

**Investigating the impact of ICT Professional Development of Six
South African Primary School Teacher's Innovation in Curriculum
Delivery**

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ABSTRACT

Despite ministerial efforts to advance education standards through the development of ICT policies aimed at encouraging and guiding ICT integration in teaching, teachers in various South African schools still lack the necessary digital skills and proficiencies to deliver the curriculum innovatively using ICTs. This lack of skill is often attributed to the ineffectiveness of previous ICT-Teacher Professional Development (TPD) training programmes, which failed to produce the desired outcomes of ICT innovation among teachers. In response to this challenge, this study investigated the effectiveness of a newly developed ICT-TPD programme, which was informed by a combination of key theories: *Rogers' Diffusion of Innovation Theory*, Constructivism Learning Theory, Self Determination Theory (SDT), and *Community of Practice* (CoP) Theory. These theories guided the facilitation process of the Professional Development (PD) training programme. The study focused on assessing the ICT innovation levels of six teachers from a primary school in urban Johannesburg, South Africa, by surveying their innovation levels before and after the ICT-TPD intervention. To support the content delivery and the development of teachers' ICT competencies, the TPD programme further employed the *Gradual Release of Responsibility Model* (GRRM) and the *Concerns-Based Adoption Model* (CBAM).

For a more comprehensive understanding of the dataset and its implications, mixed-methods were employed to triangulate the quantitative and qualitative data collection and analysis procedures derived from this study. Questionnaires, interviews, and a criterion assessment rubric were used to gather data from participants. This was followed by a mixed-methods sequential explanatory design used to collect and analyse data that was both qualitative and quantitative. A non-probability purposeful sampling technique was further employed to identify participants who could offer rich, pertinent, and varied information on their experiences and opinions regarding the ICT training curriculum. Additionally, a theme analysis was used to identify, assess, and report on patterns in the qualitative data (Braun & Clarke, 2006). Finally, the quantitative data was analysed using exploratory statistical approaches to find underlying patterns and relationships within the dataset.

The results from the study concluded that the ICT-TPD had a desired impact, to promote innovative pedagogical practices through the integration of ICTs, as well as resulted in the improvement of teachers' overall innovation levels. The sampled primary school teachers displayed resilience and dedication in engaging with the ICT-TPD programme for the benefit of their professional development, despite facing challenges such as resource and time constraints. According to the study, including its results and related theory, however, it is recommended that while there is evidence of achieving positive results from the ICT-TPD intervention, the long-term effective ICT integration for innovative pedagogical practice necessitates a more continuous professional growth approach through similar interventions, collaborative learning, and alignment with educational goals. Lastly, the study further emphasises the importance of recognising primary school teachers' intrinsic and extrinsic motivations and addressing the related challenges through targeted support to enhance the effectiveness and sustainability of the ICT-TPD programmes, which ultimately benefits the primary school students' learning experiences and eventual innovative outcomes.

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DEDICATION

To my family. My husband, *Ntate Maeane, Mthimkhulu, Radebe, Bhungane* - your love and support have carried me through the sleepless nights and moments of hopelessness. Thank you for carrying our family on your back, being both a mother and father to them, while I stayed up through the nights to complete this dissertation. Thank you for being my library buddy, my best friend and my anchor. We can go on that holiday now! My children, Kgothatso, just like your name, you motivate me to keep striving and be the best version of myself; Keorapetse, it is through you that I am reminded daily that God is ever present and hears my prayers; Keoarabile, you have been a beautiful reminder that just as God hears me, He also answers - therefore - I know that all I have asked for, through Christ, I have received it: My parents, Momzo and Laps, you have played a significant role in my life. You have encouraged me to aim beyond the sky and have given me hope during trying times. I would not be here without you. Thank you: My brother, Tebza, without saying much, you have shown me what it means to be faithful and resilient. Thank you. You have all been a blessing in my life. I love you all. Sione weh!

DECLARATION

I, Matjema Caroline Maeane, thus declare that this dissertation, *"Investigating the impact of ICT Professional Development of Six South African Primary School Teachers' Innovation in Curriculum Delivery,"* is my own original work. It has never been submitted to another university for credit towards a degree or an exam. This dissertation contains no previously published or written material, to the best of my knowledge and belief. Citations are used, when necessary, in both the text and the bibliography.

Signed:

A handwritten signature in black ink, appearing to read 'Matjema Maeane', is written over a horizontal line.

Date: 15th March, 2024

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LIST OF ACRONYMS

ICT	Information and Communications Technologies
TPD	Teacher Professional Development
PD	Professional Development
ICT-TPD	Information and Communications Technology - Teacher Professional Development
MOE	Ministry of Education
DOE	Department of Education
CPD	Continuous Professional Development
CPTD	Continuous Professional Teacher Development
NDP	National Development Plan
MISA	Most Improved School Award
SACE	South African Council for Educators
DBE	Department of Basic Education
WPeEd	White Paper on e-Education
GTTDPD	Guideline for Teacher Training and Professional Development
SDT	Self Determination Theory
CBAM	Concerns-Based Adoption Model
GRRM	Gradual Release of Responsibility Model
COP	Community of Practice
PLC	Professional Learning Communities

CHAPTER 1: INTRODUCTION:

Though a lot of people think that the global Covid-19 pandemic is the reason for the development of various ICT policies, there is literature already in existence (Jung, 2005; Mishra and Koehler, 2006; UNESCO, 2011; Tondeur). Van Braak, Ertmer & Ottenbreit-Leftwich, 2012; Vandeyar, 2013), however indicates that ICT policies have been in existence for several decades. The pandemic, however, is deserving of some credit for contributing towards the refocus of educational ministries' attention towards these policies, by accelerating the implementation and efforts to familiarise teachers with these policies (D'Agostino, Longobardi, (Migali & Russo, 2022). It is undeniable that a lot of research on teachers' Information and Communication Technology (ICT) readiness and ICT teacher professional development (TPD) emerged as a result of the Covid-19 pandemic, discussing teachers' ICT competence in the wake of the global shutdown that sent many schools to resorting to online learning as a way to mitigate the academic time that both teachers and students had lost (Dadhe & Patil, 2021). During this period, much of the educational shortfalls in many countries regarding ICT integration and teacher awareness or lack thereof, became apparent, particularly in the state of teachers' ICT-TPD, as, unfortunately, there was a significant number of teachers who still lacked confidence in the use of ICTs for pedagogical practices (Aivazidi & Michalakelis, 2021). The significance of ICT-TPD provision, support, and consistency is highlighted, raising the possibility of ICT-TPD serving as an enabler for teachers' transition towards ICT proficiency in addition to the widely held worry about infrastructure availability (Wu, Yang, Rifenbark & Wu, 2022).

It is important to note that the main focus of this study is not on the shortcomings of ICT integration by teachers during the Covid-19 pandemic; rather, it is on identifying global trends in effective ICT-TPD training approaches and applying those trends to an examination of the ICT-TPD training approaches used in a professional development (PD) programme that was provided to a primary school in the Gauteng Province, South Africa, in order to foster innovation in the use of ICT tools to deliver curriculum. Gaining understanding of how current implementation tactics can result in better outcomes in the post-COVID state of affairs and possibly in the event of similar issues in the future is the intent of this study. The study emphasises the continued significance of ICT-TPD in maintaining the calibre of teachers and, thus, guaranteeing children have excellent educational experiences, even outside of a pandemic.

Literature has long underlined the value of TPD, stating that improvements to schools and learner quality are directly correlated with teacher quality (Waheed, Salami, Ali & Dahlan, 2011). According to the literature, TPD for in-service teachers is the most significant technique for enhancing teacher quality as it enables them to keep up to date with the most recent advancements in their pedagogical field (Waheed et al., 2011). ICTs have been considered as an important aspect of the most recent innovations in education in the past few decades. As a result, ICT-TPD is now essential for raising the standard of instruction given to students in the twenty-first century. As literature further suggests, countries that actively and evidently prioritised the successful implementation of ICT-TPD training and initiatives in recent technology advancement years have noted the positive impact it has had on student

improvements as well as a positive change in teachers' beliefs and ICT competencies (Voogt & Roblin, 2012).

Additionally, they have subsequently had fewer difficulties, from an ICT pedagogic teacher readiness perspective, in abruptly transitioning to online learning during the Covid-19 global shutdown, as teachers in these countries were fairly well equipped with the necessary ICT skills notwithstanding the provision of sufficient infrastructure (Makawawa, Mustadi, Septriwanto, Sampouw & Najoan, 2021; Izhar, Al-Dheleai & Ishak, 2021). Malaysia, for example, has seen initiatives such as the *Smart School*, which was aimed at transforming traditional schools into technologically advanced learning institutions by integrating ICT into the education system through various aspects such as TPD (Ibrahim, 2009; Zainal & Zainuddin, 2020). Furthermore, the 1BestariNet project sought to improve the integration of ICT in education by giving teachers the tools they need to use it to deliver innovative curricula and improve student learning outcomes. This included providing high-speed internet connectivity to schools and offering professional development opportunities (Ibrahim, 2009; Zainal & Zainuddin, 2020). This reflects the goals of Malaysia's ICT policies, which have been to encourage educators to employ digital technology in novel ways to deliver curricula (Ibrahim, 2009).

Comparably, ICT-in-Education Masterplans have paved the way for ICT integration in education by providing infrastructure and training teachers in the use of these digital tools. Singapore, which is still ranked among the top nations in educational technology (EdTech) and ICT innovation, has these masterplans in place (Fiona, Hironari, & Kyoko, 2018; Ministry of Education Singapore, 2023). In an effort to facilitate the MOE's prompt response to "technological and contextual changes to ensure the effective use of EdTech for quality teaching and learning," Singapore's Ministry of Education (MOE) most recently created the "Transforming Education through Technology" Masterplan 2030 and the Educational Technology (EdTech) Plan in response to the global pandemic (Ministry of Education Singapore, 2023). The most recent EdTech Masterplan 2030 demonstrates how Singapore's MOE recognises that education is dynamic and always evolving, especially when it comes to ICT, and how to make sure educators stay up to date with these demands (UNESCO, 2023).

Together with the rest of the globe, South Africa has created e-Education policies to direct the integration of ICTs in education, such as the official White Paper on e-Education (WPED) (Department of Education, DoE, 2004). Guidelines for Teacher Training and Professional Development (GTTPD) in ICT was also developed to give a specific focus on TPD and teacher ICT innovation (Department of Education, DoE, 2007). It included a detailed outline of what constituted effective ICT-TPD as well as the tenets of an ICT-competent teacher who can use these digital tools to deliver curriculum in an innovative way.

Policies for ICT-TPD and e-learning were in place even before COVID-19. This is due to the fact that numerous nations, particularly the first world countries, swiftly included these technologies into their educational systems, realising well before the epidemic that ICT might revolutionise teaching methods. These policies' main objectives are to improve students' learning experiences and teachers' pedagogical expertise by emphasising innovative uses of ICTs, as well as to increase access to these tools, their effectiveness in delivering the

curriculum, and the quality of education that arises from the innovative curriculum delivery (Vandeyar, 2013). This worldwide commitment to ICT integration stems from the realisation that active engagement in the increasingly digital global economy requires technical fluency, especially in teacher knowledge and education. Several nations have created ICT-PD policies and frameworks at the ministerial level in response to these needs (Krajka & Sowa, 2017). These aim to direct the incorporation of these technologies into the educational system and, most all, to motivate educators to employ them creatively in their teaching practices. As shown in Figure 1.1 (as referenced in Krajka & Sowa, 2017, p. 74), this strategic approach is consistent with the hierarchical model of ICT competence levels established by Hampel and Stickler. It is the expectation of many educational ministries that providing PD that is focused on exposing teachers to ICT will eventually result in their creative integration of digital technologies into their pedagogic practices.

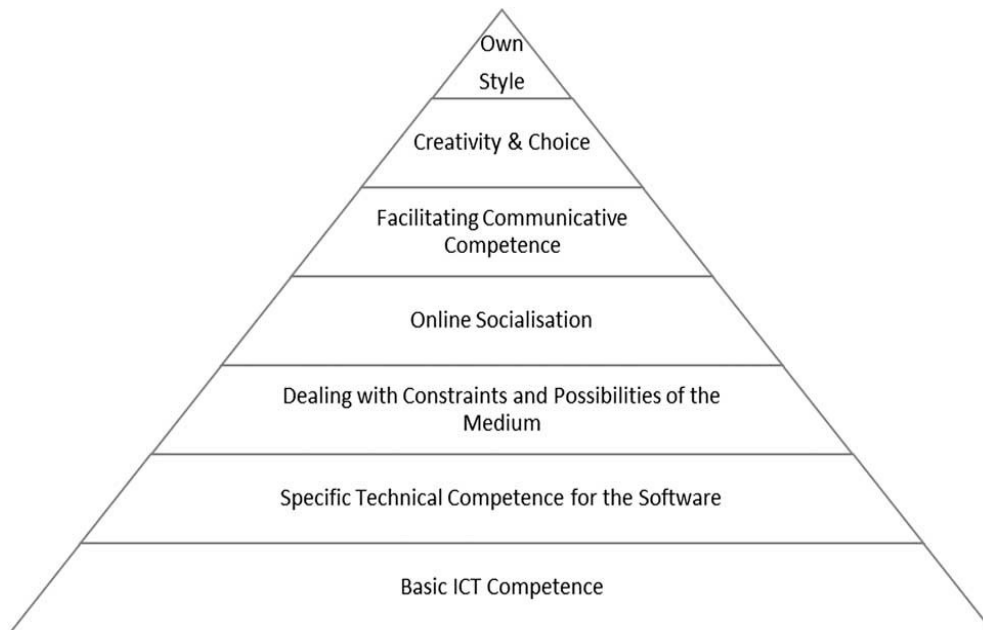


Figure 1.1: *Hampel and Stickler's "skills pyramid for language instructors"*
(Krajka & Sowa, 2017, p. 74)

Although Hampel and Stickler's model primarily focused on online language teachers, it remains relevant as it provides a hierarchical development of ICT teaching skills that indicate that gaining the relevant ICT pedagogical skills is not a one-time event but rather a process that requires consistency and commitment. Similar models have been used in illustrating the hierarchical process involved in adopting an innovation; The pyramid presented in **Figure 1.2** shows a similar hierarchical model that outlines levels of ICT competence as guided by the South African education department in its *GTPD in ICT* policy document (Department of Education, DoE, 2007) which suggests that basic ICT competence is foundational, and that as one ascends the pyramid, one acquires improved and innovative digital competencies, which results in the development of a personal style in the innovative use of technology (Hampel, as cited in Krajka & Sowa, 2017; DoE & Hindle, 2007).

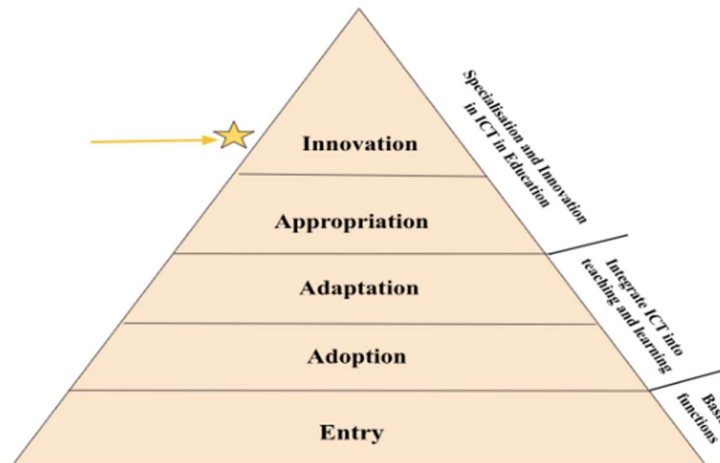


Figure 1.2: Guidelines for Teacher Training and Professional Development in ICT (DoE & Hindle, 2007).

This pyramid is further indicative of the notion of time and its relationship to innovation adoption and its progression, as Krajka and Sowa stated, “quite a few stages of development need to be overcome, a considerable amount of time might pass, and not all teachers might [even] get to the top levels of the teacher skills pyramid” (Krajka & Sowa, 2017, p.74). ICT-TPD programmes that link teachers' participation to career incentives, provide a specific subject-matter focus, involve lesson enactment in the training, include early face-to-face training, as well as continuous support during and post-training, are said to improve student learning gains (Popova, Evans, Breeding, and Arancibia, 2022). They contrast this to most at-scale TPD programmes that have significantly different characteristics which have fewer incentives to participate in the PD, offer fewer opportunities to practise new skills, and have little to no follow-ups or support after the training when teachers return to the classroom (Popova et al., 2022).

Although many nations, including South Africa, have taken the lead in integrating ICT in education, there are still gaps in the methods employed. Current literature suggests that while some clear policies and initiatives have been developed to improve access and utilisation of ICT in education, there remains a big gap between the policies in place and teachers' actual practice on the ground. This indicates that while the ICT policies expect to see creativity in teachers' delivery of the curriculum using the ICT discussed, the PD programmes that are suggested by these policies fall short of promoting the policies' desired ICT innovation from teachers. For example, countries like the United States, and Kenya, although they have policies in place, still struggle to implement the strategies suggested by the policies due to factors such as regional disparities, varying quality levels of PD training, as well as ICT infrastructure and resource limitations. It is only a few countries such as Singapore and Malaysia, as indicated above, that have been exemplary in their innovative ICT in education integration (Trucano, 2010) and approaches that are highly collaborative, teacher-driven, and supported by national strategies that emphasise pedagogical *innovation* and continuous learning. For this study, in particular, although evident in existing literature, one of the major challenges experienced was

that of insufficient ICT training resources or lack thereof. This resource factor has proven to have an inevitable impact on the rate at which teachers adopt the ICT innovation (Sahin, 2006); this is evident in Mune and Jita's research, "*The Impact of the Lack of ICT Resources on Teaching and Learning in Selected South African Primary Schools*" (2020), which indicated the detrimental effects that a lack of resources has on schools' attempt to innovatively integrate ICTs for enhanced learning. Munje and Jita (2020) found that schools that lacked or had an insufficient supply of ICT tools were unable to benefit from the ICT innovation boasted by global research on the phenomena as well as national ICT policies. Lack of resources, as a factor, can also hinder teachers from reaching the apex of the ICT teacher skills pyramid as indicated in **Figure 1.2**, thus hindering teachers' ability to innovate in their curriculum delivery (DoE, 2007).

1.1. Background of the study

South Africa's educational policy have seen substantial changes in recent decades, especially with the introduction of ICT in the classroom. This change emphasises how ICT can improve the national framework for digital education. It is supported by the GTTPD in ICT, the 'Professional Development Framework for Digital Learning' (Department of Education, DoE, 2020), and the WPeEd (Department of Education, DoE, 2004; Department of Basic Education, DBE, 2007). Despite these policy advancements, there are still challenges that persist in actively integrating ICT innovation. The issues of high dropout rates and low student achievement, which were hoped to be mitigated by introducing ICT innovation in teaching and learning, remain significant concerns. Additionally, there is a shortage of educators who are skilled in the innovative use of ICTs. There is also resistance from these teachers to using ICT among teachers for the innovative delivery of the curriculum. These issues were intended to be addressed through continuous TPD programmes. Such programmes are outlined in the GTTPD in ICT (Department of Basic Education, DBE, 2004).

Dlamini and Mbatha (2018) emphasise that professional development in ICT for primary school teachers is vital for bridging these existent skill gaps. According to Mpungose (2019), continuous professional development is especially important for in-service teachers since it expands on their pre-existing pedagogical content knowledge (PCK) and makes it easier for them to incorporate new ICT skills for creative curriculum delivery. ICT-Teacher Professional Development (ICT-TPD) programmes are instrumental in improving teachers' ICT competencies and fostering confidence in integrating these technologies innovatively (Abanda, 2017; Kolawole, 2016). Vandeyar (2020) highlights that such initiatives can lead to more innovative teaching methods, consequently improving student learning outcomes and meeting the demands of modern digital literacy (Harris & Hofer, 2011).

The integration of ICT is not merely about technological proficiency but also about fostering innovative pedagogical practices. Anderson and Dexter (2005) and Diener and Dede (2014) suggest that innovation in curriculum delivery through ICT can create an interactive learning environment that caters to diverse student needs, including those with special educational requirements. Jeffels (n.d) further argues that the integration of ICTs in primary schools, in particular, sets the foundation for young students to familiarise themselves with digital tools. Additionally, children who are introduced to ICTs from an early age are likely to be more

proficient in utilising digital tools effectively (Jeffels, n.d.; Murithi & Yoo, 2021). Therefore, understanding the impact of ICT-TPD programme strategies on primary school teachers' innovative practices is a pivotal research area as the primary school age is a crucial developmental step for laying the foundation for future learning and skill acquisition (Tsapali, Ellefson & Paes, 2018).

The goal of this study was to assess how well an ICT-TPD programme promoted innovative practices among primary school teachers in the Gauteng province of South Africa, in light of the significance of ICT integration in primary schools. It looked into the level of ICT integration in a specific primary school in Gauteng, the difficulties teachers have integrating ICT, and the training methodology employed by the ICT-TPD initiative. In addition, it evaluated how well the initiative promoted innovative curriculum delivery and determined the elements that made the programme successful or unsuccessful. The results of this study can provide important guidance for creating successful ICT-TPD programmes in South African primary schools and promoting innovative curriculum delivery.

With a mixed-methods research design, the study collected data using both quantitative and qualitative techniques. To evaluate teachers' ICT competency and use both before and after the training, secondary quantitative surveys and criterion-referenced testing were employed. In-depth descriptions of the teacher participants' experiences and opinions on the training programme were gathered through semi-structured interviews, feedback surveys, and qualitative field notes. The constructivist paradigm served as the foundation for the research design, which is consistent with our understanding of the experiences and perspectives of primary school teachers on ICT-PD and innovation in curriculum delivery. A comprehensive literature analysis of pertinent subjects, including ICT in education and TPD, as well as South African education policies and efforts pertaining to ICT and teacher professional development, were also included in the study.

The study intended that this research would provide useful insights into ICT-TPD's potential for stimulating innovation in curriculum delivery and increasing educational quality in South Africa. By identifying effective approaches to ICT-TPD, the study can contribute to the ongoing efforts to enhance the educational standards and ensure that South Africa's education system is better equipped, both in physical infrastructure and ICT relevant soft skills, to cater to the needs of its students, particularly in a world where technology is placed at the forefront of all sector development amidst economic constraints that frequently affect ministerial abilities to provide relevant resources that are essential for ICT-TPD programmes.

1.2. Research problem, aims, objectives and research questions.

Research Problem:

ICT innovation in education is still elusive in South Africa. This is despite the development of the *White Paper in e-Education Policy*, designed to catalyse a transformation in learning and teaching through ICTs, and the *GTTPD in ICT*, intended to guide teachers' professional development in ICT integration. Additionally, there have been projects implemented, such as the DBE Cloud, offering freely accessible cloud-based resources, and the Teacher Laptop Initiative, supplying teachers with laptops for improved computer literacy and technology integration. However, the overall impact of these initiatives on ICT innovation in education have been less pronounced. The rate of adoption (Rogers, 1963), in this regard, has been impeded by a reluctance from teachers, despite these national initiatives to improve access and equip teachers with innovative ICT teaching and learning skills (Dlamini & Mbatha, 2018, p. 19).

Some of the major widespread problems that have been identified as a reason for the teachers' opposition to ICT use in teaching is the ineffective training approaches that have been used in these ICT professional development initiatives (Vandeyar, 2014). Koehler and Mishra (2005), Dlamini and Mbatha (2018), and Vandeyar (2014 & 2015) argue that the choice in ICT-TPD training approaches significantly affects what is learned and how knowledge is acquired and enacted for teachers' professional development. They also affect the pace at which the introduced ICT innovation is adopted by the teachers (Koehler & Mishra, 2005; Dlamini & Mbatha, 2018). Given the potential benefits of ICT affordances in improving primary school teachers' innovative pedagogical practices and subsequently learners' literacy levels (DoE, 2004; DBE, 2007; UNESCO, 2011), this study aims to investigate the impact of the ICT-PD training approach on promoting innovation in the use of ICT for innovative curriculum delivery among primary school teachers.

Research aims:

This research aims to determine if the training approaches used in the ICT-TPD training programme have resulted in teachers' innovativeness in their delivery of the curriculum.

