-02-22 <1%

3 Internet

hdl.handle.net <1%

4 Internet

repository.up.ac.za <1%

5 Internet

uir.unisa.ac.za <1%

6 Internet

openscholar.ump.ac.za <1%

7 Internet

core.ac.uk <1%

8 Internet

ulspace.ul.ac.za <1%

9 Student papers

University of Mpumalanga on 2025-05-04 <1%

10 Student pap