Research Objectives:

1. To assess the teachers' level of innovation before the training.
2. To reflect on the delivery of the training programme.
3. To determine if the ICT training approach resulted in teachers' innovativeness in their delivery of the curriculum.

*Research Questions:***Main question**

To what extent did an ICT professional Development programme promote innovation in the use of ICTs for the delivery of the curriculum?

Sub-questions

1. What are the teachers' levels of innovation before the training?
2. What processes and strategies characterised the implementation of the course delivery within the ICT training programme?
3. To what extent did the ICT training programme result in teachers' innovative use of ICTs for the delivery of the curriculum?

1.4. Significance and rationale of the study.

Vandeyar (2013 & 2015) highlighted the importance of district and national officials being equipped with the relevant ICT skills to effectively train teachers in ICT as well as actively implement the e-Education policy in teachers' innovative delivery of the curriculum using digital tools. Similarly, Dlamini and Mbatha (2018) emphasised the significance of ICT-TPD as a way of ensuring teachers' competence in innovatively integrating ICT tools in their pedagogical practices, thus echoing Vandeyar (2013 & 2015) sentiments that ICT-TPD be conducted by appropriately skilled officials who are competent in the use of these tools. Dlamini (2022, p. 28) further reiterates the importance of "ongoing technical and pedagogical support, to increase ICT professional development opportunities for teachers", thus bridging the gap between e-Education policy and practice. This study, therefore, has implications for education policy and practice, because by evaluating the effectiveness of different ICT training approaches on teacher professional development, the study can provide valuable insights into how to actively improve the integration of ICT into teaching practices in South African primary schools so that primary school teachers are innovative in their use of these tools. Specifically, the study provides evidence-based recommendations for the DBE to potentially adopt effective ICT-TPD training approaches, particularly at the foundation, intermediate and senior phases, to ensure improved ICT competencies and innovative use among primary school teachers (Department of Education, DoE, 2004). Furthermore, the study contributes to the existing body of knowledge on effective teacher professional development by examining the impact of this study's training approaches on pedagogical innovation (Mathevula & Uwizeyimana, 2014; Dlamini & Mbatha, 2018).

While the study specifically focuses on South Africa, its findings do, however, have implications for other global countries' education research and practice too, particularly in low- and middle-income countries. The use of ICT in education is a global trend, and understanding how to effectively integrate ICT into teaching practices for innovative implementation is essential for improving educational outcomes and advancing social and economic development (UNESCO, 2013). By providing evidence-based recommendations for effective ICT-TPD training approaches, the study contributes to the development of good practices for TPD in ICT integration, which can be adapted and applied in other contexts to support teachers innovate in curriculum delivery.

1.5. Definition of key terms and concepts

1. **Innovation/ Pedagogical innovation:** The introduction of new and effective teaching methods or techniques that improve student learning outcomes (Ertmer, Ottenbreit-Leftwich, & York, 2012).
2. **ICT:** 'Information and communication technology' refers to the use of digital tools and devices to communicate and process information (UNESCO, 2011).
3. **ICT integration:** The 'process of incorporating ICT into teaching and learning practices in a way that enhances and supports learning' outcomes (Chigona & Chigona, 2010).
4. **Professional development (PD):** The ongoing process of developing knowledge, skills, and attitudes related to a profession or occupation, often through formal training or continuing education (AbdulRab, 2023).
5. **Training approaches:** The methods and techniques used to deliver PD programmes, 'including instructional design, delivery modes, and assessment strategies' (AbdulRab, 2023).
6. **Curriculum delivery:** The process of planning, designing, and delivering educational content to learners (Dadhe & Patil, 2021).
7. **ICT-TPD:** Information and Communication Technology - Teacher Professional Development. It refers to programmes and initiatives that aim to improve teachers' knowledge, skills, and confidence in using ICT to enhance their teaching practices.

CHAPTER 2: LITERATURE REVIEW:

The academic achievement of students is greatly influenced by TPD, with a focus on TPD in ICT. ICT-TPD is also thought to be essential for boosting teachers' *innovation* in developing and implementing curricula (Bingimlas, 2009; Bernadine, 2019). This chapter of the literature review explores how ICT-TPD interacts with teachers' capacity to innovate in the delivery of curricula, particularly in the setting of South African primary education.

The primary aim of this research is to investigate how an ICT in-service professional development (PD) training programme, offered to a Gauteng primary school, promotes innovation in primary school teachers' use of ICTs for teaching and learning. This review explores the different parts that constitute ICT-TPD, and desired outcomes as suggested by policy, to understand their effectiveness and impact on teacher innovation. Additionally, this review seeks to provide a better understanding into the current state of ICT-TPD in South Africa, by examining both the successes and challenges that are faced in implementing such programmes especially within the current policy implementations in the South African education system.

The scope of this literature review will include empirical studies, as well as theories that inform TPD, specifically focusing on ICT integration in the primary education sector. It will examine the correlation between teacher training in ICT and the subsequent improvement in their curriculum delivery approaches and the extent to which the curriculum delivery post-training is innovative. The review will, however, limit its focus to primary school education and the specific context of a single province, Gauteng, situated in South Africa. Furthermore, this review does not 'criticise' policy, but rather analyses ICT-TPD relevant policies to understand how ICT-TPD has thus far been implemented in South African education, as well as acknowledge the challenges and probable solutions thereof. Additionally, the review begins by briefly reviewing international trends in ICT-TPD that offer direct relevance or comparative insights to South Africa's context, then finally exploring the current trends and state of ICT-TPD within the local South African primary school context.

The layout of the chapter will begin with a brief discussion of what ICT-TPD is, an overview of international trends in ICT-TPD with the challenges and achievements in the identified international countries' ICT-TPD programmes. This will be followed by a discussion of the current status of ICT-TPD in South Africa concerning current ICT-TPD policy, and lastly a focused overview of ICT-TPD initiatives and their alignment with the goals of the South African e-Education policy. Subsequently, the review will delve into empirical studies that illustrate the effects of ICT-TPD on teacher innovativeness in curriculum delivery. Finally, the review will critically analyse the gaps and potential areas for improvement within the current framework of ICT-TPD in South Africa, linking back to the overarching research aim, objectives, and questions of this study.

2.1. What is ICT-TPD?

ICT-TPD stands for 'Information and Communication Technology - Teacher Professional Development' (Abanda, 2017), which refers to the process and practices that are involved in enhancing teachers' skills and knowledge in their use of ICT in education. The concept of ICT-TPD is multifaceted, as it includes various aspects related to teacher training and development that specifically target the integration and effective use of digital technologies in their pedagogical practice.

ICT-TPD is primarily concerned with equipping educators with the necessary ICT skill set and pedagogical approaches to effectively incorporate technology into their methods of delivering curriculum. Training in the use of digital tools, software, and other learning platforms is part of this, as is learning how to effectively use these technologies to improve learning outcomes and student engagement (Tondeur, van Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012). In addition to technical competence, ICT-TPD involves training designed to promote a mentality that supports innovative teaching in the field of digital literacy (Lawless & Pellegrino, 2007).

In a world that is constantly evolving digitally, ICT has become increasingly important and stands at the forefront of all types of development and innovation (Dlamini & Mbatha, 2018; Van der Merwe-Muller & Dasoo, 2021). The integration of ICT in education is not just a trend that gained particular popularity during the Covid-19 pandemic amidst global lockdowns but has rather become a necessity to prepare students for a technology-driven future, through the expertise of the teacher (Voogt, Erstad, Dede, & Mishra, 2013). It is for this reason that teachers, who are in essence the facilitators of learning, need to be proficient at using these technologies to deliver the curriculum and foster a learner-centred environment effectively and innovatively (DoE, 2004; Koehler & Mishra, 2009; Vandeyar, 2013; Dlamini & Mbatha, 2018; Van der Merwe-Muller & Dasoo, 2021; Harsha & Newman, 2021).

Despite the evident importance of implementing effective ICT-TPD, the process is not without challenges. These include but are not limited to, inadequate infrastructure, resistance to change among educators, limited access to resources, and a lack of administrative support from the relevant stakeholders (Ertmer, Ottenbreit-Leftwich, Sadik & Sendurur, 2012). Additionally, there is often a gap between the acquisition of the technical skills and their pedagogical application, which can hinder teachers' ability to innovate their integration of ICT in their curriculum delivery (Hu et al., 2021). For teachers to achieve an innovative level of ICT proficiency, ICT-TPD programmes must be cognisant of providing ongoing support, hands-on training, and aligning the PD training with the teachers' specific needs and curriculum goals (Mishra & Koehler, 2006). Collaborative and reflective practices, such as communities of practice and peer coaching, are also crucial for sustainable professional growth in this area (Bernadine, 2019; Hu et al., 2021; Harsha & Newman, 2021).

2.2. International trends in ICT-TPD

International trends in ICT-TPD emphasise the importance of fostering teacher innovation in curriculum delivery. Although more and more educational systems around the world continue to integrate digital technologies in education, the focus has, however, shifted from merely equipping teachers with the basic operational ICT skills to better enabling them to use these digital tools innovatively and effectively in their pedagogical practices for their specific subject matter (Tondeur, Petko, Drossel, Christensen, 2021).

According to Rudd (2001) and Dlamini & Mbatha (2018), there is a growing consensus that ICT-TPD should go beyond basic technical training but must instead include pedagogical integration where teachers are trained on practically utilising the digital tools to enhance their respective subjects. This involves teaching educators how to meaningfully incorporate technology into their lesson plans to enhance student learning and engagement in a digitally savvy manner (Mishra & Koehler, 2006; Tondeur et al., 2017; Dlamini & Mbatha, 2018). The current global trend, as Voogt et al., (2013) suggest, is towards developing teachers' capacity (digital competency) to innovate their curricular content with ICT, by making lessons more interactive, student-centred, and aligned with 21st-century digital skills.

Furthermore, there is a growing understanding of the importance of reflective and collaborative practices in ICT-TPD to support teachers' smooth incorporation of ICT in the classroom (Ertmer, 2005; Ertmer et al., 2012; Hu et al., 2021). According to DuFour (2004), initiatives that support educators in participating in communities of practice (CoP), exchanging experiences, and critically analysing their instruction have proven successful in fostering creativity in the way curricula are delivered (Lave & Wenger, 1991; DoE, 2004; DuFour, 2004). These methodologies enable the sharing of concepts and cultivate an environment that prioritises ongoing education and advancement.

Additionally, another emerging trend in ICT-TPD is the integration of advanced digital technologies such as 'Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR)' in education (Rong, Lian & Tang, 2022). These technologies are constantly improving, reaching unimaginable plights that offer new avenues for innovative teaching and learning experiences (Rong et al., 2022). It is for this reason that TPD programmes are increasingly focusing on how these technologies can be utilised to create immersive learner-oriented environments that push the boundaries of traditional curriculum delivery into more innovative employment of the curriculum (Alalwan, Cheng, Al-Samarraie, Yousef, Alzahrani, Sarsam, 2020).

Lawless & Pellegrino (2007) view ICT-TPD as a continuous, lifelong process, that requires the need for teachers to regularly update their skills and knowledge, remaining technologically relevant to keep pace with technological changes. This view is shared by many international programmes that offer ongoing support and learning opportunities for teachers, such as, but not limited to, the Microsoft Educator Community, Apple Teacher Program and Google for Education. Other international initiatives that are making strides include the International Society for Technology in Education (ISTE) Standards which is an organisation that prides

itself in offering ICT-TPD opportunities that focus on pedagogy - not just tools - but to create sustainable, high-impact and competitive pedagogically rich and innovative learning experiences for teachers to all students (International Society for Technology in Education (ISTE), n.d.). As such, many international programmes are structured to provide ongoing support and learning opportunities for teachers to keep abreast of the technological advancements in education (Lawless & Pellegrino, 2007).

It is evident, as one reflects on these international trends in ICT-TPD, that there is a shift that is taking place towards a more holistic approach to upskilling teachers so that they are innovative in their use of ICT tools and enhancing the overall education through ICT-TPD. This shift is characterised by a stronger emphasis on pedagogical integration, collaborative learning, and the inclusion of emerging technologies (International Society for Technology in Education (ISTE), n.d.; Lawless & Pellegrino, 2007). Additionally, there is a growing focus on ensuring continuous professional development and the customisation of training programmes to suit diverse educational needs (Lawless & Pellegrino, 2007). Such trends are critical in fostering teacher innovation in curriculum delivery, equipping educators with the necessary tools and skills to navigate and thrive in a digitally evolving educational landscape.

2.3. Challenges and barriers to ICT integration in primary schools

Several studies have examined the impact of Information and Communication Technology (ICT) teacher professional development on teacher innovation and curriculum delivery. These studies span over different contexts, educational levels, and methodological approaches, however, tend to conclude and concur on the positive impacts of ICT integration when well-implemented. As such, many countries base their ICT in education and ICT-TPD policies on this consensus (UNESCO, 2011). However, while ICT is being increasingly recognised for its potential in enhancing educational outcomes, integrating ICT into primary school settings is not without challenges. Several studies have highlighted the major barriers that limit the effective integration of ICT in these primary school settings.

The obstacles and difficulties associated with integrating ICT in primary schools are complex, and creating workable solutions requires a thorough grasp of them. One major hurdle is the insufficient ICT literacy and technical skills among teachers. Ertmer et al. (2012) emphasise that many teachers feel ill-prepared to use technology effectively due to limited ICT skills and knowledge. Addressing this challenge requires targeted interventions in teacher training programmes to enhance the teachers' digital competencies.

Inadequate resources and infrastructural limitations present another significant barrier to ICT integration. Czerniewicz and Brown's (2009) study on technology integration in South African schools' underscores issues such as insufficient access to ICT tools, unreliable electricity, and poor internet connectivity. Improving infrastructure and providing schools with necessary resources are crucial steps to overcoming this challenge. Teachers' beliefs and attitudes towards ICT play a greater pivotal role in its successful integration. Ertmer (2005) notes that some educators perceive technology as disruptive to traditional teaching methods, hindering its adoption. Efforts to integrate ICT should include strategies to shift teachers' attitudes, emphasising the enhancement of teaching practices through technology rather than disruption.

The lack of ongoing professional development and support emerges as a recurring issue. Bingimlas (2009) highlights that teachers often struggle to implement ICT due to a lack of continuous training and support. Establishing robust professional development programmes that provide continuous learning opportunities can, therefore, empower teachers to effectively integrate ICT into their pedagogical practices. Institutional barriers, encompassing school policies and the curriculum, also pose challenges to ICT integration. Tearle (2003) points out that when school policies do not actively encourage and facilitate ICT integration, its implementation tends to be minimal and ineffective. Addressing institutional barriers involves revisiting and revising policies to align them with the goals of promoting ICT integration in education.

In essence, overcoming challenges and barriers to ICT integration in primary schools requires a holistic approach. This involves improving teachers' ICT literacy, addressing infrastructural limitations, reshaping teachers' beliefs, providing continuous professional development, and revising institutional policies to foster a conducive environment for effective ICT integration.

2.4. ICT-TPD in South Africa

South Africa's journey in integrating ICT in education is marked by a series of strategic policies and frameworks, each contributing to the evolving landscape of digital learning and teacher professional development. The inception of this journey can be traced back to the National Plan for Higher Education (DBE, 2001), which, although was not explicit about how these impacts primary school teachers in particular, provided the foundation for subsequent advancements in policy that have somewhat provided an outcomes-based suggestion of what stakeholders can consider when developing professional development training programmes for primary school teachers. The WPED (DBE, 2004) further presented the role of ICT in transforming teaching and learning and emphasised the need for robust digital competencies among educators. This was followed by the publication of the GTTPD in ICT (DBE, 2007), which provided a structured approach to enhancing teacher skills in ICT. A significant milestone was then achieved with the adoption of the National Development Plan 2030 (DBE, 2012), which envisioned a comprehensive national development strategy that would be inclusive of innovation and technology in education. The progression culminated with the Department of Basic Education's Professional Development Framework for Digital Learning, revised in 2019 and published in 2020, which focuses on developing educators' skills in digital technologies and resources.

This timeline of ICT-TPD relevant frameworks and policies reflects South Africa's Ministry of Education's (MoE) commitment to promoting an education system where ICT is integral, therefore necessitating the need for continuous and adaptive professional development initiatives for teachers to meet the demands of a rapidly evolving digital era. However, existing research, such as that of, but not limited to, Vandeyar (2013) and Dlamini and Mbatha (2018) also indicates that while South Africa has a wealth of theoretically robust policies and frameworks that create an idealistic vision of their application, there remains a mismatch

between these policies and their practical implementation in the South African primary school educational setting.

The following section of this chapter examines the different key points that are crucial for understanding ICT Innovation as augmented by ICT-TPD, as well as the pertinent gap within policy and practice in South Africa's educational landscape. It delves into how policy directives translate or fail to translate into effective classroom practices that foster true pedagogical innovation. This includes an exploration of factors such as resource availability, teacher training quality, and institutional support systems. Additionally, the section investigates the challenges faced by teachers in integrating ICT tools innovatively within the curriculum, considering the realities of their specific teaching environments. By juxtaposing the idealistic goals set forth by current policies with the practical experiences of teachers on the ground, this discussion aims to illuminate the complexities and nuances of implementing ICT-TPD effectively and to identify strategic pathways that could bridge the gap between high-level policy intentions and ground-level teaching practices in South African primary schools.

2.4.1. Policy and Practice

ICT Innovation & Teacher Professional Development

The intention behind ICT integration in education has been the potential educational advancements it offers through the use of computers, the internet, digital devices, software applications, and other electronic technologies in educational settings. The goal with ICT in education is to improve educational outcomes, promote interactive learning experiences, and prepare students for the digital world (UNESCO, 2011; DBE, 2007; DBE, 2004). This, as Vandeyar (2013) suggests, can be achieved when teachers can innovatively augment ICT tools into their pedagogical practice. This includes the use of interactive tools, multimedia, and online resources to make lessons more engaging and tailored to the needs of individual students. It also includes promoting collaboration and communication among students through digital platforms. Such ICT educational innovation intends to improve critical thinking and problem-solving skills, backed by teachers' ongoing professional development in the implementation of these new technologies and pedagogical methodologies (Hennessy, D'Angelo, McIntyre, Koomar, Kreimeia, Cao, Brugha & Zubairi., 2022; Bingimlas, 2009; Lawless & Pellegrino, 2007; Voogt & Roblin, 2012). In practice, ICT transforms traditional classrooms into dynamic, interactive, and personalised learning environments. Teachers are key players in this transformation in ICT integration for innovative curriculum delivery. Hence the importance of ICT teacher professional development for the sole purpose of innovative curriculum delivery (Vandeyar, 2013).

The innovative integration of ICT into teaching practices requires ongoing teacher professional development (Hennessy et al., 2022). Professional development programmes that focus on teachers' use of ICT can improve teachers' knowledge and skills in using ICTs, increase their confidence in integrating ICTs into their teaching practices, and encourage them to adopt innovative practices, leading to the eventual improvement in student learning outcomes (Harris & Hofer, 2011). However, while policymakers have attempted to provide guidelines for ICT integration in education, these policies, although they briefly mention the concept of TPD,

often do not emphasise the crucial role it plays in the overall success of ICT in education. This oversight is evident in the limited attention and time allocation given to ICT teacher professional development (ICT-TPD), which research suggests should be continuous rather than a one-time event (Dlamini & Mbatha, 2018; Ertmer et al., 2012; Hennessy et al., 2022). When it comes to TPD programmes, policies tend to be more suggestive rather than direct, which is evident in the limited availability of an actual step-by-step guide on how to best implement ICT-TPD.

ICT-TPD programmes, which are initiatives designed to enhance teachers' knowledge, skills, and confidence in using ICT, are crucial in this context (Chigona & Chigona, 2010). These programmes can be delivered through various approaches such as workshops, seminars, webinars, online courses, and mentoring, and are essential for supporting the development of innovative pedagogical practices (Mathevula & Uwizeyimana, 2014; Ertmer et al., 2012). They provide opportunities for collaboration, sharing of good practices, and peer learning. The effectiveness of these programmes, however, depends on factors like the quality of training, relevance to teachers' needs, level of support, and follow-up activities (Dlamini & Mbatha, 2018). This combined approach is discussed in detail below in an examination of existing e-education policies in South Africa and how they have been rolled out so far, with a focus on ensuring that ICT-TPD programmes are context-specific, relevant, and align with teachers' needs and expectations and that they facilitate a transformation of teacher beliefs, pedagogical values, as well as encouraging the innovative practices in curriculum delivery (Hennessy et al., 2022).

South African Context in ICT-TPD

South Africa has made impressive strides in enhancing ICT infrastructure in schools. A significant percentage of schools now have access to both electricity and internet connectivity, marking a leap forward in technological integration for education (Smith & Ngqondi, 2019). The government's initiative to provide ICT equipment and resources, such as tablets and smart boards, is also a commendable step toward digitising education. However, despite these advancements, there are challenges that remain in effectively integrating ICT into educational practices, predominantly due to a lack of focused teacher training and professional development. A study by Brown and Czerniewicz (2018) highlights that many teachers are not sufficiently trained in ICT, which has a great impact on their ability to integrate these tools effectively and innovatively into their teaching.

To mitigate this issue, the South African government, through SACE, mandated the concept of Continuous Professional Development (CPD) points system requirements that include ICT training (DOE, 2020). Additionally, various universities and training institutions offer courses in ICT for education, addressing this critical need for TPD in ICT. However, the effectiveness and reach of these professional development programmes are constrained by factors such as geographical and financial barriers, as well as inconsistencies in training quality and relevance to teachers' curriculum needs (Mhlanga & Moloi, 2020). Consequently, a unified and standardised approach to ICT professional development across the nation to ensure that all

teachers receive high-quality and relevant ICT training is needed (Van Deursen & Van Dijk, 2019).

Furthermore, to facilitate effective ICT integration, it is essential to encourage innovation in teaching practices. Some initiatives have been established to try and foster such ICT innovation; these initiatives include the Technology Innovation Agency (TIA), which is a government entity that focuses on leveraging technological advancements to foster developments across different sectors including education (DOE, 2020). There is also the Technology for Rural Education Development programme (Tech4RED) which is an initiative that aims to provide the necessary resources and training for places such as rural areas where there is generally an undersupply of resources (DOE, 2020). Such programmes are crucial in *empowering* teachers to explore new technologies and *innovative* teaching methods.

While efforts to integrate ICT in education are commendable, there are significant gaps that remain, particularly in the context of teacher training and professional development. Current government initiatives and educational policies, though crucial, often overlook the need for differentiated ICT skill development that aligns with the teachers' specific subject areas (Aivazidi & Michalakelis, 2021; AbdulRab, 2023). For instance, an English teacher's ICT needs differ markedly from those of a science teacher, as each requires distinct skills to effectively integrate technology into their respective curriculums in an innovative manner. To truly enhance the quality of education through ICT integration, there is a pressing need for intentional, lifelong learning opportunities and teacher support that are meticulously aligned with the diverse curriculum needs of various subjects (Albion et al., 2015). This approach would ensure that professional development in ICT is not only comprehensive but also contextually relevant, thereby equipping teachers with the specific technological competencies required for their unique teaching disciplines and innovation needs. The following section will discuss key gaps in these policies and frameworks, and some ICT-TPD training initiatives, and to some extent propose targeted solutions to address each shortfall, ensuring that professional development is both comprehensive and contextually relevant for teachers across different subject areas.

2.4.2. Policies and initiatives related to ICT and teacher professional development:

This section discusses pivotal South African policies fostering ICT innovation in education, particularly for teachers' pedagogical practices. The points of discussion are on the WPeEd (2004), GTTPD in ICT, the Professional Development Framework for Digital Learning, the National Development Plan (NDP) 2030 as well as Operation Phakisa: ICT in Education (2015), by assessing how effective they have been in improving teachers' innovation in curriculum delivery.

White Paper on e-Education (WPeEd)

The WPeEd (DoE, 2004) was one of the earliest and most significant policy documents to emphasise the specific role of ICT in education in South Africa. This policy framework was intended to help teachers transcend beyond basic computer literacy of the merely operational skills (DoE, 2004). This policy aimed to transform teaching and learning by ensuring ICT

access to both students and teachers (DoE, 2004). The primary goal included upskilling teachers through ICT teacher professional development (DOE, 2004, p. 22-26; Vandeyar, 2013; Dlamini & Mbatha, 2018). Additionally, the policy encouraged schools to establish professional development programmes that would train teachers to effectively use ICT tools in their teaching, as well as highlighted intended collaborative efforts between the department and Higher Education institutions to train both in-service and pre-service teachers in ICT use (DoE, 2004, p. 26). These steps were intended to foster innovation in teachers' use of ICTs. However, the literature reveals a lack of consistency and intention from the government and policy agents in meeting the policy's objectives, which indicates that not all the intended goals were consistently pursued or achieved.

Objectives of the WPeEd

The WPeEd set forth three main goals: improving teacher professional development, guaranteeing that all students have access to ICT resources, and revolutionising teaching and learning (DoE, 2004). The goal of the policy was to include ICT into the curriculum in order to foster a collaborative and learner-centred approach, which would ultimately raise the standard of education as a whole (DoE, 2004). By 2013, the goal of the strategy was to close the digital gap and advance social and economic development in South Africa by guaranteeing that all students have access to ICT resources (DoE, 2004). Moreover, the policy underscored the significance of ICT teacher professional development and the creation of teacher training programmes to equip educators with the necessary skills to effectively use ICT tools, which lies at the core of all the educational advantages that ICT would provide for students (DoE, 2004). The DoE and Higher Education Institutions collaborated to create these ICT training courses, which aimed to give pre-service and in-service teachers at the elementary and high school levels comprehensive ICT training and support (DoE, 2004, p. 26).

Additionally, in *section 2.23* of the WPeEd, the policy articulates a clear vision, that “Every South African learner in the general and further education and training [FET] bands” would be expected to be ICT literate upon completing their education at FET level (DoE, 2004, p. 17). While the policy does not explicitly emphasise primary education as the crucial stage for ICT intervention, it implicitly, although there is a paucity of research in this regard, suggests a significant role for primary schools in achieving this vision. This is because reaching a level of ICT literacy is not a one-time event, but rather something that takes time and continuous extended support (Rogers, 1963). The rationale is straightforward, i.e., to ensure students are ICT literate by the time they leave FET institutions, the foundation must be laid at an early stage. Therefore, ICT teacher professional development training programmes should ideally prioritise the primary school education settings, specifically primary school teachers. By equipping primary school teachers with robust ICT skills, they, in turn, can effectively impart these skills to learners. This strategic approach aligns with the overarching goal of the policy, which is to ensure a continuum of ICT literacy that begins at the primary level and culminates in the FET bands, thereby fulfilling the policy's ambitious objective (DoE, 2004). Moreover, the policy sought to introduce rewards or incentive initiatives in the form of appraisal systems such as that of *Continuous Professional Teacher Development (CPTD)* by the South African Council of Educators (SACE), as well as annual honorary recognition through the *Most Improved School Awards (MISA)* which were aimed at, but not limited to, recognising schools

that were making strides in innovatively integrating ICTs into their teaching (DoE, 2004, p.26). The purpose of these awards, as outlined in the policy, was to identify schools with best practices to share with their colleagues (DoE, 2004, p.26). Based on these set goals, one may assume that the policymakers in this regard, understood, theoretically, the linear process that the goals would need to undertake to be reached, including consistent engagement and support from all educational stakeholders. However, in practice, this has not been the case as there has been a shortfall of consistent implementations of the goals.

Identified Gaps in the Policy

Despite, though ambitious, goals of the WPeEd, there were several shortfalls in its implementation. One of the significant shortfalls being that of inconsistency in the implementation of the pre-set goals (Czerniewicz & Brown, 2009). The inconsistency is evident in the initiative of the MISA, the CPTD appraisal system, the collaborative efforts between the DoE and Higher Education Institutions, as well as the overall introduction of effective ICT-TPD programmes.

One of the notable inconsistencies in policy and practice has been with the MISA. With the last evident ceremony having been held in 2007, three years after the WPeEd was gazetted, the only mention of ICT integration was a mere highlight of future interest by Former Deputy President, Phumzile Mlambo-Ngcuka, who stated the importance of “Teacher training for mathematics, science, Information and Communications Technology (ICT) and language competence in public education”, however, the 2006 awards did not include any improvements in the integration of ICTs in education as had been suggested by the e-Education policy (South African Government, 2006; DoE, 2004). Similarly, the last recorded, 2007, ceremony had no recognition given for the strides, if any, in the ICT integration in education (South African Government, 2007). This indicates that although the MISA ceremonies were conducted, they did not include categories or awards for improvements in ICT integration in education or innovation thereof. This omission is particularly important given that the White Paper, gazetted in 2004, emphasised the importance of ICT in education and intended to use the MISA as a platform to encourage and recognise successful efforts to implement ICTs in education by teachers and school principals. The last ceremony of these awards was in 2007, three years after the policy's inception, and the lack of subsequent ceremonies indicates a lapse in consistent follow-through on the policy's objectives (Vandeyar, 2015). Although some researchers may argue that three years post-policy inception may be a bit premature to expect significant changes in the field, the urgency of ICT change may suggest that there should be some level of improvement and intention shown regardless (Tondeur et al., 2012; Vandeyar, 2013; Vandeyar, 2015). The inconsistency in policy implementation is further highlighted by the recent NEEA initiative, which, in its 9th year, has yet to include categories celebrating excellence in ICT strides in education (South African Government, 2023).

This poor recognition, or lack thereof, in ICT-TPD within initiatives such as the MISA and NEEA sheds light on a gap that has implications for measuring the progress in teachers' ICT professional development (Rudd, 2001; Albion, Tondeur, Alona & Peeraer, 2015). The introduction of the CPTD points system by the South African Council for Educators (SACE) was aimed at enhancing teachers' professional competencies, including their proficiency in

ICT. However, the limited recognition of ICT integration in education by awards like the MISA, NEEA, and similar ceremonies indicates a gap in acknowledging advancements in this area or perhaps even tracking the progress (Van der Merwe-Muller & Dasoo, 2021). This disconnect raises questions about the effectiveness of the CPTD system in promoting and measuring progress in teachers' ICT professional development.

Research has established a strong link between ICT and educational innovation (Harsha & Newman, 2021; Van der Merwe-Muller & Dasoo, 2021), suggesting that ICT positively influences teacher innovativeness and the adoption of new teaching methods (Hu, Yuan, Luo & Wang, 2021). Furthermore, the development of conceptual models for evaluating Teacher Professional Development (TPD) practices, with ICT as a catalyst for educational transformation, highlights the need for effective ICT-focused TPD (Hu et al., 2021). However, the apparent lack of alignment between the CPTD points system and the actual recognition of ICT skills in practice suggests potential challenges in the system's implementation or its perceived relevance to educators' professional growth in the context of ICT integration. Consequently, this further casts a shortfall on the achievement of the goals set by the e-Education policy (Vandeyar, 2015; DoE, 2004).

Existing literature acknowledges the strong link between ICT and educational innovation, which highlights the positive effects that ICT has and can have on teacher innovativeness (Hu, Yuan, Luo & Wang, 2021). Additionally, the development of conceptual models for evaluating TPD practices, using ICT as a lever for educational change, underscores the recognised need for effective TPD in ICT (Hu et al., 2021).

There is a big gap in the recognition of ICT abilities, especially when it comes to awards like MISA and NEEA. This is revealed by the evaluation of the CPTD system's aims and its impact on improving teachers' ICT proficiency, without seeking to analyse and condemn it (Bernadine, 2019). This mismatch highlights a failure to meet the goals set forth in the e-Education policy (DoE, 2004; Vandeyar, 2015) and casts doubt on the efficacy of the current system. Therefore, it is critical to investigate different strategies to close this gap and actively encourage educators to acquire cutting-edge ICT skills. Therefore, in order to strategically address concerns about the calibre of the educational system's ICT pedagogy, Callahan, and Martin (2007) and Stephens and Boldt (2004) support collaboration between 'schools and higher education institutions within professional development' (as cited in Trent, 2012). Such collaborations have been mandated by governments in the United States of America (USA), Australia, and the United Kingdom (UK) in order to provide schools greater ICT influence in teacher education, with an emphasis on teacher professional development (Trent, 2012). According to Trent, the establishment of a strong cooperation between schools and universities is crucial for improving student learning as well as for advancing teacher education and offering continuing professional development to working educators.

This collaborative approach aligns with the goals of the e-Education policy and resonates with the broader discourse on improving educators' ICT competencies and eventual ICT innovativeness. The emphasis on teacher professional development within these partnerships offers a promising avenue for advancing both the teacher's innovation in ICT and the overall

quality of the educational system. The need for a critical reassessment and potential restructuring of the CPTD system, as suggested by scholars (Bernadine, 2019; Van der Merwe-Muller & Dasoo, 2021), should aim to better align with contemporary technological advancements and educational needs, fostering the growth of teaching practices in line with the primary objectives of the e-Education Policy.

Advancing the e-Education Landscape: Strategic Considerations

The WPeEd policy contains several sound approaches that consider how ICT professional development of curriculum innovation can be implemented (Vandeyar, 2013; Vandeyar, 2015). However, according to Vandeyar (2015), and Dlamini and Mbatha (2018), there is a mismatch between policy and practice, where many of the strategies outlined in the policy are not implemented in reality. As such, in correcting this misalignment between policy and practice, there are several strategic considerations that emerge. Firstly, there is an urgent need for a nuanced evaluation of the current CPTD system's objectives and its effectiveness in, particularly, fostering teachers' ICT proficiency and innovativeness. The inadequacies in recognising ICT competencies within initiatives such as the MISA and NEEA signal a significant gap in measuring teachers' progress, particularly, in ICT professional development (Rudd, 2001; Albion et al., 2015), which raises questions about the efficacy of the CPTD system in promoting and tracking advancements in teachers' ICT skills (Van der Merwe-Muller & Dasoo, 2021). Consequently, alternative approaches must be explored to actively support the development of innovative ICT skills among educators.

The e-Education policy's stated goals should be intentionally addressed and carried out by policy implementers. For instance, Callahan and Martin (2007) and Stephens and Boldt (2004; as cited in Trent, 2012) advocate for actively implementing collaborative relationships between institutions of both basic and higher learning for professional development. This collaborative approach resonates with the broader debate on enhancing educators' ICT competencies and encouraging eventual ICT innovativeness, which is in line with the goals of the e-Education policy (DoE, 2004).

A systematic approach to teacher training and support is necessary to foster innovation in the use of ICT in education (Lawless & Pellegrino, 2007; Dlamini & Mbatha, 2018; Bernadine, 2019). Improving teacher professional development is important to filling these gaps. To provide teachers with the skills and knowledge they need to use ICT tools successfully and keep up with the fast-evolving technologies of today, it is imperative to develop ongoing, contextually relevant training courses (Jaffer et al., 2007). Teachers must be assisted in developing a mindset that encourages innovation and originality in their teaching techniques, in addition to receiving technical ICT training.

There should be support structures for continuous improvement and collaboration among teachers that are established. These structures may include mentorship programmes, peer coaching, professional learning communities, and online platforms for sharing resources and best practices (Bernadine, 2019). By fostering a culture of collaboration and continuous learning, teachers can be better prepared to integrate ICT in innovative and effective ways, ultimately enhancing student learning outcomes (Bernadine, 2019; Vandeyar, 2013).

Lastly, integrating ICT into the curriculum requires the collaborative development of contextually relevant digital content and the encouragement of innovative teaching practices that utilise technology (Trent, 2012; Vandeyar, 2013; Bernadine, 2019). Teachers should be empowered to experiment with new pedagogical approaches, tailoring ICT integration to their specific contexts and learner needs. This may involve adopting project-based learning, flipped classrooms, or other learner-centred strategies that leverage the full potential of ICT in education.

Building on the foundation set by the WPeEd (DoE, 2004) and following recommendations for improvement, the South African government implemented yet another key strategy to increase ICT integration in education. Operation Phakisa: ICT in Education, initiated in 2015, sought to speed ICT implementation in schools, improve learning results, and close the digital divide. This strategy demonstrates the government's continued commitment to advancing ICT in education and resolving the issues raised in the WPeEd.

Guidelines for Teacher Training and Professional Development (GTTPD) in ICT

To further supplement the integration of ICT in Education, the DBE (2007) established the GTTPD in ICT. These guidelines aim to provide a point of reference from which educational stakeholders could refer in understanding what ICT-TPD is, what it entails and what it should achieve. The Guidelines further provided a succession pyramid that indicated the different levels of ICT skill progression and eventual innovation at its apex. This succession pyramid is indicative of what innovation looks like through the succession stages.

Objectives of Guidelines for Teacher Training and Professional Development in ICT

The UNESCO (2011) guidelines for ICT in education, including teacher training and professional development, primarily focus on guiding policymaking and capacity building in the integration of technology within educational contexts. These UNESCO guidelines informed the South African version, the GTTPD in ICT, to assist policymakers in adopting technology in education by particularly equipping teachers with the necessary ICT skills for innovative use and integration of these digital tools (DoE, 2007).

This GTTPD in ICT document outlines various ways of promoting ICT teacher innovation; through building competence in ICT in a manner that goes beyond basic computer literacy and into a level of material creation and curation which is the apex of the ICT competency pyramid (DoE, 2007). Refer to *Figure 1.2* for this GTTPD hierarchical model that outlines levels of ICT competence.

The GTTPD in ICT is indicative of what ICT-TPD ought to ultimately achieve, as well as how teachers' level of innovation is linked to effective PD, therefore, to ensure the success of teachers' ICT PD, factors promoting and hindering effective PD should be realised (Jung, 2005). The GTTPD document presents fundamental ideas to consider in professional development programmes for teachers: (1) The aim of training should be to accomplish learning outcomes; (2) programme development should provide contextualised learning

experiences using a subject-specific learning strategy; (3) TPD should be needs-driven according to subject-specific requirements; (4) teachers should be given continuous pedagogic support from subject advisors and professional learning communities (PLCs); (5) PD should be ongoing and reflective because ICT is ever-changing. Similarly, the failure of most PD and innovation problems has resulted in non-adherence to similar guidelines. Blignaut, Hinostroza, Els & Brun (2010) compared the ICT in education policy and practice of two developing countries and found that where TPD is concerned, one of the major concerns hindering ICT PD and innovation was the significantly low availability of courses relating to ICT pedagogical integration. The provision of such courses is the responsibility of mostly, for example in South Africa, the Ministry of Education (DoE, 2004) thus indicating a disengagement between what policy states and ministerial implementation on the ground (Blignaut et al., 2010).

Like the WPeEd, the GTTPD has some shortfalls that mostly have to do with the inconsistency between policy and practice, owing to the gap in the comprehensive integration of ICT competencies into the daily practice and professional development of teachers. While the UNESCO ICT Competency Framework for Teachers (CFT), as shown in **Figure 1.2**, outlines necessary competencies that are further synthesised by the South African GTTPD in ICT, its application and efficacy can vary significantly across different contexts, thus highlighting the need for more contextualised approaches within the educational landscape and needs of South African primary school teachers (UNESCO, 2022).

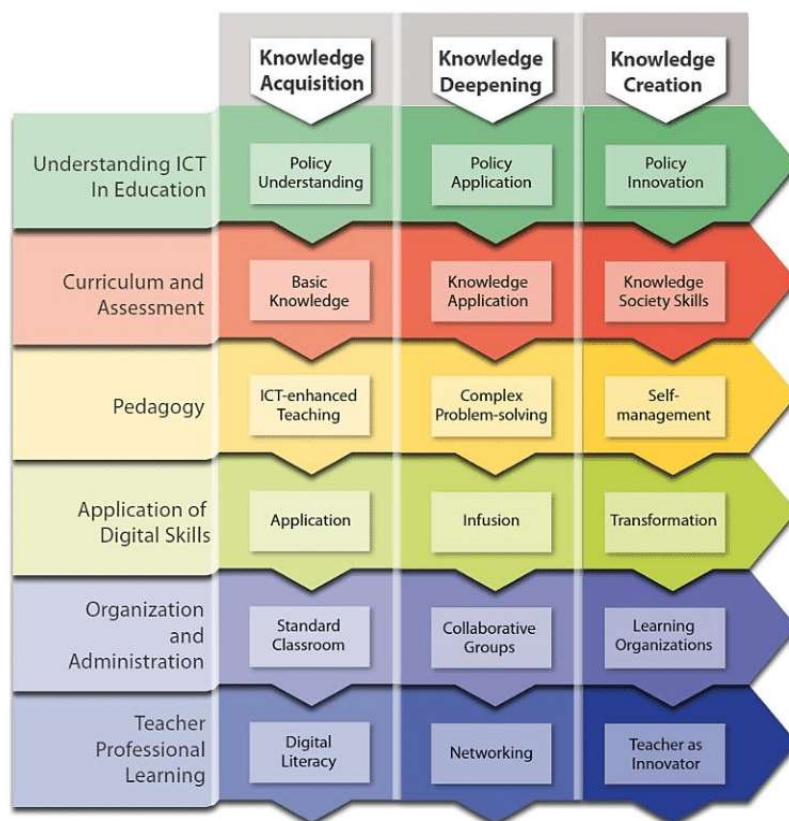


Figure 2.1: UNESCO ICT Competency Framework for Teachers Source: *ICT Competency Framework for Teachers (2018)*

Furthermore, Jung (2005) and Blignaut et al (2010) argue that initiatives stemming from the GTTPD should focus on addressing the varying levels of ICT proficiency among teachers. Recognising that the guidelines offer broad recommendations, initiatives should take into account the diverse needs and skill levels within the teaching community. Dlamini & Mbatha (2018) and Bernadine (2019) concur and further state that there should be customised and differentiated training programmes based on teachers' existing ICT competencies could be a more effective strategy to encourage innovation across a broad spectrum of educators.

Strategic Initiatives for Advancing ICT Teacher Development

The DoE (2004) and DoE (2012) have underlined that teachers' digital technology expertise is crucial to the successful integration of ICT in educational courses. As such, to improve the effectiveness of the guidelines, some of the strategic ways, apart from enhancing digital accessibility to reduce digital divides, is by contextualising training programmes to meet specific national and institutional needs, ensuring their relevance and applicability (Vandeyar, 2015; UNESCO, 2022). It is also vital to strengthen support systems at various levels such as among government, educational institutions, and school leadership for the effective implementation of the ICT-CFT (UNESCO, 2022). Additionally, the regular revision and updating of the ICT CFT and related guidelines are necessary to reflect emerging technologies and pedagogical advancements, as well as feedback from practitioners and experts (UNESCO, 2016). The South African DoE has attempted the implementation of some initiatives to help aid teachers' ICT proficiency and innovation, these include initiatives such as Operation Phakisa

The National Development Plan (NDP) 2030

The South African government created the National Development Plan (NDP) 2030 as a long-term strategic plan to direct the nation's development and handle important socioeconomic issues. The country's aim to enhance the educational system by 2030 is outlined in Chapter 9 of the policy statement. Subtly, the role of ICT in education is one of those components (National Planning Commission, 2012, p. 296). It also emphasises how important it is to raise the standard of education and increase the abilities of teachers in order to support South Africa's social and economic growth (National Planning Commission, 2012). The integration of ICT into teaching and learning, along with continuous certified professional development to guarantee that teachers possess the skills and knowledge needed to use technology effectively and creatively in their respective subject teaching, are two of the main strategies outlined in the NDP to improve the educational system (National Planning Commission, 2012, p. 308).

Objectives of the NDP 2030

One of the important suggestions made by the NDP 2030 is to, “Expose teachers to the use of technology in their own training and train them to use it in their teaching” (National Planning Commission, 2012, p. 308). This coincides with the e-Education policy, as it reiterates the need for teachers to integrate ICT pedagogically into teachers’ pedagogic practice as this will allow them the skills necessary to integrate technology innovatively into their teaching practices.

In terms of teacher professional development, the NDP 2030 recognises the need to enhance the skills and competencies of teachers to deliver quality education. It highlights the importance of continuous TPD and support for teachers to keep up with new pedagogical approaches, technologies, and curriculum reforms (National Planning Commission, 2012). However, what the NDP falls short of providing, is the roadmap to achieving all of these outcomes.

Furthermore, aligned with the NDP 2030's vision, there have been initiatives such as Operation Phakisa (OP) (DoE, 2015; Kwet, 2017), policies such as the GTTPD) in ICT (DoE, 2007), provincial efforts like Gauteng Online (Mpehle, 2011), as well as non-government initiatives such as those by the SchoolNet South Africa under the organisation National Association of Social Change Entities in Education (NASCEE) (SchoolNet South Africa, n.d.) which collectively strive to provide teachers with ICT skills, thus fostering innovation and aligning with the goal of a technologically empowered education system (National Planning Commission, 2012, p. 308).

Challenges and Opportunities in the NDP 2030 for ICT-TPD

The NDP 2030 has set forth ambitious goals for the integration of ICT in education, teacher training, and teacher innovation. While some progress has been made, some notable gaps and challenges have hindered the full realisation of these objectives.

The necessity of improving teachers' ICT competencies and skills is emphasised in NDP 2030 chapter nine (2012). A number of projects have been put in place to help teachers incorporate ICT into their lesson plans and to offer training in this area (DBE, 2013). But there are shortcomings in these projects' relevance, sustainability, and quality (Mpehle, 2011; Dlamini & Mbatha, 2018; Dlamini, 2022). Many educators still lack the self-assurance and pedagogical expertise needed to employ ICTs in the classroom successfully (Dlamini, 2022). Furthermore, the scalability and long-term impact of these projects are impeded by insufficient training opportunities and resource availability (Hart, 2023).

Regarding teacher innovation in the use of ICTs, the NDP recognises the potential of technology to enable innovative teaching practices, however, while there are pockets of innovation and teachers who have embraced ICTs in their teaching, there remains widespread of teachers who have not adopted nor implemented the innovative practice (Dlamini & Mbatha, 2018; Dlamini, 2022). There are several reasons for this, such as resistance to ICT change, lack of institutional support, and insufficient incentives for innovation pose challenges to achieving widespread teacher innovation (Mpehle, 2011).

Heeding the opportunities for improvement suggested by the NDP 2030 requires a comprehensive set of strategies and interventions. Such as a clear roadmap to achieving effective teacher training programmes that would equip educators with the necessary pedagogical knowledge and skills for effective ICT integration (Hart, 2023,). Dlamini & Mbatha (2018) and Mbatha (2022) emphasise the need for high-quality and ongoing professional development that is relevant to teachers' needs. Lastly, as Vandeyar (2015) argues, policy coherence and coordination across government departments and stakeholders involved

in the NDP's implementation are crucial. He further emphasises the importance of aligning ICT initiatives with broader education policies and strategies (Vandeyar, 2015).

South Africa can close the gaps in the NDP's implementation, strengthen ICT integration in the classroom, boost teacher training and professional development, and encourage teacher creativity by seizing these chances for the NDP 2030 to grow and succeed. In the end, all of these may result in better learning opportunities and outcomes for students. Furthermore, a lot of work has been done in South Africa's educational system to include ICT into teaching and learning while also emphasising teacher professional development. The nation's trajectory towards a technology-driven education system has been significantly shaped by policies and initiatives like the WPeEd (2004), GTTPD, and Operation Phakisa (OP): ICT in Education (2015). These programmes emphasise how crucial it is to provide educators with the know-how they need to integrate technology into the classroom, with the ultimate goal of raising student achievement and closing the digital gap in South Africa.

In 2015, the South African government launched Operation Phakisa (OP): For the Department of Basic Education, an element of OP focused on ICT in Education, an initiative aimed at accelerating the implementation of ICT in schools to enhance learning outcomes and bridge the digital divide (DoE, 2015). This initiative focused on four key areas: connectivity, digital content, devices, and teacher professional development (DoE, 2015). OP introduced several programmes to train and support teachers in integrating ICT into their pedagogy, such as the e-Professional Development Programme, which provided online courses, resources, and collaboration platforms to help teachers develop their digital competencies (DoE, 2015).

Objectives of Operation Phakisa (OP): ICT in Education

OP: ICT in Education is an initiative that began in 2015 and was aimed at fast-tracking the integration of ICT in teaching and learning (DoE, 2015). The initiative focused on four key areas: connectivity, digital content, devices, and teacher professional development which aimed to enhance learning outcomes, bridge the digital divide, and improve the overall quality of education by accelerating the implementation of ICT in schools, ultimately it aimed to meet the set goals of the e-Education policy (DoE, 2015; Kwet, 2017). This included ensuring that all schools had access to reliable internet connectivity, providing students and teachers with appropriate devices, and developing high-quality digital content to support teaching and learning (DoE, 2015). The policy also emphasised teacher professional development, as effective ICT integration requires well-trained and competent educators, although the initiative was not as rigorous about it as with the deployment of digital devices (DoE, 2015). While OP does not specifically focus on teacher professional development as its primary objective, it, however, recognises the importance of developing teachers' skills and competencies to enhance the quality of education in South Africa. In the education sector, OP emphasises the need for comprehensive teacher development programmes that address the challenges faced by teachers and promote their professional growth (DoE, 2015; Kwet, 2017). It shows some recognitions of how well-trained and motivated teachers are essential for improving student outcomes and transforming the education system.

The use of the Integrated Strategic Planning Framework for Teacher Education and Development (ISPFTED) is one of the main tenets of OP in education (DBE, 2011). By using a coordinated and methodical approach, the ISPFTED seeks to improve teacher development and education (DBE, 2011). It focuses on things like teacher support networks, ongoing professional development, and initial teacher education. As per DBE (2011), OP, in conjunction with ISPFTED, aims to enhance the calibre of teacher education programmes by coordinating them with the requirements of the educational system, specifically e-Education needs and policies, and guaranteeing that educators possess the essential knowledge and abilities to provide high-quality instruction using ICT (DBE, 2015). In line with the goals of the White Paper on e-Education policy (DoE, 2004), the programme also encourages the use of technology in teacher professional development to improve access, cooperation, and creativity in teaching techniques (DBE, 2011).

Additionally, similar to the e-Education policy, OP recognises the importance of collaboration between the government, teacher unions, teacher training institutions, and other stakeholders to drive effective teacher professional development initiatives (DoE, 2015; Kwet, 2017). However, falls short of active implementation of the initiative, thus highlighting the inadequacy of TPD programmes (DBE, 2020). Although OP highlighted the importance of teacher training, many educators still faced challenges in effectively integrating ICT into their teaching practices as OP did not emphasise the pedagogical integration of ICT (Isaacs, 2018; DBE, 2020). Furthermore, the lack of ongoing support and contextually relevant training programmes hindered teachers' ability to develop the necessary skills and confidence to use ICT effectively (Kwet, 2017; DBE, 2020).

In the 2019/2020 Annual Report document (DBE, 2020), the DBE reported on South Africa's e-Education standpoint progress at the time. The reported a summary of the initiatives, policies and frameworks that are in place in South African education, implemented to aid in the development and innovative integration of ICT in education. The summary table in **Figure 2.2** indicates that while there are various several initiatives in place, not all of these initiatives prioritise pedagogical ICT-TPD (DBE, 2020). As such many of the initiatives in place, do not always offer pedagogically and sub-related ICT-TPD relevant to teachers' pedagogical needs (Vandeyar, 2013; Vandeyar, 2015; Kwet, 2017; Dlamini & Mbatha, 2018).

DIMENSION OF ICT IN EDUCATION	e-Education white paper strategic objectives	Phakisa focus areas	NIMB framework	UNESCO ICT-CFT	e-learning report	ICT4RED 12 components	Roundtable discussion
Vision, policy, planning, and implementation							
Curriculum and content							
Assessment							
Pedagogy							
Change management and leadership							
ICT							
Management and administration							
Professional development							
Sharing research and innovative practices							

Figure 2.2: *Summary of dimensions of ICT in Education, as defined by different initiatives (DBE, 2020, p. 14)*

The report strongly advocates for the seamless integration of ICT Professional Development (ICT-PD) into the broader framework of Teacher Professional Development (TPD). Educational stakeholders, according to the report as well as the initial e-Education policy document, are advised not to view professional development concerning ICT in isolation, but rather as an integral part of overall TPD. This directive emphasises the necessity of aligning ICT-PD activities with provincial policies and the national curriculum to ensure cohesiveness in educational strategies (DBE, 2020, p.26).

Lastly, the report extends its guidance to ICT management, urging educational ICT Management and Administration to refrain from supporting the implementation of technology solutions in isolation. Instead, they are encouraged to adopt a holistic and integrated approach that considers factors such as appropriate support and teacher development. The report emphasises that such an approach is essential, cautioning against accepting or endorsing one-size-fits-all solutions in ICT implementation (DBE, 2020, p.28). These comprehensive guidelines aim to strategically align ICT initiatives, fostering adaptability and comprehensiveness within diverse educational contexts. This report (DBE, 2020), in the broader context of national educational objectives, aligns with the National Development Plan

(NDP) 2030, which envisions a technologically empowered and innovative education system. The report (BDE, 2020) highlights the importance of pedagogical integration of ICT competencies among teachers, subject-relevant individualised training, and collaborative support from Professional Learning Communities (PLCs) like their colleagues. Customised ongoing pedagogically centred teacher support from educational ICT experts is highlighted as a critical component, which concurs with the overarching goals outlined in both the NDP (2030) and the report itself (DoE, 2004; DuFour, 2004; DBE, 2020; Harsha & Newman, 2021).

2.5. Review of Empirical Research on ICT-TPD and Teacher Innovation

This section, on the review of empirical research surrounding the use of Information and Communication Technology (ICT) in education, aims to synthesise existing research on ICT Teacher Professional Development (TPD), with an emphasis on worldwide trends, related challenges, and ICT-TPD within the South African context. This evaluation will look at how ICT-TPD has been implemented both globally and locally, identifying important barriers to ICT integration in primary schools and evaluating the efficacy of policies and initiatives aimed at encouraging ICT innovation in teaching methods in South Africa.

Global trends in ICT-TPD and ICT integration in education

One of the significant trends in ICT-TPD is the shift towards more innovative teaching and learning practices (Pelgrum & Law, 2003). ICT is being leveraged to create more interactive, student-centric learning environments, which are perceived as more effective in engaging students and improving their overall learning outcomes (UNESCO, 2023). Countries like Finland and Singapore are at the forefront of this trend, utilising ICT to foster creative and critical thinking skills among students (UNESCO, 2023). The systematic review by Lawless and Pellegrino (2007) supports this by showing how ICT-TPD programmes are increasingly focusing on pedagogical integration, ensuring that teachers not only have the technical skills but also the pedagogical understanding to use ICT effectively in the classroom.

Pelgrum and Law, in a 2003 UNESCO-endorsed article, discuss the historical highs and lows of ICT use and integration in education. They give context for how digital technologies were viewed as change agents in the 1990s, with the goal of transforming education by making the teaching and learning process more "effective and motivating" (Pelgrum & Law, 2003, p. 19). However, this high expectation was quickly dashed when it became clear that teachers were not incorporating technology into their subject matter, but rather supplementing the existing curriculum (Pelgrum & Law, 2003). Despite the initial disappointment, the introduction of the World Wide Web revived recognition of the potential that digital technology had in reforming the education system for the better (Pelgrum & Law, 2003; UNESCO, 2023), combined with a new understanding of the importance of related ICT-TPD.

TPD programmes are evolving globally to better equip educators with the skills needed for effective ICT integration. Recent empirical research indicates a growing trend towards continuous, rather than once-off, professional development initiatives. For example, a study by Popova, Evans, Breeding and Arancibia (2021) on a rigorous evaluation of 33 different ICT-

TPD programmes reveals that successful programs often include ongoing support, collaborative learning opportunities, and the integration of emerging technologies. This approach is particularly evident in countries like Singapore (Fiona, Hironari, & Kyoko, 2018), the USA (Popova et. al., 2021) and Malaysia (Ibrahim, 2009; Zainal & Zainuddin, 2020), where ICT-TPD is part of a broader strategy to improve overall educational quality.

Singapore's ICT Masterplans, initiated in 1997, focused on integrating ICT in education through a series of four strategic plans. The first plan established basic ICT infrastructure and skills, while subsequent plans aimed to deepen ICT integration. The second plan emphasised innovative ICT use for professional development, the third plan enhanced teachers' role as facilitators, and the fourth plan focused on teachers as designers of learning experiences. Singapore's approach benefited from a structured ICT-TPD Framework, which included training ICT mentors, collaborative professional learning communities, and reward programs for innovative practices (Fiona et al., 2018; Birger et al., 2008).

In Malaysia, the Smart School initiative aimed to enhance teachers' use of digital technologies in curriculum delivery by promoting varied teaching strategies and learner-centred approaches. This reform involved redesigning curricula, pedagogy, and assessments to foster innovation and achieve educational ICT goals. The initiative was supported by cluster schools that facilitated resource and skill sharing among schools, with backing from higher education institutions. Despite the extensive 305 hours of training over 14 weeks, concerns about the intensity and quality of the training were raised (Ibrahim, 2009; Ming et al., 2010).

Challenges and Barriers to ICT Integration and ICT-TPD

Despite the global push for ICT integration, significant problems remain, especially in primary schools. Common challenges include a lack of resources, inadequate educator training, and educators' resistance to change (Bingimlas, 2009; Albirini, 2016). Several empirical research by scholars such as ABC show that while legislation to promote ICT in education exists in many countries, its practical implementation frequently falls short due to the above-mentioned obstacles. Research indicates that even in areas with adequate ICT infrastructure, a lack of ongoing teacher support and professional development remains a significant barrier to effective ICT integration.

In a systematic review of ICT integration in education, specifically focusing on enhancing learner performance in STEM disciplines, Macharia (2022) has highlighted several limitations that hinder its effectiveness. These limitations include restricted access to ICT resources, inadequate digital materials, and a lack of thorough teacher professional development. These challenges hinder teachers from fully embracing ICT to enhance their teaching methods within their specialised subjects (Bingimlas, 2009). Teachers frequently lack the necessary skills to effectively incorporate ICT resources into their teaching techniques, compromising student engagement and learning outcomes.

Additionally, in another study by Alalwan, Cheng, Al-Samarraie, Yousef, Alzahrani and Sarsam (2020) where 29 teachers were interviewed, the integration of advanced technologies such as augmented reality (AR) and virtual reality (VR) in education also faces significant challenges. Similar to Macharia's systematic study, teachers report a lack of competency, limited instructional design, and insufficient resources as major barriers to utilising these technologies in science education. Furthermore, the factor of time has been identified as another major obstacle where the time often required to prepare and implement lessons using these technologies tends to be demanding, as is the difficulty in maintaining students' focused attention during these lessons (Alalwan, et al., 2020). These issues highlight the broader problem of integrating cutting-edge technologies into traditional educational settings without adequate preparation and support.

ICT-Teacher Professional Development (ICT-TPD) is thus essential for equipping educators with the skills and knowledge needed to fully integrate ICT effectively into their teaching practices, while also addressing the pedagogical challenges that arise from these technologies. Continuous and well-designed ICT-TPD programs are particularly important for closing competency gaps, especially in the use of advanced technologies like AR and VR. By providing targeted training and ongoing support, these programmes enable teachers to overcome resistance to change, adopt innovative teaching methods, and ultimately improve student engagement and learning outcomes, especially in their respective subject of expertise. The prioritising of such TPD has been identified as being crucial for maximising the potential of ICT in enhancing education in primary schools.

Policy Implications and Government Initiatives

Government policies and initiatives play a crucial role in shaping the landscape of ICT integration in education. Countries with strong governmental support, such as South Korea and Japan, have seen more successful ICT integration in their education systems. This success is often attributed to comprehensive policies that not only provide the necessary infrastructure but also emphasise teacher training and support. The UNESCO report (2023) emphasises that for ICT integration to be effective, it must be accompanied by well-designed policies that address both the technological and pedagogical aspects of ICT-Teacher Professional Development (ICT-TPD).

ICT policies designed for education must recognise the central role of teachers in the teaching and learning process and in achieving effective learning outcomes. According to Albion et al. (2015), the design and delivery of ICT for teacher professional development and innovation are most effective when they focus on pedagogy - emphasising how to use ICT, rather than just what technologies to use. In a study by Tinmaz and Ozturk (2019), where South Korea's ICT integration and competencies in education was compared to that of Turkey, South Korea proved to be better established due to its bigger business sector where ICT-based education is concerned. Having had longer exposure to ICT in education, the country's ICT policies are better aligned with the UNESCO ICT Competency Framework for Teachers (CFT), which outlines 18 competencies divided into three levels of ICT pedagogical use and grouped into six components of professional practice (UNESCO, 2018).

South Korea has made significant strides in integrating ICT into its education system through initiatives like SMART Education, which provides digital textbooks and personalised learning platforms. The government's investment in ICT infrastructure, including high-speed internet and digital devices for students and teachers, has been critical in this advancement (Tinmaz & Ozturk, 2019; Kargol, 2021). Furthermore, comprehensive ICT targeted teacher PD training programmes have enhanced educators' ability to incorporate technology effectively, leading to improved student engagement and performance (Kargol, 2021).

In South Africa, the “Presidential National Commission on Information Society and Development” (PNC on ISAD) initiated the policy, White Paper on e-Education in 2004, aiming to transform teaching and learning through ICT (Department of Education, 2004). However, according to Blignaut (2010), Vandeyar (2014), and Abanda (2017), while this policy provides rich insight on the potential of ICTs to transform the education spectrum of South Africa, initiatives such as *GautengOnline* and the *Paperless Classroom* in the Gauteng province – which aimed to establish ICT infrastructure in schools – have had their implementation fall short due to the lack of a guiding policy that emphasises specific teacher involvement, their competencies, as well as readiness. The gap between policy rhetoric and reality is blatant, as these initiatives did not fully consider the socio-economic inequalities present in South Africa, nor did they adequately involve teachers in the decision-making process (Vandeyar, 2014; Blignaut et al., 2010).

The success of ICT integration in education, particularly in South Africa, relies on policies that are not only comprehensive in their scope but also adaptive to the local context (Dlamini R. , 2022). This includes recognising the importance of ongoing ICT-TPD that is designed to address both the pedagogical and technological challenges faced by educators (Vandeyar T. , 2015; Dlamini & Mbatha, 2018). By involving teachers in the policy development process and ensuring that professional development is continuous and context-specific, South Africa can better realise the potential of ICT to enhance education and overcome the persistent challenges that have hindered its integration to date (Amory, 2015 as cited in Meyer & Gent, 2016).

2.6. Foundational theories related to ICT-TPD.

ICT-TPD is supported by fundamental ideas that clarify the complex relationships that exist between pedagogy and the integration of technology in educational settings. These theories offer a conceptual structure for understanding how educators (as students) learn, embrace technology, as well as incorporate it into their pedagogical approaches. While several theories inform ICT-TPD, this section will only discuss three theories; *Rogers' Attributes of Innovation* in his *Diffusion of Innovation Theory*, the *Constructivism Learning Theory* (together with the *Self Determination Theory - SDT*) as the theory that informed the facilitation process of the PD programme, and the *Community of Practice (CoP) Theory*. As part of the facilitation and support process, the PD programme used the *Gradual Release of Responsibility Model (GRRM)* and the *Concerns-Based Adoption Model (CBAM)*. **Figure 2.3** provides an illustration of the conceptual framework that informed this study by employing the GRRM, the CBAM as well as Rogers' Attributes of Innovation, all under the defining learning approach of constructivism which emphasises active learning.

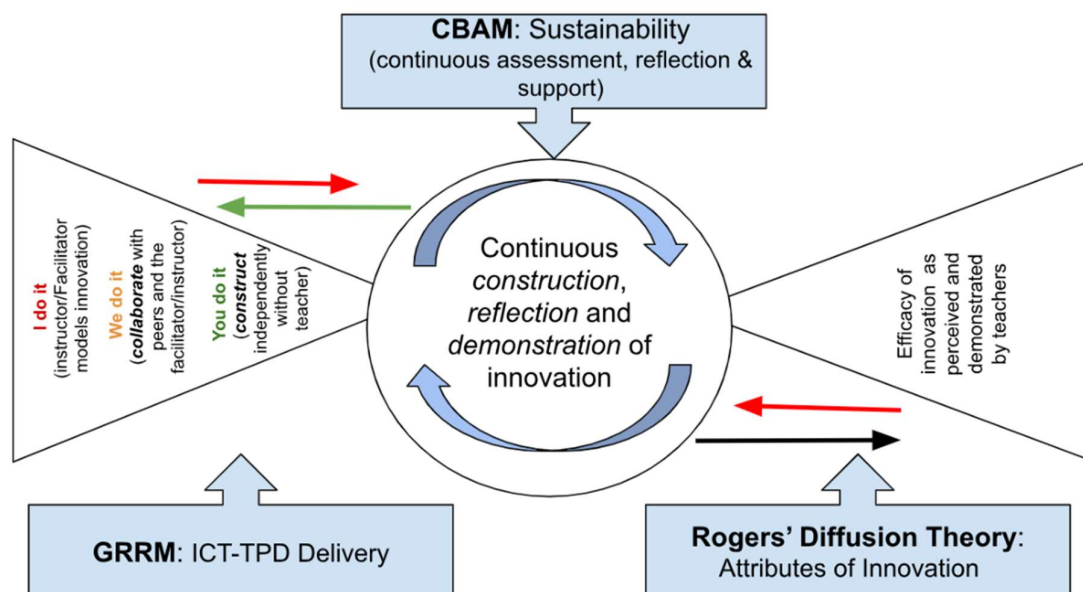


Figure 2.3.: *A conceptual framework for Effective In-service training for teachers' innovation in the use of ICT for innovative delivery of the curriculum*

These theories act as cornerstones for good strategies in conducting TPDs, influencing the conversation on the practical approaches, difficulties, and chances for educators' professional growth in the area of technology integration in the classroom. By examining these fundamental concepts, one can gain an understanding of the intricate process of ICT-TPD programmes. This process also shows the complex relationships between technical expertise, pedagogical practices, and contextual factors that influence teacher professional development in the digital age. Finally, the issue of South African teachers' resistance to ICT integration in the classroom is addressed as well as how it can be mitigated through ICT-TPD to encourage innovation in their use of ICTs.

2.6.1. Rogers' Attributes of Innovation

Rogers' Attributes of Innovation are a concept developed from his Diffusion of Innovation theory to help explain how individuals perceive an innovation, as well as the aspects of an innovation that lead its eventual adoption (Scott, Plotnikoff, Karunamuni, Bize & Rodgers, 2008). This theory is especially important as it works to inform the concept of innovation adoptions and the reasons behind people's adoption of an innovation, or lack thereof. In this instance, ICT is a pedagogic tool to deliver the curriculum in an innovative way. Rogers' Diffusion of Innovations Theory, founded by Everett M. Rogers in 1962, is a well-known paradigm for understanding how new ideas, inventions, or technology spread and are adopted within a social system. (Rogers, 1963). This theory provides valuable insights into the process of adoption and diffusion, and sheds light on the reason that some innovations are embraced quickly while others encounter resistance or take longer to gain momentum in acceptance. This

theory is particularly suited for studying technology adoption, such as ICT integration in education for the purpose of innovative curriculum delivery by teachers. It emphasises the attributes of innovation, including the relative advantage as perceived by the teachers, compatibility of the innovation to the teacher's needs, complexity in use, trialability of use, as well as observability. Rogers' theory was used to determine teachers' levels of innovation resulting from the programme and assess the programme's efficacy. Figure 2.3 below shows the five attributes of innovation as stipulated in Rogers' Diffusion of Innovation theory.

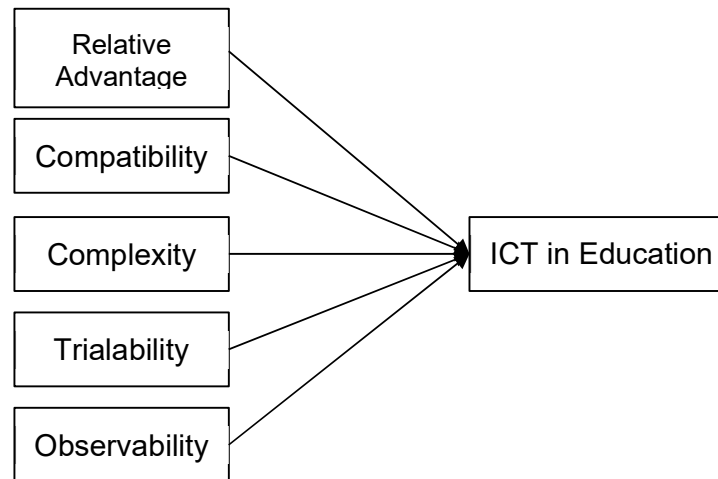


Figure 2.4.: Attributes of Innovation in the Diffusion of Innovation Theory (Roger, 1983) adapted by Aygul, Aysegul & Cemal (2014)

The Diffusion of Innovations theory examines how novel concepts, and inventive ideas proliferate within a social structure (Rogers, 1963). This theory can assist in analysing the variables that affect teachers' acceptance of new technologies and comprehending the phases of the adoption process in the context of ICT-TPD. The innovation of integrating ICT into teaching and encouraging creative curriculum delivery in their particular disciplines is one that instructors are adopting, and Roger's Diffusion of Innovation Theory will help to comprehend this process.

Rogers (1963, p. 252) describes innovators as being “first members of a social system to adopt new ideas”. These individuals, according to Rogers (1963) are often considered somewhat outcasts or called overambitious, as the innovations they often adopt are, at the time, considered ‘unrealistic’, or paved with many challenges. One of the challenges that result from adopting an innovation is the ‘uncertainty’ that may accompany the innovation (Sahin, 2006, p. 14). Rogers describes uncertainty as a significant barrier to the “adoption of innovation”, in this case, technologies (Sahin, 2006, p. 14). According to Rogers (as cited in Sahin, 2006), the adoption or rejection of an innovation can lead to changes in individuals, or the societal systems, thus creating uncertainty. To eliminate uncertainty while adopting an innovation [technology], users should be informed about the innovation's benefits and drawbacks, including its potential consequences. Rogers identified three types of consequences: “desirable versus undesirable (functional or dysfunctional), direct versus indirect (immediate result or result of the immediate result) and anticipated versus unanticipated (recognised and intended or not)” (Sahin, 2006, p. 14).

In the context of this study, to examine how an ICT-TPD programme can promote innovation in teachers' curriculum delivery, *Rogers' Diffusion of Innovation* theory is useful for understanding ICT-TPD and its influence on teacher innovation. When evaluating the adoption process of innovative practices, such as integrating ICT into teaching practice, it is common for teachers to experience uncertainty as a result of a lack of comprehensive understanding regarding the benefits, drawbacks, and potential consequences of incorporating ICT in curriculum delivery (Sahin, 2006; Vandeyar, 2013; Mathevula & Uwizeyimana, 2014; Vandeyar, 2015; Dlamini & Mbatha, 2018; Dlamini, 2022). When implemented correctly, effective ICT-TPD programmes play a crucial role in lessening this uncertainty. By providing educators with well-designed ICT-TPD initiatives, these programmes have the potential to equip teachers with the knowledge and skills necessary for informed decision-making in the innovative delivery of their curriculum using the innovation [technologies] (Sahin, 2006; Prestridge, 2012; Redmond & Henson, 2018; Rout & Behera, 2014). Furthermore, the types of consequences, whether desirable or undesirable, direct or indirect, anticipated, or unanticipated, that emerge as a result of the adoption of the innovation - hold particular relevance (Sahin, 2006). As teachers navigate the environment of implementing ICT into their teaching practices, effective ICT-TPD becomes increasingly important in moulding their attitudes, expectations, and, ultimately, innovation. Therefore, by addressing uncertainty through informed ICT-TPD, educators may navigate the challenges of ICT integration, thus creating a more sustainable environment for long-term teacher innovation in curriculum delivery.

In this respect, Rogers (as cited in Sahin, 2006, p. 17) introduces the Attributes of Innovations and Rate of Adoption as a way of reducing uncertainty in the adoption of an innovation. For this study, Rogers' attributes are crucial as they provide a framework for understanding how teachers adopt and incorporate innovative ICT tools. Additionally, these attributes offer an understanding into the factors that influence teachers' innovation-adoption decisions, which can further be used to help tailor effective strategies for ICT-TPD programmes to address the concerns around teachers' resistance to adopting the use of ICTs into their teaching. Roger's attributes of innovations are categorised as five characteristics of innovations: "(1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability" (Sahin, 2006, p. 17). According to Rogers (as cited in Sahin, 2006), the manner in which individuals perceive these characteristics can predict the adoption rate of innovations. For instance, in the context of this study, Rogers' first attribute of 'relative advantage' refers to the extent to which teachers perceive the new ICT tools as being more advantageous than their existing methods; teachers are thus more likely to adopt ICT innovations if they believe that it will offer them better opportunities to deliver their curriculum more effectively (Mathevula & Uwizeyimana, 2014). The 'compatibility' attribute explores how the ICT innovation aligns with teachers' values, needs, and practices; as the teachers' adoption relies on how well they think the innovation will be applicable and relevant to their respective subject areas (Bingimlas, 2009). 'Complexity' refers to how difficult the innovation is perceived to be; therefore, by simplifying the use of technology and making it user-friendly, this concern can be mitigated, thus facilitating adoption. The 'trialability' refers to the notion of allowing teachers to experiment with the new technology on a trial basis to get an idea of what a complete integration may look

like in their classrooms. This approach may reduce uncertainty and increase teachers' confidence in using the innovation once it has been officially integrated into their daily teaching. 'Observability' refers to how evident the successful integration of the technology is to the teachers. By showcasing examples of successful ICT implementations by fellow teachers and demonstrating the positive outcomes can make the innovation more visible and 'desirable' for adoption.

In essence, Rogers' *Attributes of Innovations and Rate of Adoption* offer valuable insights into the dynamics of ICT adoption among teachers. These five characteristics shed light on the factors that influence teachers' decisions to either embrace or reject innovative ICT tools. This framework is important in guiding the development of effective ICT-TPD programmes, by addressing specific concerns and challenges that teachers encounter in the adoption of ICT innovations. The alignment of ICT tools with teachers' values, simplifying utilisation complexities, and showcasing successful implementations are key strategies to encourage adoption and reduce uncertainty in adopting the innovation. Overall, Rogers' framework provides a practical guide for developing targeted interventions that facilitate a seamless integration of ICT into teaching practices.

2.6.2. Constructivism Learning Theory

Constructivism is one of the fundamental ideas of learning. This theory emphasises the value of students' active participation in groups, both individually and collectively, making it especially pertinent to examine in the context of this study. Constructivist philosophy is based on the idea that students are not just passive consumers of knowledge, but also active agents in their education, creating meaning and understanding by real-world experiences (Main, 2021). Comprehension of the principles of an effective ICT-TPD programme requires a comprehension of the fundamental constructivist ideas of Piaget, Vygotsky, Dewey, and Bruner (Main, 2021). Additionally, how ICT-related TPD can be organised using best practices to ensure that the instructors receive training that will provide positive results. Thus, the constructivist theory, as applied to this study, examines how teachers' active participation as students can foster a favourable learning environment that leads to their adoption of ICT innovation and enhances their understanding of it as seen through the prism of Rogers' Attributes of Innovation.

Piaget's constructivist theory, which emerged as a critique of the behaviourist theory that viewed learning as passive, challenged this behaviourist perspective by arguing, instead, that learners actively construct their own understanding (Olusegun, 2015). Piaget's constructivism is rooted in the idea of cognitive development through active engagement (Harlow, Cummings & Aberasturi, 2006). He proposed that learners construct knowledge through interactions with their environment, by either physically manipulating physical matter or by mentally refining existing knowledge (Harlow et al., 2006). As such, in the context of an ICT-TPD programme, Piaget's perspective aligns with the idea that teachers are able to construct their understanding of technology tools and how to innovatively integrate them by *actively engaging* - practise - with the digital tools, through physically exploring the tools, as well as mentally reflecting on how they can be best used for their subject matter (Becker, 2002).

While the Vygotskian stance on constructivism is similar to Piaget in that sense of active engagement, Vygotsky expands on Piaget's view of learners being active agents in their learning by emphasising the social aspect of learning. Vygotsky's socio-cultural theory emphasises the role of social interaction and culture in students' cognitive development (Verenikina, 2010). The Zone of Proximal Development (ZPD), which is the range between what a student is able to do with the guidance of an expert as opposed to doing the task independently, highlights the importance of collaborative learning as it suggests the importance of social interaction between the student and the teacher in reaching the proximal level of learning (Verenikina, 2010). In this regard, Vygotsky's perspective suggests that collaborative learning and social interaction are crucial in the professional development of teachers for ICT integration. Collaborative ICT-TPD activities can facilitate the development of teachers' skills within their ZPD (Rudd, 2001). The concept of Professional Learning Communities (PLC), which is discussed later in this section under the *Community of Practice* theory, is suitable for this collaborative approach to TPD as it employs the notion of social constructivism.

The constructivist epistemology suggests "that knowledge is not based on an objective reality that is discovered; instead, knowledge is created or invented by learners actively giving meaning to their engagements with problems" (Jonassen, 1991 as cited in Wang, 2009, p. 208). As such, Dewey's constructivism emphasises experiential learning and the concept of integrating what a student learned with their actual real-life experiences. ICT tools are meaningless on their own when placed in a classroom, they, however, gain significant value when actively utilised and integrated into daily teaching and learning practices to enhance the educational experience of the learners (Wang, 2009). Similar to Piaget, Dewey advocates for learning through active participation, as well as through problem-solving. Dewey's ideas align with the notion that ICT-TPD should involve practical, hands-on experiences, hence *experiential learning*, and problem-solving by practically exploring innovative ways in which the digital tools can enhance learning and mitigate some of the educational problems experienced in the classroom (Rout & Behera, 2014). Dewey's concept of constructivism suggests that teachers develop their understanding of ICT integration by actively engaging with technology in authentic educational contexts. Therefore, as argued by Rudd (2001), Mpehla (2011), Vandeyar (2015), and Dlamini & Mbatha (2018), ICT-TPD should emphasise how these technologies can be used in teachers' respective subjects so that they can integrated the digital tools in a way that is innovative and relevant to the subject content.

Bruner's constructivist views focus on the importance of structure and scaffolding in learning. Although Bruner's notion on Constructivism, though similar to that of Piaget, Vygotsky and Dewey, advocates for an active, he further introduces the concept of a 'cognitive theory of instruction' that urges teachers to design lessons that take students through a series of statements until the problem or educational material is understood (Stapleton & Stefaniak, 2019). Bruner suggests an inquiry-based approach to education and emphasises the role of the teacher in providing continuous guidance and support to help the learner determine the appropriateness of newly acquired knowledge to the task at hand (Stapleton & Stefaniak, 2019). Bruner's ideas suggest that ICT-TPD programmes should offer structured support and continuous ICT related guidance to teachers in the PD as they explore and integrate the

technology in their teaching. Additionally, scaffolding of the various ICT pedagogical skills and instruction is crucial to help enhance teachers' confidence and competence in using ICT tools effectively. In this regard, facilitators should caution against providing training that spans over a single day where there would be an overload of information, thus minimal scaffolding, and instructional support.

Self-Determination Theory (SDT)

In addition to the constructivist perspectives discussed above, it is important to take into account the significance of motivation in teachers' engagement with ICT-TPD programmes. This can be better understood through the lens of the Self-Determination Theory (SDT). According to the SDT, individuals have an innate desire to participate in activities that fulfil their psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 2000).

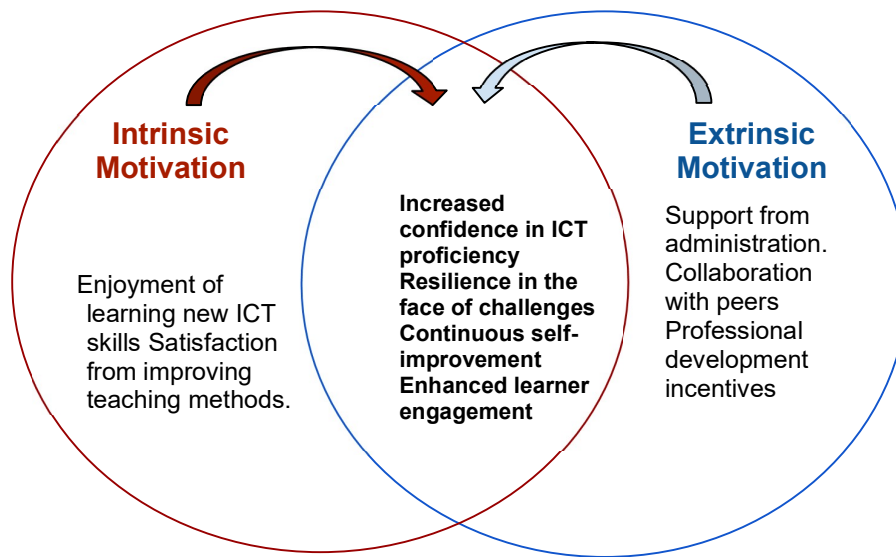


Figure 2.5: *The intertwined relationship between Intrinsic and Extrinsic motivation. Adapted from Deci and Ryan's (2000) Self-Determination Theory.*

In the context of ICT-TPD programmes, the constructivist approach advocated by Piaget, Vygotsky, Dewey, and Bruner aligns with the principles of SDT by emphasising active learning, autonomy in learning, and collaborative interactions among teachers. For example, Bruner's emphasis on *structured and continuous support* in learning resonates with the need for competence and autonomy outlined in the SDT as well as the Concerns-Based Adoption Model (CBAM) (discussed in section 2.3.5). Furthermore, Vygotsky's focus on collaborative learning highlights the importance of *relatedness*, as teachers interact and support each other in their professional development journey. This concept of collaboration is further supported by the Community of Property (CoP) theory (discussed in section 2.3.4). By integrating the principles of SDT into understanding the different aspects that can strengthen an ICT-TPD programme, researchers can create a supportive and motivating learning environment that fosters teachers' motivation to adopt ICT innovations in their pedagogical practices.

In essence, constructivism is a fundamental theory in education that when examined from the viewpoints of Bruner, Dewey, Vygotsky, and Piaget, emphasises how an ICT-TPD that adopts

a constructivist approach can enhance Rogers' Attributes of Innovation: Piaget's emphasis on active learning is in line with the goal of ICT-TPD, which is to support instructors in creating knowledge via practical use of digital resources thus enhancing Rogers' 'compatibility' and 'trialability' attributes. Vygotsky's emphasis of collaborative learning in ICT-TPD similarly enhances Rogers' 'relative advantage' as the teachers' perception of the innovation can potentially improve, making it relatable and minimising its perceived difficulty. Similarly, Dewey's focus on practical ICT integration through experiential learning in ICT-TPD, can potentially enhance Rogers' 'relative advantage', 'compatibility', and trialability' attributes as experiential practice allows for better familiarity of the innovation. Finally, the continuous coaching and scaffolding approach suggested by Bruner similarly enhances Rogers' 'relative advantage' and 'compatibility' attributes by also minimising the perceived difficulty of the innovation. When applied together, these constructivist viewpoints, together with the SDT create a good framework from which to implement an effective ICT-TPD programme. The integration of the constructivism theory with the SDT ensures that the ICT-TPD programme to be implemented practically considers Rogers' Attributes of Innovation, CBAM and CoP, thus encouraging teachers' successful adoption of the ICT innovation for innovative pedagogical practice.

2.6.3. Gradual Release of Responsibility Model (GRRM):

The Gradual Release Model (GRRM) which also informs the conceptual framework as illustrated in **Figure 2.3.**, aligns with constructivism by advocating for a structured shift of responsibility from teacher-directed instruction to student-centred learning. It supports active engagement, reflecting the constructivist idea that learners construct knowledge through hands-on experiences. In the context of ICT-TPD, the model emphasises the importance of gradually empowering teachers (as students) to independently integrate technology into their teaching practices, resonating with the study's focus on innovative curriculum delivery. As well as the scaffolding (as per Bruner's constructivist) of training material so as to not overwhelm the teachers, as students, thus reducing the level of uncertainty as defined by Rogers' attributes of innovation characteristic (Sahin, 2006; Rogers, 1963).

This model, as proposed by Killian (2015), advocates a top-down training approach, which is often referred to as the "*I do, We do, You do*" model. It emphasises the importance of demonstration or *modelling*, prompting, and practice. In the "I do" phase, the instructor introduces a new concept, through modelling the skill, as the teachers (as students) observe. During the 'we do' phase, the instructor prompts for participation, thus fostering *collaboration* (as encouraged by Vygotsky's constructivism for learning). Finally, in the 'you do' phase, teachers can independently complete tasks, by mimicking the modelled behaviour. This model is guided by Bandura's observational learning theory as well as the constructivist sociocultural learning theory that encourages active observation, participation. This includes collaboration thus reflecting the idea that the mastery of *innovation* requires ongoing engagement through practice (Fagerberg, 2003). Combined with Rogers' Attributes of Innovation, as well as the Constructivism theory as discussed in sections 2.3.1 and 2.3.2 respectively, the GRRM contributes to the lens from which to develop an effective ICCT-TPD. **Figure 2.6** illustrates the GRRM.

TEACHER RESPONSIBILITY



Figure 2.6.: *Gradual Release Model (Killian, 2015)*

2.6.4. Community of Practice (CoP) Theory and Professional Learning Communities (PLCs)

The concept of a group of people who have a common interest, interact frequently, and learn from one another collectively through their experiences and expertise is described by the Community of Practice (CoP) theory, a learning framework created by social learning theorists Jean Lave and Etienne Wenger (1991). Comparable to the GRRM's description of the learning process, the CoP theory permits students to apply an idea in order to demonstrate what they have learned and identify areas in which additional support is required. According to Lave and Wenger, people in a CoP develop a sense of identity around their shared area by working together and exchanging information (Smith, Hayes & Shea, 2017). The theory emphasises how learning is socially constructed, as well as highlights the importance of participation, and having mutual engagement in the development of knowledge and skills within a community. Similar to the father of Constructivism, Piaget (1896-1980), Lave and Wenger (1991) argue that learning is not just a passive reception or absorption of information, but rather, as they constructively perceived it, learning is a process of “increasing participation in communities of practice” (p. 49). Like the constructivist notion, the process of learning is an active procedure, suggesting that, for example, in the context of this research, an ICT-TPD programme should emphasise the notion that learning and skill development requires a hands-on engagement of its participants, the teachers, in a collaborative setting - a community.

In alignment with the constructivist view, learning is conceptualised as a social construct, emphasising that individuals learn through social interaction (Becker, 2002). Correspondingly, Lave and Wenger (1991) assert the importance of collaborative learning. Additionally, to encourage the adoption of new skills, in this regard, an ICT innovation, Lave and Wenger (1991), in their CoP theory, suggest that teachers share their best practices by showcasing examples of how their practices have garnered successful results that have contributed to learners' acquisition of knowledge through the use of the ICT innovation. This concept coincides with Rogers' 'observability' characteristic within his five attributes of innovation (Sahin, 2006; Smith et al., 2017). Consequently, an effective ICT-TPD programme would incorporate learning groups, where teachers are able to learn from each other through collaboration, thus fostering continuous guidance and support from their colleagues.

In unison to the CoP theory, DuFour (2004) introduces the concept of professional Learning Communities (PLCs) as a conceptual framework that centres around creating a collaborative

and continuous learning environment within educational environments. PLCs are meant to function as communities where educators work collaboratively to achieve shared goals, reflect on their pedagogic practices, and improve students' outcomes (DuFour, 2004). DuFour (2004) asserts three "big ideas" (p. 8) that function as guiding principles of PLCs: Focus on learning, collaborative culture, and results orientation. In the context of this study, the concept of PLCs including its three big ideas are significant as they provide a structured framework that illustrates defining components of an effective ICT-TPD programme. These components foster a culture of shared learning that ensures a focused approach on improving student learning outcomes through innovative ICT integration and maintaining a results-oriented perspective that aligns with the research objective of examining the impact of ICT-TPD training programmes on teachers' innovativeness in curriculum delivery. In the context of ICT-TPD, the 'focus on learning' idea aligns with the study's objective to assess teachers' levels of innovation as well as determine the impact of the ICT training on their curriculum delivery (Lave & Wenger, 1991; DuFour, 2004; Smith et al., 2017). Subsequently, the 'collaborative' component aligns with the study's use of subject or phase related groups where teachers can collaboratively explore and share innovative ways to integrate ICT into their teaching practices to foster innovative curriculum delivery (Lave & Wenger, 1991; DuFour, 2004; Smith et al., 2017). Lastly, the results-oriented approach ensures an outcomes-based approach that encourages the monitoring learners' academic improvement or lack thereof (Lave & Wenger, 1991; DuFour, 2004; Smith et al., 2017).

Essentially, for this study on ICT-TPD and teacher innovation in curriculum delivery, the CoP theory provides valuable insights in understanding how teachers collectively engage in learning and knowledge-sharing activities related to ICT pedagogic integration. Additionally, the concept of PLCs further emphasises the significance of shared learning in the strengthening of TPD to garner desirable results. These theories, CoP and PLCs, explore how teachers form a community to collaboratively address challenges, share successful practices, and collectively develop innovative approaches to incorporating ICT in their teaching. Additionally, the dynamics of CoP, as well as PLCs, among teachers participating in ICT Professional Development programmes offer insights into the social aspects influencing teacher innovation and the adoption of ICT in curriculum delivery. These theories further ensure that teachers always have access to guidance and support, whether moral or technical, to assist them in their ICT integration. The collective consideration of Rogers' Attributes of Innovation, the Constructivism theory, the GRRM and CoP encourages an effective ICT-TPD that enhances the successful adoption of the ICT innovation by teachers.

2.6.5. Concerns-Based Adoption Model (CBAM)

To sustain the effectiveness of the ICT-TPD intervention, the CBAM further contributes insights into the concerns and stages of adoption that teachers undergo when incorporating new practices, including ICT integration. The Concerns-Based Adoption Model (CBAM) is a conceptual framework developed by Hall, Wallace, and Dossett (1973) and further refined by Hall and Hord in the following years. CBAM is designed to assist educational leaders and practitioners in understanding and facilitating the process of adopting and implementing innovations in educational settings (Hall et al., 1973). CBAM assesses and supports educational transformation. It recognises that change is a process, not an event, and offers tools to assess teachers' concerns, levels of use, and innovation configurations. This model's stages of concern and levels of use were included in a survey questionnaire to gauge teachers' attitudes, views about innovation, and their ICT competency.

This model complements Rogers' Diffusion of Innovation, as it explores individual concerns, such as self-efficacy and the perceived advantages of adopting innovations. By addressing teachers' concerns and by offering individualised support, the CBAM aligns with the collaborative and supportive elements emphasised in the Constructivism and CoP theories, thus creating a conducive well supported environment for an effective ICT-TPD programme. Together, these models provide a comprehensive framework that considers both the gradual developmental process of teachers and the subtle concerns that may influence their adoption of ICT innovations, therefore, reinforcing the study's aim to understand and promote teacher innovation in ICT curriculum delivery through effective ICT-TPD that employs these theories.

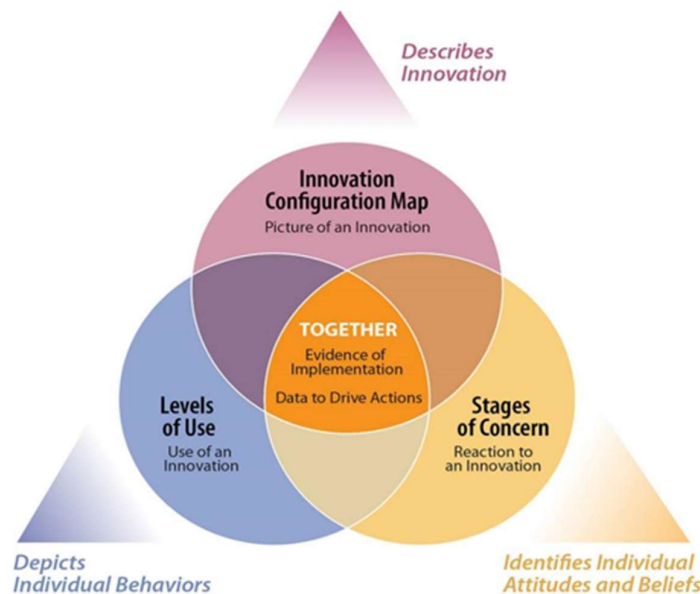


Figure 2.7.: *Concerns-Based Adoption Model (SEDL Archive, n.d)*

These theories: Gradual Release Model (GRM) and the Concerns-Based Adoption Model (CBAM) complement the overarching framework formed by constructivism, Community of Practice, and Rogers' Diffusion of Innovation, offering nuanced perspectives on teacher professional development and technology adoption within ICT-TPD. The GRM and CBAM have further been used to develop a conceptual framework for this study, to inform the roll-out of the ICT-TPD training programme offered to primary school teachers at a primary school in Gauteng.

Essentially, understanding these theories, *Rogers' Diffusion of Innovation*, *Constructivism*, *GRRM*, *CoP* and *CBAM*, provide a comprehensive theoretical foundation for understanding the dynamics of ICT-TPD and its impact on teachers' innovation in curriculum delivery. Rogers' Diffusion of Innovation theory is at the apex of the study as it emphasises the adoption of innovation; Constructivism then highlights the active role of teachers (as students) in constructing knowledge through hands-on engagement with ICT tools; this further aligns with the experiential nature of the GRRM, as well as the collaborative nature of CoP, where shared experiences and expertise contribute to collective learning; the CBAM then discusses the longevity and sustainability of an effective ICT-TPD programme, suggesting that innovation is a process and not a destination, therefore a good ICT-TPS programme should provide continuous support to teachers beyond the duration of the TPD programme. Together, these theories offer a robust framework that aligns seamlessly with the research focus on assessing the impact of ICT training on teachers' innovativeness in curriculum delivery. It further provides an understanding of the complex interplay between teachers' innovation, technology, and pedagogy.

CHAPTER 3: METHODOLOGY

This chapter outlines the methodological framework utilised in investigating the effectiveness of an ICT training programme in promoting the innovative use of ICTs by trained teachers. The research's aim stems from the prevailing issue in the South African education system: despite nationwide initiatives to reinforce ICT infrastructure and train teachers in innovative ICT teaching and learning techniques, there is resistance among teachers that persists. This resistance is largely due to ineffective training approaches used in professional development initiatives (Vandeyar, 2014). Consequently, this research strives to examine how different training approaches impact what is learned and how it influences teachers' professional development, specifically regarding their innovative use of ICT in pedagogy (Jung, 2005).

This study, which is informed by the pragmatic research paradigm, recognises the importance of both subjective and objective knowledge in comprehending the research challenge. In order to provide a thorough knowledge of the phenomenon being studied, a mixed-methods approach is utilised, which recognises the importance of both quantitative and qualitative data (Creswell & Plano, 2018). In particular, a mixed-methods sequential explanatory design is employed. This approach comprises two distinct stages: first, the collection and analysis of quantitative data, and subsequently, the collection and analysis of qualitative data. According to Ivankova, Creswell, and Stick (2006), the purpose of the qualitative phase is to provide a deeper comprehension of the quantitative results.

Non-probability purposeful sampling is employed to select participants who can provide rich, relevant, and diverse insights regarding their experience and perspectives on the ICT training programme. Data collection tools include qualitative interviews and surveys as well as a quantitative survey and an assessment rubric. For data analysis, a thematic analysis is used for qualitative data to “identify, analyse, and report patterns within the data” (Braun & Clarke, 2006). The quantitative data, on the contrary, is analysed by using exploratory statistical techniques to uncover underlying patterns and relationships.

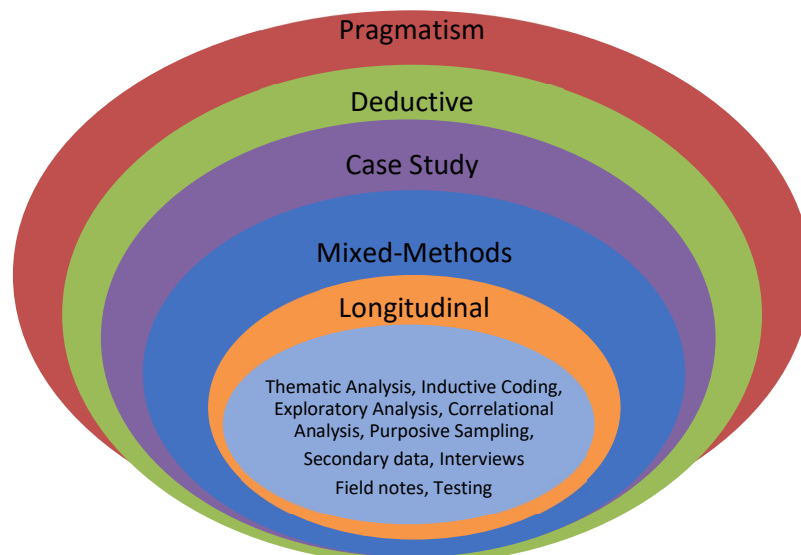


Figure 3.1: Research Onion Adapted from Saunders et al. (2007)

3.1. Research paradigms and philosophy.

Positivist scholars contend that knowledge can either be true, false, or meaningless, leaving no room for interpretation as knowledge is independent of human cognition (Creswell & Plano Clark, 2018). Conversely, interpretivism posits that knowledge is invariably influenced by social and cultural factors, examining individuals' mental processes in connection to their social and cultural contexts (Creswell & Plano Clark, 2018). Unlike positivism, interpretivism acknowledges the existence of social grey areas. Although these paradigms seem at odds, they both contribute valuable perspectives to our understanding of the world. As such, there is room for both bodies of theory to co-exist within the same research, offering a comprehensive approach to complex questions. Each perspective can shed light on different facets of a problem, ultimately providing a more complete understanding.

The guiding paradigm for this research is pragmatism, which underscores the practical implications of research findings (Saunders & Towey, 2012/2013, p. 58). Pragmatism suggests that no single perspective can capture the full complexity of a phenomenon and that multiple realities of a phenomenon may necessitate both objective and subjective modes of analysis (Saunders & Tosey, 2012/2013).

Accordingly, this research employs both positivist (quantitative) and interpretivist (qualitative) approaches to data collection in order to gain a comprehensive understanding of teachers' evolution towards pedagogical ICT innovation during their course training. This study acknowledges that while digital competence and innovation can be measured and objectively assessed to a certain extent, various factors may influence an individual's ability to develop digital competence and, consequently, to innovate. One such factor is the method adopted when training teachers to use digital or ICT tools.

Therefore, the research examines not only the level of innovation but also the impact of the training on the participants. The anticipated correlation between these elements necessitates an examination of both measurable aspects of the research, such as digital competence before and after the training, and interpretable facets, such as the perceived efficacy and value of the training approach. Hence, the decision to employ a research methodology informed by the pragmatism paradigm.

3.2. Research approach.

This research study employs the deductive approach. According to Saunders, Lewis, and Thornhill (2009), a research approach refers to the overarching strategy or plan that guides the steps in the research process as well as the rationale behind them. A research approach provides a road map that specifies whether the researcher will take a deductive or inductive path to the creation of knowledge (Saunders et al., 2009; Thesismind, 2019). The deductive approach starts with a hypothesis or a theory, which is then tried through empirical processes (Saunders et al., 2009; Thesismind, 2019). The inductive approach, on the other hand, begins with

observations or data collection without a preconceived theory, with the intent of “developing a theory as a result of data analysis” (Saunders et al., 2009).

As such, this study lies on the premise that effective ICT-TPD programmes are informed by the foundational theories as discussed in Chapter 2.3. When these theories are employed into training strategies, then teachers (as students) benefit from the programme by being able to apply their new knowledge to other contexts outside the training. In this case, the teachers would be able to innovate in their use of ICT tools.

Saunders et al (2009) advocates the importance of the choice of research approach as it influences how research questions are framed, the type of data collected, and how it is all interpreted. The choice in research ultimately shapes the direction and nature of the entire research process (Saunders & Tosey, 2012/2013).

3.3. Research Strategy

The research strategy undertaken in this study is that of a Case Study. According to Saunders et al's (2009) research methodology, a research strategy is the overall plan that outlines the study's approach to addressing the research question or questions. The research strategy entails deciding on particular procedures, methods, and strategies to employ for data collection and analysis in the study. The research questions, objectives, and the theoretical framework all have an impact on the strategy, which is essentially a guide for carrying out the study (Saunders et al., 2009).

According to Robson (2002, p. 178, as cited in Saunders et al., 2009, p. 145-146), a case study can be understood as “a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence”. Yin (2018) further emphasises the importance of acknowledging the context when dealing with a case study, suggesting that the context makes clear the advantages and disadvantages that may be present within a particular setting where the study takes place.

In this study, the Case Study strategy has been employed because it provides a detailed understanding of how teachers (as students) learn to use technology innovatively in their pedagogic context. By focusing on one Gauteng primary school's ICT training programme, there can be an understanding of how the training contributes towards an improvement in teachers' levels of innovation in their use of digital tools. This method allows for a close observation of changes in teaching practices following the ICT-TPD training intervention. It is especially useful when the training and the school environment, such as in this case, are closely linked. A detailed study of this specific situation can reveal the development of teachers' skills and the integration of technology in their pedagogic practice. Insights gained from this approach can inform strategies to enhance technology use in education more broadly.

3.4. Research Design and Choices

3.4.1. Methodological Choice

The Mixed approaches research design is the methodological choice used in this study. It gives a complementary framework that integrates the advantages of both quantitative and qualitative approaches and improves comprehension of the research issues (Creswell & Plano Clark, 2018). Because the research subject is multifaceted and complex, this design is especially suitable for this study.

As outlined earlier, positivist and interpretivist perspectives each offer distinct but valuable insights. Positivism, with its emphasis on objective measurements and data, is well-suited to assess the quantifiable aspects of this study, such as the levels of digital competence before and after the training. On the other hand, interpretivism, with its focus on subjective experience and interpretation, is ideally suited to explore the qualitative aspects of this research, such as the teachers' perceptions of the efficacy and value of the training approach.

By integrating these two perspectives through a mixed-methods approach, this research not only addresses the objective and subjective elements of the research problem but also enhances the robustness of the study. It enables a more comprehensive exploration of how teachers' digital competence evolves with training and how this evolution can drive innovation in pedagogical practices. Hence, mixed-methods research, embodying "multiple ways of seeing and hearing" (Greene, 2007, as cited in Creswell & Plano Clark, 2018), is an apt approach for this study.

3.4.2. Research Purpose

In Saunders et al (2009) the research purpose examines how questions are asked in a study. The manner in which research questions are asked could "result in either descriptive, descriptive and explanatory, or explanatory answers" (Saunders et al., 2009, p. 138). Saunders et al (2009) argues that by meditating on the research question, a study begins to explore the purpose of the study. Based on the research question, the purpose of the research can be threefold by either producing *descriptive, descriptive and explanatory, or explanatory* answers (Saunders et al., 2009).

The research purpose that informs this study is the *sequential explanatory mixed-methods*. The sequential explanatory mixed-methods design is well-aligned with the mixed-methods research approach, as it combines both the quantitative and qualitative methods in a two-phase process, which ensures a comprehensive examination of the research question (Ivankova, Creswell, & Stick, 2006).

In the first phase, quantitative data was collected and analysed, employing a quasi-experimental design, specifically a pretest-post-test design. A pretest-post-test quasi-experimental design involves collecting data before and after an intervention, in this case, the ICT training programme. This type of design allows researchers to compare the state of the dependent

variables - teachers' digital competence and their innovativeness in the use of ICT tools for teaching and learning - before and after the intervention (Creswell & Plano Clark, 2018). The goal is to observe if there are significant changes that can be attributed to the intervention. Hence, initial data was collected from a secondary source, my supervisor's concurrent study, providing a baseline on teachers' digital competency before the training. After the ICT training programme, I collected primary data to evaluate the level of innovative implementation of the newly acquired ICT skills into the teachers' teaching practice.

The collected quantitative data were subjected to both descriptive and correlational analyses. Descriptive analysis involves summarising the data in a way that describes its main characteristics (Healey, 2012). For this study, it entailed examining the central tendencies and distributions of teachers' digital competence and innovativeness both pre- and post-training. On the other hand, correlational analysis was used to establish the relationship between the training programme (independent variable) and any observed changes in teachers' ICT use and innovation (dependent variables) (Healey, 2012). Correlational analysis helped to assess the strength and direction of this relationship, thus providing insights into the effectiveness of the training programme.

The second phase of the research involved collecting qualitative data through a case study design. The case study design allows for in-depth exploration of the specific context, in this case, the Gauteng primary school where the training was conducted (Creswell & Creswell, 2018). The qualitative data helped to explore teachers' perceptions of the training programme, their experiences during the training, and their perspectives on how the training has influenced their use of ICT in curriculum delivery.

The sequential explanatory mixed-methods design was chosen as it combines both a broad overview (through the quantitative phase) and a detailed examination (through the qualitative phase) of the research problem (Creswell, 2009). By using both quantitative and qualitative data together, the dataset will provide a better understanding of the research findings, making the study more trustworthy.

3.5. Time Horizons

In Saunders et al.'s research onion and time horizons 'refer to the timeframe over which the data is collected, and the study is conducted' (2009). There are generally two types of time horizons: cross-sectional and longitudinal. Cross-sectional research is the investigation of a specific occurrence or phenomena at a single moment in time. Saunders et al. (2002:90) call this a "snapshot time horizon" (p. 155). A cross-sectional study, like a 'snapshot', provides a view of the research variables at a single point of the research (Saunders et al., 2009). Contrary to the cross-sectional design is the longitudinal time horizon which involves conducting the study over a longer period of time to observe changes and developments. Longitudinal studies can provide insights into how variables change over time, the dynamics of the phenomenon, and the sequence of events or behaviours over the course of the study.

This study conforms to the longitudinal time horizon as it observes teachers' change in ICT innovation levels over the duration of the study, i.e. before and after the ICT-TPD intervention. While the study could be considered cross-sectional to some extent, it, however, includes non-assessed observations through the use of field notes, indicating how teachers' perceptions and competence of the innovation change over time. While a longitudinal study is often conducted over a number of years, Thomas (2020) argues that it has no set amount of time, this is as long as the participants are repeatedly observed during the course of the study. Longitudinal studies can, therefore, range "from as short as a few weeks to as long as several decades" (Thomas, 2020).

3.6. Techniques and procedures

This section on the research techniques and procedures provides an outline of the specific methods and tools used for data collection and data analysis. This is inclusive of the selection of particular methods that are aligned with the chosen research strategy and approach, such as surveys, interviews, experiments, observations, or use of existing data.

3.6.1. Sampling and recruitment procedures

The initial population for this research study comprised 30 teachers, deemed as potential participants based on their likely knowledge and experience concerning the research question. This approach aligns with Patton's (2002) advocacy of purposeful sampling, where the goal is to select information-rich cases for in-depth analysis.

For the initial quantitative phase, a survey was conducted involving all 30 teachers, providing a comprehensive overview of the teachers' digital competence and familiarity with ICT tools for teaching and learning. This method of total population sampling is supported by Daniel (2012), who highlights its usefulness in producing accurate and reliable data about the population. The intervention phase of the study, however, utilised a smaller sample size for practicality and efficiency. Out of the initial population, 12 teachers enrolled in the course training programme offered by the research study. Yet only six teachers consistently attended, participated, and completed the core tasks. The decision to focus on these teachers is supported by the argument that consistent participation could be indicative of a deeper level of engagement and thus richer data (Bryman, 2016).

In the qualitative phase, field notes were taken on the six teachers who consistently participated throughout the ICT-TPD programme. Additionally, all six of these consistently participating teachers were invited for interviews, reinforcing the idea that qualitative research often requires smaller, more focused samples (Creswell & Poth, 2018). This procedure ensures a more in-depth understanding of the participants' experiences and perspectives (Merriam & Tisdell, 2015).

The last aspect of data collection involved the teachers' e-portfolios which contained a practical example of what they were able to contribute during the ICT-TPD intervention. While only five teachers, from the consistent six, completed their e-portfolio tasks, only three provided the correct shareable links, which allowed their work to be evaluated. The other three did not

respond with shareable links, and further probing was not pursued in respect of their autonomy as well as in attempt to maintain ethical standards in research (Creswell & Plano Clark, 2018).

This sequential reduction of sample size aligns with the sequential explanatory mixed-methods design, which commonly involves narrowing the focus of the study in subsequent phases (Ivankova et al., 2006). Despite the reduction in sample size, the data collected at each stage were deemed sufficient for answering the research question and achieving the study's objectives.

3.6.2. Data collection methods and instruments

The research employed a sequential explanatory mixed-methods design, which utilised a systematic approach to collecting both quantitative and qualitative data. This design was chosen to comprehensively analyse the effects of an ICT training programme on teachers' digital competence and innovation in using ICT tools. As part of this design, the data collection approach can be characterised as longitudinal, involving multiple data collection points over an extended period, for example, pre-training, during- training and post training.

Unlike a cross-sectional design, where data is gathered at one specific point, the longitudinal aspect of the sequential explanatory design enabled the tracking of changes and developments in teachers' digital competence and innovation both before, during, and after the training programme (Menard, 2008). By collecting data at different stages, this design facilitated a richer, time-bound analysis, providing valuable insights into the temporal effects of the training intervention. The combination of quantitative and qualitative phases within a longitudinal framework allowed for a more nuanced and dynamic understanding of the research problem, aligning well with the study's complex and multifaceted nature (Singer & Willett, 2003; Creswell & Plano Clark, 2018).

Quantitative Data Collection

The quantitative data collection process was carried out in three main stages:

Pre-Training Survey: Before the training programme, a digital survey was administered through Google Forms to ascertain the teachers' baseline digital competency (Creswell & Plano Clark, 2018). Shared via email, with daily reminders and coordination with school administration, the survey was designed to capture a general understanding of the teachers' readiness for the training.

Criterion-Referenced Rubric Assessment of Training Tasks: Throughout the training programme, teachers were tasked with creating and completing an e-portfolio, containing various digital activities. A criterion-referenced rubric was employed to evaluate these tasks, assessing the participants' ability to apply the skills taught (Jonsson & Svingby, 2007). However, not all teachers provided shareable links to their e-portfolios. As an improvisation, individual assessments were conducted on the activities that the teachers shared during the training when seeking help or advice on their coursework. This adaptive approach allowed for a consistent assessment of performance, despite the variation in submission methods (Moskal & Leydens, 2000).

Post-Training Survey: A post-training survey was conducted after the initial coding and analysis, motivated by a concern that the existing quantitative data might not sufficiently determine whether the training had indeed encouraged innovation and improved digital competence (Saldaña, 2016). This survey provided concrete evidence for evaluating the long-term effects of the training programme.

Qualitative Data Collection

The qualitative data collection complemented the quantitative methods, providing deeper insights:

Field notes: Field notes were taken during the training sessions to record how the teachers' perceptions and engagement with ICT innovation changed throughout the training. This type of observation is impactful in data collection because it captures detailed observations and interactions in real-time, and provides rich, contextual data that might not be fully captured through recordings or interviews alone.

Open-Ended Interviews: Open-ended interviews were conducted after training to explore the teachers' subjective experiences and views on the effectiveness of the programme (Seidman, 2013). This method allowed an in-depth exploration of the participants' perspectives.

Post-Training Qualitative Survey: A post-training quantitative survey was also used to quantify teachers' perceptions of the training. The combination of these methods reflects the principle of triangulation, enhancing the validity of the findings (Denzin, 2012).

The use of such multifaceted data collection strategies achieved a rich and robust understanding of the research problem. The combined use of surveys, field notes, interviews, and assessments offered a comprehensive picture of the training's impact.

3.6.3. Data analysis methods

The data analysis methods used in this research were selected to align with the sequential explanatory mixed-methods design, a recognised approach that emphasises integration and explanation of quantitative and qualitative phases (Ivankova, Creswell, & Stick, 2006; Creswell, 2009). The quantitative phase included exploratory analysis, which has been noted for its capability to summarise and describe main features of the dataset (Tukey, 1977), and correlational analysis to examine relationships between variables such as access to resources and innovation over time (Field, 2013). For the qualitative phase, thematic analysis was employed, a method that has often been used for its focus on understanding the underlying meanings of qualitative data (Braun & Clarke, 2006), this is supplemented by inductive coding where themes are developed without predetermined codes from the use of the in vivo coding process (Thomas, 2006). Together, these methods provided a rich and multidimensional analysis of the research question, thus representing the core principles of mixed-methods research that seeks to provide a broad understanding of the phenomenon (Creswell & Plano Clark, 2018). The following sections detail the specific techniques and rationales behind the chosen analysis methods.

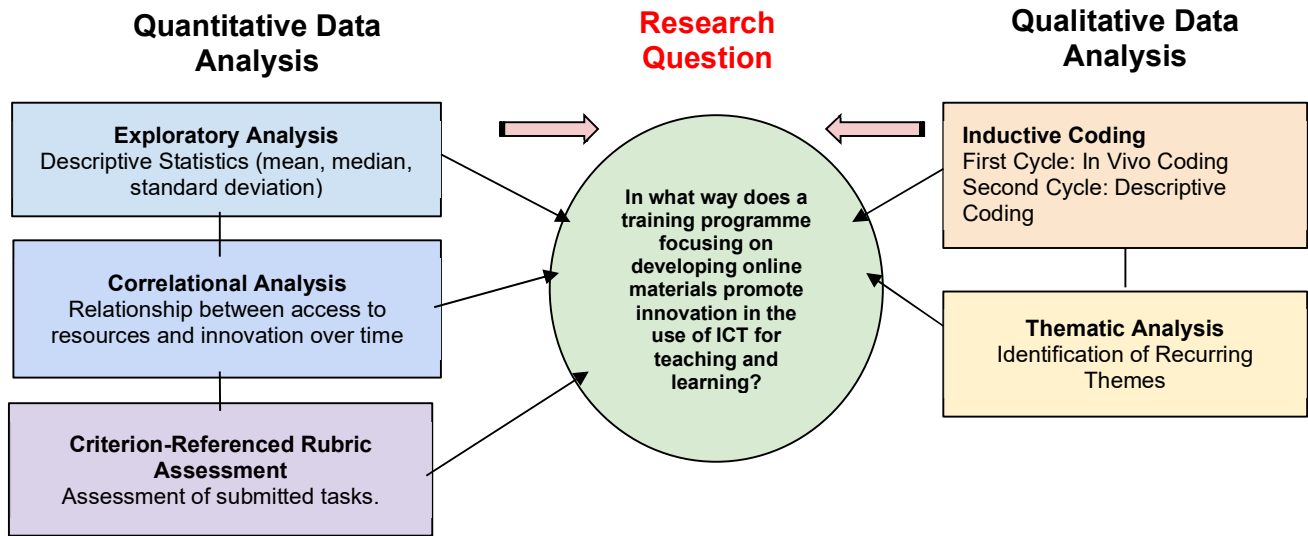


Figure 3.2: *Integrated Data Analysis Framework:
Unveiling Insights Through Quantitative and Qualitative Perspectives*

Quantitative Data Analysis

The analysis of the quantitative data in this research was conducted through a three-fold approach to capture various facets of the study's objectives.

Exploratory Analysis: Exploratory data analysis (EDA) is an initial step in data analysis that focuses on uncovering the underlying structure of a dataset through visual and statistical techniques (Tukey, 1977). In this study, EDA was performed to describe and summarise the main characteristics of the pre-training digital competencies and familiarities of the participants. This involved computing descriptive statistics such as mean, median, and standard deviation, providing a comprehensive overview of teachers' initial digital competence and their familiarity with ICT tools. Such an approach is instrumental in revealing insights that may guide subsequent analysis (Field, 2013).

Correlational Analysis: Correlational analysis is “a method used to evaluate the strength and direction of the linear relationship between two quantitative variables” (Healey, 2014). In this study, correlational analysis was conducted to investigate the relationship between access to resources and participants' innovation over time. By assessing the correlation coefficient, this analytical method allowed the study to identify patterns and understand how these variables might influence each other. The analysis provided valuable insights into how resource access could be linked to innovation in the participants' teaching practices.

Criterion-Referenced Rubric: A criterion-referenced rubric is a scoring guide used to evaluate a participant's performance against a set of predetermined criteria (Popham, 1997). In this study, participants' submitted tasks were assessed through a criterion-referenced rubric, aligning with specific learning objectives of the training programme. This rubric allowed for a structured and consistent assessment of the teachers' ability to apply the skills taught during training. By evaluating their performance against defined standards, the analysis ensured an

objective and transparent evaluation of the participants' digital competencies and innovative implementation of ICT tools.

Qualitative Data Analysis

The qualitative data in this study were analysed through the following methods:

Inductive Coding: The coding process for this study began with an inductive approach, allowing for the emergent patterns within the qualitative data to guide the coding process (Thomas, 2006). Unlike deductive approaches where codes are predetermined, this method provided flexibility and an organic understanding of the complex nuances of teachers' experiences with ICT training.

- *First Cycle - In Vivo Coding:* During the initial phase of coding, in vivo coding was employed. This technique involves using participants' own words as codes, preserving their voice and offering a grounded perspective on the data (Saldaña, 2015). It allowed for an immediate and rich connection with the participants' views and experiences during the training.
- *Second Cycle - Descriptive Coding:* Following in vivo coding, descriptive coding was used to summarise the primary topic of each data excerpt (Saldaña, 2015). This second cycle helped in condensing the data into a more manageable form, making connections between the teachers' experiences and their reactions to the training.

Thematic Analysis: After the coding process, a thematic analysis was employed to delve into the underlying meaning behind the sentiments shared by participants. Thematic analysis involves 'identifying, analysing, and reporting patterns (themes) within the data', focusing on discovering shared meanings across the dataset (Braun & Clarke, 2006). By identifying recurring patterns and themes in the interview responses and field notes, the analysis in this study centred on understanding teachers' perceptions, experiences, and the contextual factors affecting their engagement with the training programme. This approach provided a comprehensive and nuanced exploration of how the training influenced teachers' digital competence and innovation in using ICT tools.

Integration of Quantitative and Qualitative Analysis

The sequential explanatory mixed methods design of this study required an integration of both quantitative and qualitative analyses. The quantitative findings laid the groundwork for the qualitative phase, and the insights gained from both were *triangulated* to provide a comprehensive view of the impact of the ICT training programme. Triangulation refers to the use of different "datasets, methods, theories, and/or investigators" to respond to the same research question (Bhandari, 2022). This strategy is used to help enhance the validity and reliability of research findings in order to mitigate research bias (Bhandari, 2022). This

triangulation approach ensured a multifaceted exploration of the research question, allowing for breadth and depth in understanding the problem (Creswell & Plano Clark, 2018).

As this is a mixed-methods research, this study employs a methodological triangulation approach which integrates different methodologies, such as quantitative and qualitative methods to collect data (Bhandari, 2022). In this study, triangulation of the quantitative pre-training survey and criterion-referenced rubric results are integrated with the qualitative field-notes, interview responses and post-training survey. This is to help answer the research question that explores the impact of the ICT-TPD on teachers' innovative delivery of the curriculum. **Figure 3.3** illustrates how triangulation is used in this study:

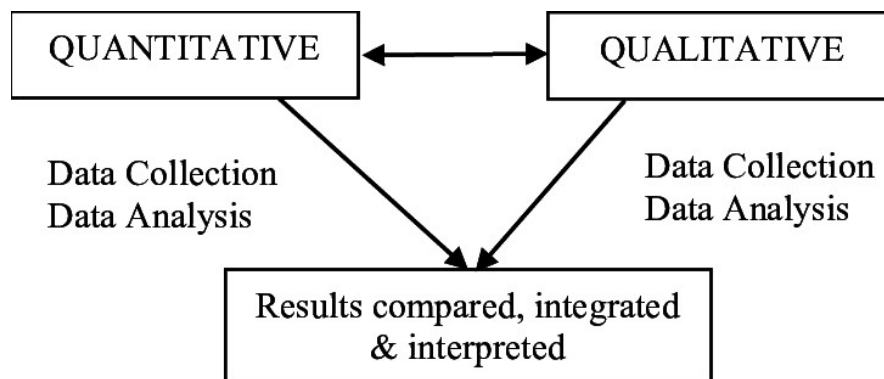


Figure 3.3: *A Visual Diagram of the Mixed-Methods Concurrent Triangulation Strategy*

3.7. Ethical considerations

In research, the ethical considerations of a study refer to the academic values and moral manner in which the study was conducted. This ensures best practice in research for all parties involved, both researcher and participants. Ethical considerations in research are pivotal to ensure that participants are protected, to maintain the integrity of the study, and foster public trust in the research community. Adhering to ethical principles protects participants from both direct or indirect harm, guarantees informed consent, and upholds legal and pro-standards (Creswell & Plano Clark, 2018). Ethical considerations contribute to the credibility and acceptance of research in academic journals and facilitates access to funding opportunities. Ethical research practices also emphasise long-term positive impacts, social responsibility, and accountability from researchers, which align with fundamental academic values (Creswell & Plano Clark, 2018). Ultimately, ethical considerations are foundational for responsible and meaningful research, promoting transparency, fairness, and the well-being of all involved parties. This research was guided by ethical considerations at all stages of the process. The following considerations were prioritised to ensure the integrity and quality of the research:

Ethics and Ethical Clearance:

To assure the research's ethical integrity, I, the researcher, received ethical clearance after completing a three-hour online ethics training course through Training and Resources in Research Ethics Evaluation (TRREE). This training was designed to provide me with the knowledge and skills needed to conduct the research in a way that protects both the participants and me while adhering to established ethical standards and principles in the field of research (Creswell, 2009; Bryman, 2016; Creswell & Plano Clark, 2018).

Validity and Reliability:

A study's *validity* relates to how precisely it measures what it was designed to measure (Bryman, 2012). In this study, validity was ensured by carefully harmonising the research objectives, research methodology, and data collection instruments. The aims were to investigate how an ICT-TPD training programme for teachers in a primary school in Gauteng, South Africa, would improve ICT integration in the classroom and stimulate pedagogical creativity. The sequential explanatory mixed-approaches design, which integrates quantitative and qualitative methods in two phases, increased validity by providing a thorough evaluation of the research topic (Creswell & Plano Clark, 2011).

Reliability relates to the consistency of study findings (Golafshani, 2003). In this study, reliability was ensured by using triangulation to analyse and interpret the data. This strategy is used to improve the validity and reliability of research findings, hence reducing research bias (Bhandari, 2022), and to maintain a consistent approach to data collecting and analysis, including the treatment of both quantitative and qualitative data. Such consistent approaches improve the study's repeatability, confirming its reliability and trustworthiness in representing the research's goal (Lincoln & Guba, 1985).

Trustworthiness:

The trustworthiness of the research was ensured through the triangulation of data. Trustworthiness in research refers to the credibility, validity, and reliability of the research and its findings (Creswell & Creswell, 2018). It's about providing a convincing argument that the results acquired from the research are well-grounded and supported by actual data, and that they reflect the phenomena that is being studied, as accurately as possible. The correspondence between the initial survey and interview responses was evaluated to confirm the coherence of findings across different data sources, thus enhancing the credibility of the results (Denzin, 2012). By triangulating the data, the risk of personal bias in interpreting the results was further minimised.

Reflexivity:

In research, reflexivity is the process through which a researcher recognises, examines, and considers their own role in the study, their biases, beliefs, and influence on the research procedure and results (Creswell & Plano Clark, 2018). It requires a critical introspection of how the researcher influenced the choice of study topic, the research questions posed, the methods employed, data gathering, analysis, as well as the interpretation of the results.

The researcher acknowledged and critically examined personal biases, assumptions, and values that could have influenced the research findings and process. This was achieved by ensuring to only speak to and make deductions based on what the results indicated. Due to the researchers' poor mathematical background, the statistical results were unpacked with the help of a colleague who has many years' experiences in quantitative research. The qualitative results were further analysed by my academic mentor to get a different perspective of the results. This reflexive stance helped ensure transparency and increased the study's credibility (Finlay, 2002).

Credibility, Transferability, Dependability, and Confirmability:

The study sought to maintain 'credibility, transferability, dependability, and confirmability' as defined by Lincoln & Guba (1985). Credibility was ensured through the consistent application of methodological procedures and triangulation of data sources. Transferability, or the potential for the findings to be applicable to other contexts, was established through a detailed description of the research context and the participants. Dependability, the stability of data over time and conditions, was achieved through a clear and thorough recording of all research procedures and data collection methods. Confirmability, which refers to the objectivity or neutrality of the data, was ensured through reflexivity and systematic data analysis procedures.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1. Introduction

This research study addresses the need to improve South African Primary School teachers' innovative ability to deliver curriculum through the help of ICT-TPD. There is great potential for ICT to revolutionise teaching and learning processes in the classroom, but incorporating the requisite ICT tools into daily pedagogic practice presents various problems, as seen by the delayed integration of these tools in the classroom. It is thus important to assess the impact of an ICT in-service training programme delivered at a primary school in Gauteng, particularly in terms of promoting teachers' innovative use of ICTs for teaching and learning.

This research is informed by three sets of objectives, which are: to assess the teachers' level of innovation prior to the training, to reflect on the delivery of the training programme, and to determine if the ICT training approach has resulted in teachers' innovativeness in their delivery of the curriculum. The study employed a mixed-methods research design to achieve the set objectives and answer the research questions, which are, *'what is the teachers' level of innovation prior to the training?'* *'What processes and strategies characterised the implementation of the course delivery within the ICT training programme?'* As well as *'in what way has the training approach used in the ICT training programme resulted in teachers' innovative delivery of the curriculum?'* These questions are led by the overarching question, *In what way does a training programme focusing on developing online materials promote innovation in the use of ICT for teaching and learning?* The research design used in this study incorporates both qualitative methods of data collection, namely: open-ended interviews, field notes, and an online post-training survey; and quantitative methods, such as a survey and a criterion-referenced rubric.

This chapter presents the data that was collected and analysed as part of the study. The analysis forms the backbone of the research, which provides the evidence necessary to address the research aims and objectives as provided in chapter one. This chapter sheds light on the extent to which the ICT training approach fostered teacher innovation in curriculum delivery, as well as how the approach used to roll-out the training could be adapted for future, larger scale implementation.

Because this is a mixed-methods study, the first chapter will discuss the quantitative data obtained from descriptive statistics applied to the original survey responses and the criterion-referenced rubric evaluations of the instructors' E-portfolios. This will be followed by the results of qualitative data collected through open-ended interviews, field notes, and open-ended replies from a final survey. Each topic detected in the data will be examined in light of the research objectives. Furthermore, the qualitative findings will be triangulated with quantitative results to provide a more complete knowledge and study of the influence of the ICT-TPD training strategy on teacher creativity in curricular delivery.

4.2. Quantitative Data Results

Description of the study participants

This study's data is derived from a sample of primary school teachers who partook in an open, face-to-face ICT-Teacher Professional Development (TPD) course training. The study's initial participant pool consisted of 30 teachers who completed the introductory digital competency survey. Although half of these teachers initially expressed interest in participating in the research study, this number dwindled as the TPD course training progressed. Ultimately, only ten teachers demonstrated consistent commitment to the ICT-TPD training. Of these, six teachers showed remarkable resilience, not only by completing all the course training tasks but also actively engaging with the course content. It is the data from these six teachers that forms the focus of the analysis in this study.

The demographics of the participants provide a critical context for the study. These participants' ages varied. This provided a good comparison between the young and the older group of participants. The youngest participant fell into the age bracket of 25-30 years, while two participants were aged between 31-40 years. One participant was aged between 41-50 years, and the two oldest participants fell within the age range of 51-60 years. Although the study's sample was not very broad in numbers, this spread across age groups, however, enabled a broad view of digital competency and attitudes towards ICT integration across different career stages.

Gender representation in the sample was balanced, with three males and three females. Five of the participants identified as Black Africans, while one participant identified as Indian. All participants resided and worked within the Johannesburg area, which ensured the study's relevance to the local education context. However, it is important to note that the participants did not disclose information about the economic background of the areas in which they reside, an aspect which may have contextual significance in a comprehensive understanding of their ICT usage and access, as their economic background could provide the likelihood of their affordability in accessing ICT devices for personal use. These demographics lay the groundwork for a nuanced analysis of the ICT-TPD course training's effectiveness and the extent to which it fostered innovative curriculum delivery practices amongst the teachers.

Analysis of data collected from the participants.

4.2.1. Quantitative Survey:

As discussed in chapter 3.6.2 to understand the participants' level of digital competency and familiarity before partaking in this study's ICT training programme, an initial digital survey was conducted. The questions, in *Table 4.1.*, were asked in this initial survey. These questions were aimed at answering the first research sub-question, which enquired the teachers' levels of innovation prior to the training provided as part of this research.

Table 4.1: Survey questions

1. **Access and Infrastructure:** Questions about internet access, device ownership, and familiarity with virtual conferencing applications.
 - How do you access the internet?
 - Which of the following devices [cellphone, laptop, tablet] do you own or have regular access to?
 - Which of the following devices [cellphone, laptop, tablet] do you own?
2. **Familiarity with Digital Tools:** Question regarding awareness and use of virtual conferencing platforms.
 - Which of the following virtual conferencing applications are you familiar with?
3. **Technological Proficiency:** Questions gauging the level of knowledge and skills with specific software and policy understanding.
 - Please rate your knowledge and skills on the following:
 - [South African ICT in Education Policy]
 - [Microsoft Word to create Content]
 - [Microsoft Word for lesson prep and assessment]
 - [Microsoft PowerPoint to present lessons]
 - [Microsoft PowerPoint to create Content]
 - [Microsoft Excel to record, calculate and evaluate assessment]
 - [Any online tool to teach or assess learners]
4. **Tool Utilisation in Teaching:** Questions about the practical application of ICT tools in the classroom.
 - Which of the following [ICT tools/software] do you use in your lessons?
 - [Microsoft Word to create Content]
 - [Microsoft Word for lesson prep and assessment]
 - [Microsoft PowerPoint to present lessons]
 - [Microsoft PowerPoint to create Content]
 - [Microsoft Excel to record, calculate and evaluate assessment]
 - [Any online tool to teach or assess learners]

This research sub-question was designed to assess the existing skill set, familiarity, and attitudes towards ICT among the teachers prior to the start of the training programme. The intention was to gather baseline data against which the impact of the ICT training could subsequently be measured at the end of the study.

These questions were set at determining the teachers' pre-existing infrastructure and tool capacity, which is a critical foundation for any form of ICT integration and innovation. The survey also set out to understand teachers' mental associations with computers, through a one-word response and its subsequent explanation, where teachers were asked to associate a metaphor to the notion of ICTs. This was intended to capture the teachers' psychological relationship with the innovation tool, which can provide insights into their potential receptivity towards technology as well as barriers they may face in adopting innovative practices using the ICT tools.

Finally, the survey required teachers to rate their knowledge and skills in several key areas of ICT use in education, such as their understanding of South African ICT in Education Policy, the use of Microsoft Office tools for various education-related tasks, and the use of any online tool for teaching or assessing learners. This helped to establish a clear picture of the teachers' existing ICT competencies, both in terms of policy awareness and practical skills.

In essence, the aim of the first research sub-question, as reflected in the survey design, was to understand the teachers' ICT navigation before the training began as well as the extent to which they were innovative in using ICTs. This baseline understanding is important to recognise the magnitude of change and innovation that the training could possibly bring about in their professional practice.

Survey Descriptive Statistics:

This section provides an overview of the quantitative data results for the initial survey conducted prior to the commencement of the ICT-TPD training. The first five tables, Table 4.2 - Table 4.6, provide a summary of the responses. As discussed in Chapter 3, although the population size was 30, the sample size, however, amounted to only 6 participants whose data could be analysed for this research. This is why the following outline of the number of participants and responses are as per the sample size of six respondents.

Table 4.2 provides a summary of the record of participants involved in the study's data collection. It indicates that all the six sample participants provided a response in this survey: The "No." column shows how many responses were given for each category; the "Valid Percent" column shows the percentage of given responses out of the total expected responses, and excludes any missing responses; the "Missing No." counts how many responses are missing for each category; the "Missing Percent" represents the percentage of expected responses that were not given for each category; the "Total No." indicates the sum of given and missing responses for each category; and lastly, the "Total Percent" shows all the percentage of expected responses and combines the given and missing ones.

Table 4.2: Case Sample Summary

	Cases					
	Valid		Missing		Total	
	No.	Percent	No.	Percent	No.	Percent
Internet Access	6	100,0%	0	0,0%	6	100,0%
Frequently Used Virtual Conferencing	6	100,0%	0	0,0%	6	100,0%
Regularly Accessed Devices	6	100,0%	0	0,0%	6	100,0%
Devices Owned	6	100,0%	0	0,0%	6	100,0%
Knowledge of and Familiarity with ICT Policy and Tools	6	100,0%	0	0,0%	6	100,0%
Tool Utilisation in Teaching	5	83,3%	1	16,7%	6	100,0%

In short, Table 4.2 indicates that data was collected from six participants who gave responses regarding their *internet access, use of virtual conferencing tools, device accessibility, familiarity with ICT policy and tools, and utilisation of ICT tools in teaching*. It shows that all participants reported having internet access, regularly using virtual conferencing tools, having regular access to and owning [digital] devices, as well as being knowledgeable about ICT policy and tools. However, there was one missing response regarding the utilisation of ICT tools in teaching, with five out of six participants reporting their [digital] tool utilisation. Overall, the data indicates high levels of technology access, familiarity, and utilisation among the participants, with minimal missing responses across the categories that were surveyed.

In Tables 4.3 to 4.7, the responses have been categorised into four categories: *Access and Infrastructure, Familiarity with Digital Tools, Technological Proficiency, and Tool Utilisation in Teaching*. To better interpret the tables presented, the following descriptions should be considered: In the “No.” column, the data represents the total number of people who gave an answer for each question.; the “Valid Percent” column indicates what portion of the total answers are usable for interpretation.; “Missing No.”, this column shows how many people did not answer a question.; the “Missing Percent” column represents the portion of the total answers that are missing or incomplete; the “Total No.” column shows the number of answers, including those that were complete and those that were missing; and lastly, the “Total Percent” column confirms that all the expected answers, both complete or missing, have been accounted for.

It is important to note that the “percentage of cases” may exceed 100% and appear distorted. However, this calculation takes into consideration that one participant may have access to more than one tool or software, therefore, resulting in the outcome appearing as overstated.

Access and Infrastructure:

Table 4.3 outlines the data summary of the survey question related to Internet Accessibility. In analysing the statistics to the survey question, “How do you access the internet?” There are four internet access options provided for participants to choose from and indicate their internet access points, namely, cellphone, the school’s Wi-Fi, the individual’s personal home Wi-Fi and or the internet cafe.

Table 4.3: Internet Access

		Responses		Percent of Cases
		No.	Percent	
How do you access the internet?	Cellphone	4	36,4%	66,7%
	School Wi-Fi	3	27,3%	50,0%
	Home Wi-Fi	3	27,3%	50,0%
	Internet café	1	9,1%	16,7%
Total		11	100,0%	183,3%

Table 4.3 illustrates how participants access their internet by indicating the percentage of cases for each method. Most participants (36.4%) use their cellphones to access the internet, followed by 27% of the participants using the school Wi-Fi and home Wi-Fi, and finally a smaller percentage of 9.1% uses internet cafes to access the internet. The total percentage of cases (183,3%) exceeds 100% due to participants selecting multiple options to indicate their internet access, which shows that the participants can access the internet from more than a single platform.

The following Tables, 4.4 and 4.5, indicate the responses to the survey questions that enquired about participants' regularly accessed devices, as well those owned by the participants, "Which of the following devices do you own or have regular access to?" and "Which of the following devices do you own?". It is important to understand that, in distinguishing between these questions, the one asks for mere access and the other for ownership; this suggests that one is able to access a device without owning it. However, ownership subsequently means access. For these questions, three devices were provided as options to choose from, a *cell phone*, *laptop* and a *tablet*.

Table 4.4: Regularly Accessed Devices

		Responses		
		No.	Percent	Percent of Cases
Which of the following devices do you have access to?	Cellphone	6	60,0%	100,0%
	Laptop	4	40,0%	66,7%
Total		10	100,0%	166,7%

Table 4.4 accounts for 10 responses in total with a total case percentage (166,7%) exceeding 100%. This is due to participants being allowed to select multiple access options, thus indicating that they have access to more devices. Cellphones are essential and as such, the table illustrates that all six participants have access to a cellphone (60%) while only 4 (40%) of the 6 participants have access to a laptop. The low access percentage could be attributed to how costly it is to buy and maintain a laptop.

Table 4.5: Devices Owned

		Responses		
		No.	Percent	Percent of Case
Which of the following devices do you own?	Cellphone	6	54,5%	100,0%
	Laptop	5	45,5%	83,3%
Total		11	100,0%	183,3%

In contrast to Table 4.4, Table 4.5 accounts for 11 responses at a case percentage of 183,3%. The table indicates that while all the participants owned a cellphone (54,5%), which coincides with the number of participants with access to cellphones in Table 4.5, only 5 participants (45,5%) owned a laptop. However, there is a discrepancy between the number of participants who own a laptop (5) versus those who just have access (4) to it. As ownership should mean access, it would be expected that the number of participants who own or have access to a laptop would either be the same or that access would exceed ownership. This discrepancy, therefore, raises questions about the accuracy or interpretation of the data in these two tables, 4.5 and 4.6, as well as how well the participants understood the questions.

Familiarity with Digital Tools:

Table 4.6 provides the results for the survey question enquiring the participants frequently used virtual conferencing application, “Which virtual conferencing are you familiar with”. The options given for this question were, *Zoom Video Communications*, *Microsoft TEAMS*, and *Google Meets*.

Table 4.6: Frequently Used Virtual Conferencing

		Responses		Percent of Cases
		No.	Percent	
Which virtual conferencing do you use?	Zoom	3	30,0%	50,0%
	TEAMS	6	60,0%	100,0%
	Google Meet	1	10,0%	16,7%
Total		10	100,0%	166,7%

Table 4.6 indicates that the majority of participants (60.0%) reported using TEAMS, followed by Zoom (30.0%) and then Google Meet (10.0%). The total percentage of cases (166,7%) exceeds 100% because there are participants who selected multiple platforms, further indicating that the participants have access to more than one platform. Overall, the table shows 10 responses, with each response representing a percentage of the total cases surveyed (100%). Again, the participants’ selection of more than one virtual conferencing application illustrates that the participants frequently use and have access to more than one virtual conferencing platform.

Technological Proficiency

The following response summary from Table 4.7 provides responses from the survey question that sought to determine the teacher’s knowledge of and familiarity with the South African ICT in Education Policy, as well ICT teaching and learning tools *for content creation*.

Table 4.7: Knowledge of and Familiarity with ICT Policy and Tools

		Responses		Percent of Cases
		No.	Percent	
Knowledge of the ICT Policy & Tools	South African ICT in Education Policy	3	13,6%	50,0%
	MS Word to create Content	4	18,2%	66,7%
	MS Word for lesson preparation and assessment	3	13,6%	50,0%
	MS PowerPoint to create Content	4	18,2%	66,7%
	MS PowerPoint to present lessons	3	13,6%	50,0%
	MS Excel to record, calculate and evaluate assessment	3	13,6%	50,0%
	Any online tool to teach or assess learners	2	9,1%	33,3%
Total		22	100,0%	366,7%

Table 4.7 indicates varying levels of familiarity with different ICT tools and policies. For example, 14.8% of participants reported using MS Word to develop content, while a slightly higher percentage (14.8%) reported using it to prepare lessons and assessments. Similarly, 11.1% of participants indicated a familiarity with the South African ICT in Education Policy. The total percentage of cases (366,7%) exceeds 100% because participants were allowed to select multiple options. These multiple selections indicate that the participants are familiar with more than one application for the purpose of either their administration or creating educational material. Overall, the table accounts for 22 responses, with each response representing a percentage of the total cases surveyed (100%).

Tool Utilisation in Teaching:

Table 4.8 provides a summary of the responses given in the survey, for the question “Which of the following do you use in your lessons?”. The options provided to choose from for these questions were, “Microsoft Word to create Content; Microsoft Word for lesson prep and assessment; Microsoft PowerPoint to present lessons; Microsoft PowerPoint to create Content; Microsoft Excel to record, calculate and evaluate assessment; Any online tool to teach or assess learners”.

Table 4.8: Tool Utilisation for Teaching

		Responses		Percent of Cases
		No.	Percent	
Which of the following do you use in your lessons?	MS Word to create Content	1	10%	16,7%
	MS Word for lesson preparation and assessment	4	40%	66,7%
	MS PowerPoint to create Content	1	10%	16,7%
	MS PowerPoint to present lessons	1	10%	16,7%
	MS Excel to record, calculate and evaluate assessment	2	20%	33,3%
	Any online tool to teach or assess learners	1	10%	16,7%
Total		10	100%	166,7%

The dataset in Table 4.8 illustrates that Microsoft Word for lesson preparation and assessment is the most commonly used tool, with 40% of respondents utilising it. Microsoft Excel for recording, calculating, and evaluating assessments follows, with 20% of respondents using it. Microsoft Word to create content, Microsoft PowerPoint to create content, Microsoft PowerPoint to present lessons, and any online tool for teaching or assessing learners are each used by 10% of respondents. Overall, the total percentage exceeds 100% (166,7%) due to some respondents using and having selected multiple tools. These findings indicate a limited range of tools utilised by teachers in their teaching practices, with Microsoft Word and Excel being the most prevalent among the surveyed respondents and the others being underutilised.

Table 4.9 outlines the overall descriptive statistics for the initial quantitative survey questionnaire that was aimed at providing a response to the first research sub-question. The table summarises statistics for the various survey indicators related to internet access, virtual conferencing, devices accessed and owned, and familiarity with ICT policy and tools. For each indicator, the table shows the number of respondents, the minimum and maximum values, the mean (average), and the standard deviation (a measure of how much the values vary from the average). To understand the table, the following can be considered for the minimum, maximum, mean and standard deviation:

The **minimum** value in the dataset represents the smallest observation or data point within that variable. For example, within a set of variables, the minimum value of 0, would indicate that a respondent *did not have* access to the suggested tool; The **maximum** value in the dataset represents the largest observation or data point within that variable. For example, within a set of variables, the maximum value of 1, would indicate that a respondent *had* access to the suggested tool; The **mean**, which is a measure of central

tendency, represents the average value within a dataset by summarising all the variable's values and dividing them by the number of observations; The ***standard deviation*** is a way to measure how spread out data is, it indicates how much individual data points are different from the average (mean). If the standard deviation is small, it means most data points are close to the average, while a big standard deviation means the data points are more spread out, showing more differences from the average.

Table 4.9: Overall Descriptive Statistics

Survey Indicators		No.	Minimum	Maximum	Mean	Std. Deviation
Internet Access	Cellphone	6	0	1	,67	,516
	SchoolWIFI	6	0	1	,50	,548
	HomeWIFI	6	0	1	,50	,548
	Internet cafe	6	0	1	,17	,408
Frequently Used Virtual Conferencing	Zoom	6	0	1	,50	,548
	TEAMS	6	1	1	1,00	,000
	Google Meet	6	0	1	,17	,408
Regularly Accessed Devices	Cellphone	6	1	1	1,00	,000
	Tablet	6	0	0	,00	,000
	Laptop	6	0	1	,67	,516
Devices Owned	Cellphone	6	1	1	1,00	,000
	Tablet	6	0	0	,00	,000
	Laptop	6	0	1	,83	,408
Knowledge of and Familiarity with ICT Policy and Tools	South African ICT in Education Policy	6	0	4	1,83	1,722
	Microsoft Word to create Content	6	1	4	2,00	1,549
	Microsoft Word for lesson prep and assessment	6	1	4	1,83	1,169
	Microsoft PowerPoint to create Content	6	0	4	1,33	1,366
	Microsoft PowerPoint to present lessons	6	0	4	1,83	1,722
	Microsoft Excel to record, calculate and evaluate assessment	6	0	4	1,83	1,722
	Any online tool to teach or assess learners	6	0	4	1,67	1,862
Tool Utilisation in Teaching:	Microsoft Word to create Content	5	0	1	0,17	0,41
	Microsoft Word for lesson prep and assessment	5	0	1	0,83	0,41
	Microsoft PowerPoint to create Content	5	0	1	0,17	0,41
	Microsoft PowerPoint to present lessons	5	0	1	0,00	0,00
	Microsoft Excel to record, calculate and evaluate assessment.	5	0	1	0,33	0,52

Any online tool to teach or assess learners.	5	0	1	0,17	0,41
Valid N (listwise)	6				

Based on the descriptive statistics presented in Table 4.9, the following deductions can be made for each of the survey indicators:

Access and Infrastructure:

The Internet Access

The mean values for these indicators are all around 0.5, indicating that, on average, approximately half of the respondents (3/6 individuals) have access to each of these internet sources. The standard deviations are relatively low which indicates a relatively low variability in internet access among the respondents. This further indicates that the majority of respondents have similar, as well as multiple, access patterns.

Regularly Accessed Devices

The mean values are high, indicating that, on average, respondents have **regular access** to a cellphone and laptop, and collectively do not have access to a tablet. The standard deviations are very low or at zero, implying that there is a minimal variability in the regular access, or lack thereof, to these devices among the respondents.

Devices Owned

The mean values are all 1.00 for the Cellphone and Laptop options, which indicates that all respondents own these two devices. However, similarly, none of them own a tablet. The standard deviations are zero for the ownership of a cellphone and tablet, which suggests that there is no variability; all respondents either own or do not own these devices.

Familiarity with Digital Tools:

Frequently Used Virtual Conferencing

These indicators assess the participants' frequency of using virtual conferencing platforms such as Zoom, TEAMS, and Google Meet. The mean values indicate that, on average, the respondents frequently use these virtual conferencing tools. Zoom, in particular, has a mean of 1.00, showing that all respondents frequently used it. The standard deviations are low, indicating little variability in the usage of these virtual conferencing platforms among the respondents.

Technological Proficiency:

Knowledge of and Familiarity with ICT Policy and Tools

These indicators as presented in Table 4.7 and summarised in Table 4.8 measure respondents' familiarity with and knowledge regarding the South African ICT in Education Policy as well as various software tools. The mean values for these indicators are moderate, suggesting that

the respondents generally have some level of familiarity or knowledge with these policies and tools. Furthermore, the standard deviations vary, indicating differing levels of variability in respondents' knowledge and familiarity with these aspects. For instance:

Familiarity with ICT in Education Policy:

The data for the South African ICT in Education Policy indicates a range of familiarity among the respondents. The minimum score of 0 suggests that some participants may have no awareness of this policy. Conversely, the maximum score of 4 indicates that other respondents are knowledgeable about it. On average, the respondents have a moderate familiarity level, as reflected by the mean score of approximately 1.83. However, the relatively high standard deviation of about 1.722 indicates a notable difference and gap between the respondents who are familiar with the e-education policy and those who are not.

Familiarity with ICT tools:

The mean scores for participants' familiarity with technological tools (such as Microsoft Word, PowerPoint, and Excel) indicate moderate levels of familiarity. The standard deviations (ranging from 1.169 to 1.862) show substantial differences in participants' knowledge and familiarity with these digital applications. This variety emphasises the importance of adapting training programmes to participants' varying skill levels and learning needs, to ensure that all participants receive sufficient assistance and direction to improve their ICT skills.

Tool Utilisation in Teaching:

Practical use in the classroom

The mean scores for tool utilisation in teaching reflect how frequently participants used various ICT tools (e.g., Microsoft Word, PowerPoint, and Excel). The standard deviations (ranging from 0.17 to 0.52) indicate some variation in the utilisation of tools among participants, which indicates variances in how these technologies are integrated into teaching approaches. This heterogeneity emphasises the need for focused ICT interventions to promote more consistent and effective use of ICT tools, which aligns with the study's goal of exploring ICT utilisation in education and fostering curriculum innovation.

In essence, Table 4.9 indicates that all the participants had access to the internet through their cellphones, while access through school WIFI and home WIFI was also common, but not used or accessed by everyone. Internet access via internet cafes was also less frequent. TEAMS was the most frequently used virtual conferencing platform, followed by Zoom and Google Meet. All the respondents owned a cellphone, but the ownership of tablets and laptops was less common. The reason behind the ownership of one device over the other could be attributed to the costs involved in purchasing the devices. Similarly, while most respondents were familiar with tools like Microsoft Word and PowerPoint, their familiarity with the South African ICT in Education Policy varied. Moreover, their tool utilisation, prior to the ICT-TPD intervention, was limited with respondents mostly using Microsoft Word for lesson preparation and assessment, as well as Microsoft Excel for the recording, calculation, and evaluation of assessments. Overall, the table offers valuable insights into the participants' technology access,

familiarity and utilisation proficiency with ICT tools and policies, highlighting areas of strength and potential improvement.

4.2.2. Criterion Referenced Rubric (CRR) for E-portfolio:

The criterion referenced rubric was used to determine the teachers' creative use of ICTs for an innovative delivery of the curriculum. The rubric was used to assess the impact of the training programme on teachers' adoption of innovative curriculum delivery methods following the integration of ICT tools into their teaching practices. Specifically, after participating in the ICT-TPD training, which was guided by the conceptual framework depicted in Figure 2.3 of Chapter 2.3; this rubric in Table 4.10, was used to evaluate whether the teachers' ICT levels had improved, compared to their levels indicated in the pre-training survey results. The effectiveness of this training approach was then measured against the results obtained in the CRR, indicating whether teachers had become more innovative in their development and delivery of content material. To display the level of innovation fostered in the ICT-TPD programme, participants were tasked with creating E-Portfolios through Google Sites. Within these E-Portfolios, participants were instructed to consolidate all the digital materials they developed throughout the training.

Table 4.10: Rubric for training engagement and E-Portfolio

COMPETENCIES	LEVEL OF COMPETENCY		
	Level 1 EXPLORATION	Level 2 INTEGRATION	Level 3 INNOVATION
Technology Ability to pick and apply a variety of technological tools for appropriate, responsible, and efficient reasons, including knowing the principles that govern them, how to combine them, and the licences that limit their usage.	Recognises and understands various technological tools and their possible integration into educational practices.	Educators use a variety of technological tools depending on their role, curricular area, level, and context. <i>e.g., computer for admin, cell phone for communication and knowledge with colleagues/parents/students</i>	Utilises diverse technology knowledge to create creative learning environments and solve context-specific challenges. <i>e.g., designing and sharing interactive remedial worksheets (or anything similar) with students/parents via the variety of technological tools</i>
Communicative Demonstrates proficiency in synchronous and asynchronous educational conversations utilising Professional Learning Communities (PLCs).	Communicates with the educational community through a variety of ICT-related channels and languages. <i>(PLC groups).</i>	Creates collaborative work practices in school based on experience with ICT networks and communities.	Participates in communities and completes learning assignments on Google Sites (e-portfolio) utilising ICT-enabled languages.
Pedagogical ability to use ICT for teaching and learning, while understanding its potential and limitations for both student and professional	Identifies and is aware of new techniques and ways for using ICT as a tool in his or her professional activity.	<i>Suggests various learning practices that utilise ICT to help pupils learn.</i> <i>e.g., ability to suggest.</i>	Leads significant experiences for themselves and others, including varied learning environments based on students' needs and interests.

development.		strategies that might or might not be possible to implement within their context such. Kahoots game that requires all students to have a cell phone device in class.	e.g., incorporation of interactive worksheets and PPT presentations; using gamification
Management's ability to use ICT for successful planning, organisation, administration, and evaluation of educational processes, including both instructional practices and institutional development.	Organises professional activities using ICT.	Implements ICT to improve his or her institution's managerial, academic, administrative, and community-related procedures.	Suggests and leads activities to improve the integrated operations of school administration.

To better understand the rubric in Table 4.10, the competency levels can be interpreted as follows: An individual in the Exploration level is familiar with technology but is still discovering its potential in education (UNESCO, 2011). They would use ICT technologies for basic tasks like administration and communication. At the Integration level, the individual would actively incorporate ICTs into their teaching, learning, and administrative processes (UNESCO, 2011). They would participate in collaborative work and begin to showcase their engagement in online spaces. Lastly, at the Innovation level, individuals are able to leverage ICTs creatively (UNESCO, 2011). They demonstrate their creativity by designing innovative learning materials and leading initiatives to improve educational practices and management processes through innovative ICT use. The goal for any teacher is then to progress to the green level, innovation level.

Out of the six participants who fully engaged in the programme from its commencement to its conclusion, four successfully completed and submitted their E-Portfolios. However, among the four submissions, only three adjusted their sharing settings to grant the researcher viewing access to their sites. Unfortunately, these three participants still had one or two of their materials within their E-Portfolios set to 'private,' preventing the researcher from viewing the content within their E-Portfolios. To address this challenge, the researcher requested direct access to these documents. However, they encountered difficulties in modifying and updating the settings, leading them to sending the original documents via email to the researcher. This workaround enabled the researcher to evaluate the content effectively. Furthermore, the criterion referenced rubric, was also used to assess the participants' overall engagement with the ICT-TPD programme material, experience, and feedback. These results will further be explored and analysed qualitatively. The following criterion reference in *Table 4.10* was used to assess the participants' E-Portfolios.

CRR Descriptive Statistics:

This section provides an overview of the quantitative data results derived from the data collected in the Criterion Referenced Rubric. The analysis focuses on four key competency

dimensions which are, '*Technology-Use, Communication and Collaboration, Pedagogical Practice, and Management-Use*.'. These are assessed on a three-level scale of Exploration (level 1), Integration (level 2), and Innovation (level 3). These findings provide insights into the current state of competency development among the participants and serves as a foundation for the subsequent discussions regarding the innovative curriculum delivery through ICT teacher professional development and the ICT-TPD training that was provided to the participants of the research.

The following should be considered to help with the interpretation of Tables 4.11 - 4.14; The *Frequency* tells us how many participants fall into each category of technology use (exploration or innovation). The *Percent* column shows the percentage of participants in each category relative to the total number of participants (out of six). The *Valid Percent* represents the percentage of participants within each category but excludes any missing or invalid responses. The *Cumulative Percent* column shows the total percentage of participants up to each category, helping us understand the overall distribution of participants across categories.

Table 4.10 provides the results summary for the technology competency which evaluates a participant's capacity to choose and utilise a diverse range of technological tools for appropriate, accountable, and effective purposes. It also assesses their comprehension of the underlying principles guiding these tools, their ability to integrate them effectively, and their awareness of any shareability restrictions that may limit their usage.

Table 4.11: Technology-Use

	Frequency	Percent	Valid Percent	Cumulative Percent
Exploration	1	16,7	16,7	16,7
Innovation	5	83,3	83,3	100,0
Total	6	100,0	100,0	

Table 4.11 indicates that 1 out of 6 participants (16.7%) falls into the "Exploration" level for the "Technology" competency, while the majority, 5 out of 6 participants (83.3%), are at the "Innovation" level. This suggests that there is a significant portion of the participants who have demonstrated a high level of competency in being able to utilise technological tools for relevant, responsible, and efficient purposes such as designing and sharing interactive remedial worksheets (or anything similar) with students/parents via the variety of technological tools and platforms available.

Table 4.12 shows the results for the Communication competency. This competency category examines the participant's capability to engage in educational discussions, both synchronously and asynchronously, while effectively connecting with Professional Learning Communities (PLC).

Table 4.12: Communication and Collaboration

	Frequency	Percent	Valid Percent	Cumulative Percent
Exploration	1	16,7	16,7	16,7
Integration	2	33,3	33,3	50,0
Innovation	3	50,0	50,0	100,0
Total	6	100,0	100,0	

Table 4.12 shows that out of the six participants, only one falls under the Exploration level, which indicates a basic understanding of the communication tools. Two participants are categorised at the Integration level, which signifies a higher level of proficiency in utilising communication tools effectively. Notably, three participants are placed in the Innovation level, which reflects a basic ability to engage in educational discussions both synchronously and asynchronously with Professional Learning Communities (PLC) using various channels and languages associated with ICT. These results indicate a promising trend towards enhanced communication skills among the participants, with the majority demonstrating an innovative approach in their ICT-led communication abilities within an educational context.

Table 4.13 examines the Pedagogical competence, which assesses the participant's skill in employing ICT to enhance teaching and learning processes. This includes their awareness of the potential and constraints of integrating these technologies into both students' educational development and their own professional growth.

Table 4.13: Pedagogical Practice

	Frequency	Percent	Valid Percent	Cumulative Percent
Integration	4	66,7	66,7	66,7
Innovation	2	33,3	33,3	100,0
Total	6	100,0	100,0	

Table 4.13 results reveal interesting insights into the participants' competencies. The majority, specifically four out of six participants, are placed in the Integration level. This indicates a significant proficiency in using ICT to support teaching and learning processes. Meanwhile, the remaining two participants are categorised at the Innovation level, which suggests that they have gone a step further in recognising the potential of these technologies in both student development and their own professional growth. These findings indicate a generally positive trend in the participants' pedagogical abilities, with a substantial portion demonstrating advanced skills in integrating ICT into educational practices.

Table 4.14 addresses the Management competency. This competency assesses an individual's ability to use ICT to efficiently plan, organise, administer, and evaluate educational processes; it also includes aspects related to teaching practices and institutional development.

Table 4.14: Management-Use

	Frequency	Percent	Valid Percent	Cumulative Percent
Exploration	4	66,7	66,7	66,7
Integration	1	16,7	16,7	83,3
Innovation	1	16,7	16,7	100,0
Total	6	100,0	100,0	

Table 4.14 provides insights into the participants' ability to use ICT for effective planning, organisation, administration, and evaluation in educational processes. This data reveals that the majority of participants, specifically four out of six, are in the Exploration level. This demonstrates competence in using ICT for basic management tasks. One participant is placed in the Integration level, which indicates a higher level of proficiency in incorporating ICT into their educational management practices. Another participant is at the Innovation level, demonstrating an advanced ability to leverage ICT for more innovative and transformative management processes. These findings suggest a varying degree of competence in ICT-based management practices among the participants, with some showing advanced skills in this area and others not.

Table 4.14 presents overall statistics that are related to the participants' competency levels in the four key areas: *Technology-Use*, *Communication and Collaboration*, *Pedagogical Practice*, and *Management-Use*. These statistics are valuable for understanding the extent to which the training approaches employed in the study have influenced the teachers' innovative delivery of the curriculum.

Table 4.14: Statistics

	Participant	Technology-Use	Communication and Collaboration	Pedagogical Practice	Management-Use
N	Valid	6	6	6	6
	Missing	0	0	0	0
Mean		2,67	2,33	2,33	1,50
Median		3,00	2,50	2,00	1,00
Mode		3	3	2	1
Std. Deviation		,816	,816	,516	,837
Variance		,667	,667	,267	,700
Skewness		-2,449	-,857	,968	1,537
Std. Error of Skewness		,845	,845	,845	,845
Range		2	2	1	2

The statistics table can be understood as follows:

Technology-Use Competency: The mean competency score in Technology-Use is 2.67. This suggests that, on average, the participants are at an intermediate level in terms of selecting and using technological tools. This score reflects a reasonably strong grasp of the technological use of these tools. However, it is important to note that the skewness value of -2.349 suggests that the distribution is negatively skewed. This means that a few participants may have lower scores in this area of competence, thus dragging down the average. The median score of 3.00 and the mode of 3 emphasise that the majority of participants are at the intermediate level of competence in this area, while others may have lower scores.

Communication and Collaboration Competency: With regards to the Communication and Collaboration ability, the mean competency score is 2.33, which signifies an intermediate level of proficiency in the educational communication of teachers using ICT as a tool. Similar to the Technology competency, the negative skewness of -0.857 suggests that there may be some participants with lower scores in this aspect, but the majority fall within the intermediate range. The median score of 2.50 and the mode of 3 further support this interpretation.

Pedagogical Practice Competency: According to the results for this competency area, the participants exhibit an average competency level of 2.33 which indicates an intermediate ability to use ICT to support teaching and learning. The positive skewness value (0.968) suggests that more participants may have higher scores in this area, and therefore, a greater level of proficiency. The median score of 2.00 and the mode of 2 confirm that the majority of participants are at the intermediate level or a higher level in terms of their pedagogical competence in employing ICT tools.

Management-Use Competency: In the Management aspect, the mean competency score is 1.50, which is closer to the lower end of the scale. This indicates that, on average, the participants have a lower level of competence in using ICT for effective planning, organisation, and administration of educational processes. The positive skewness (1.537) suggests that there may be a few participants with higher scores, but the majority are in the lower competency range. The median score of 1.00 and the mode of 1 suggest that a significant proportion of participants have lower competencies in this competency area.

Overall, these statistics provide a comprehensive picture of the participants' competencies across the four areas of competency. The results indicate that while participants have achieved intermediate levels of competency in their Technology-Use, Communication and Collaboration abilities, and Pedagogical Practice, there is room for improvement, particularly in the Management-Use aspect. To stimulate teachers' innovative delivery of the curriculum, it may be necessary to focus on enhancing their management competency through tailored training and support. The skewness values also highlight the diversity in the individual competencies, which may suggest the importance of personalised professional development approaches to address specific needs of the participants as well as foster innovation in their curriculum delivery.

4.3. Qualitative Data Results

The purpose of these qualitative data tools was to measure the level of positive impact that the training has had on the participating teachers. In this regard, a positive impact would be determined by the teacher's ability to innovatively integrate ICTs into their daily teaching through the ability of creating creative digital learning material using ICT tools. Counter to this, a negative impact would be determined by there not being any change in the way teachers deliver lessons in their daily teaching. Through a qualitative analysis lens, the results in this section have adopted a thematic structure.

4.3.1. Field notes:

This section presents the findings gathered from the field notes taken during the course of the training. The field notes were recorded before the commencement of each training session. The purpose for this was to understand the teacher's transition after the introduction of each concept explored in the ICT-TPD training programme's session. The qualitative analysis of these notes provides a description of the participants' change in perception of the ICT tools as they gain more exposure and confidence in using them. However, it is important to highlight that, out of the twelve weeks of this ICT-TPD training, there are only six records of these field notes that have been accounted for. This is as a result of notes that were misplaced, thus lost during the course of the study. Due to this incomplete data, it may be difficult to draw in depth conclusions on how teachers' innovation evolved over the twelve weeks of training. However, despite the incomplete nature of these field notes, there are three major themes that arose from the few remaining notes collected: *Smart Learning*, *Resources* and *Parent Feedback*.

Smart Learning

The first important theme that emerged from the field notes is that of Learning Smart. This theme includes the idea of new teaching approaches that involve the use of ICTs. Throughout the ICT-TPD programme, teachers were encouraged to think creatively and experiment with innovative instructional strategies that go beyond standard classroom bounds. To improve student engagement and learning results, digital platforms and resources such as *Microsoft Office*, *Canva* and *Google Workspace* were used to create interactive worksheets and slide presentations, as well as automated assessments. By embracing these innovative ICT teaching tools, educators could cater to varied learning styles and modify their pedagogical approaches to meet students' learning needs in an increasingly digitised environment.

Resources

The second theme to arise from the field notes had to do with the availability of digital resources such as laptops, cellphones, internet connectivity and software applications such as Microsoft Office. Despite teachers' eagerness to incorporate ICTs into their classrooms, many of them faced challenges due to limited access to the relevant digital tools as well as the use of outdated technology. This scarcity of resources limited their ability to fully explore the possibilities of using these digital technologies for education in their teaching practice. Teachers are frustrated by the difference in access to critical resources, which emphasises the need for more assistance and provision of relevant ICT infrastructure to allow effective ICT integration in primary

schools. Addressing these resource restrictions is critical to ensure that all educators have the required ICT tools as well as ICT related support for them to properly use the technology in the classroom for an innovative delivery of the curriculum.

Parent Feedback

The third theme to arise from the field notes was on the impact of feedback on teachers' motivation to continue experimenting with ICTs in their pedagogical practice. Feedback in this regard is particularly the feedback that teachers received from parents regarding the ICT integration initiatives shared with the students. This can be both negative parent criticism as well as positive comments made by parents. Teachers reported feeling demotivated when confronted with parental criticism or lack of engagement with digital skills and educational content. This affected their desire to share digital resources with parents and pupils, which results in a more cautious approach to ICT integration. Despite students' eagerness to use the digital tools, resource constraints restrict them from accessing these materials outside of the classroom. As a result, teachers face issues related to parental expectations and concerns, seeking alternate techniques to include the digital technologies into their instruction while addressing potential adoption barriers.

In essence, these three themes, Learning Smart, Resource Restrictions, and Parental Feedback, illustrate the complex dynamics that are at work in the attempt of ICT integration at primary schools. By addressing these issues, educators and other education stakeholders may work to break down the obstacles, develop better teaching and learning experiences for both educators and students, as well as promote effective ICT use for the innovative delivery of the curriculum.

4.3.2. Interview Results:

This section presents the findings of the interviews conducted with the primary school teachers who participated in the ICT-TPD training programme. These interviews provided valuable insights into how the training approach used positively influenced the teachers' motivation and digital competence, subsequently impacting their readiness to innovate in curriculum delivery through the integration of ICT. The qualitative analysis of these interviews provides a better understanding of the participants' perspectives of the ICT-TPD programme impact on their innovation, which further provides valuable input for the enhancement of future teacher professional development programmes. The emergent themes in these interviews were: *perception, digital competence, motivation, workload, course delivery* and *sustainment*. These themes have been used to present the variety of responses given in the interviews, and further illustrate how all these different themes have an impact on teachers' ability to innovate in their delivery of the curriculum.

Table 4.15: A summary of the emergent interview themes

Main Themes	Associated Sub-themes
Perceptions	Sub-theme 1: Positive outlook Sub-theme 2: Negative outlook Sub-theme 3: Feelings
Digital Competence	Sub-theme 1: ICT familiarity Sub-theme 2: ICT proficiency Sub-theme 3: Innovation in ICT usage
Motivation	Sub-theme 1: Support Sub-theme 2: Collaboration Sub-theme 3: Resource constraints Sub-theme 4: Resilience in the face of challenges Sub-theme 5: Self-improvement and Professional growth
Workload	Sub-theme 1: Time constraints Sub-theme 2: Priorities
Course Delivery	Sub-theme 1: Pace Sub-theme 2: Time Allocation Sub-theme 3: Guidance/Facilitation Sub-theme 4: Instructional Approach Sub-theme 5: Instructional Material
Sustainment	No sub-theme

Perceptions

Perception refers to the point of view of something, essentially the way in which something is understood or interpreted. In this study, the theme perception refers to what the participants understand ICT to be in education as well as how they interpret its potential relevance in their own teaching practices. The theme of “perception” encapsulates the teachers overall understanding of what ICT is, their beliefs about ICT as an educational tool, as well as their *emotions* and *attitudes* regarding the integration of ICT into their teaching. This theme does not cover the participating teachers’ behavioural actions using ICT in the classroom, their technical skills or any external factors that may have contributed to these perceptions. For example, some of the keywords and phrases that emerged for this theme were the words, *nervous*, *very tricky*, and more positive words like *enjoyed* and *interested*.

Subtheme 1: Positive outlook

This subtheme reflects any positive perception characterised by a participant’s eagerness and excitement about the potential use of ICT in the classroom. In practice, a positive outlook is seen when a teacher actively embraces ICT, by seeking out new technological tools, and sharing their excitement with others.

For example, in the interview, when asked about the aspect of the training which she benefited most from, Sarah expressed her initial discomfort with PowerPoint, however,

grew to enjoy and favour it. She also used words such as “*fascinated*” and “*interested*” to describe her outlook on the use and learning of PowerPoint. Figure 4.1 shows a snippet of the response that Sarah gave:

Figure 4.1: Sarah’s response concerning her outlook on the training.

Interviewer: Okay. (5) What aspects of the training do you think you benefited the most from? Sarah: Uh, when PowerPoint, because I wasn't so comfortable with PowerPoint, I enjoyed that. Interviewer: And do you still use it now? Sarah: At home, I usually go through the, the lessons that we did. And the work that I did. Mm-hmm. And so I'm fascinated, you know, I'm so interested that sometimes when I look at it and I say, ah, I did this. And I also said to my and to my children, I have all the children who are married and they have young children as well who are in school right now. So I would send them the lessons. [Interviewer: That's nice.] Can you let my grandchildren listen to this? So I enjoyed power, I enjoyed it. And when we, the interactive, which I also enjoyed that.

Similarly, Laila responded, “*The one of the interactive worksheet, that ones like, it's very interesting.*” Another response included “*the training opened my eyes to, to the various platforms that we do have that are available to us, uh, that, you know, don't necessarily require, uh, monetary commitment,*”, by Ismail, which indicated that some perception of ICT tools as being unaffordable. These responses provided an idea of the participants’ perception of the digital tools, indicating a high ‘relative advantage’ as advocated by Rogers’ Attributes of Innovation.

Subtheme 2: Negative outlook

This subtheme encompasses a less favourable attitude towards the ICT training programme. This does not include scepticism about the effectiveness of using ICT in the classroom, or any resistance or reluctance towards ICT in teaching. In context, a negative outlook manifests as a negative attitude towards any aspect of the training programme, such as the time length, pace or instructional material.

For instance, one of the participants, Thabo, expressed his dissatisfaction with the length of the program meme. His negative attitude towards this was indicated in the words and phrases that he used, such as describing the programme as being “*tedious*” as well as the phrase, “*ah, this is too long*”, when asked about the challenges he experienced during the training. These responses can be found in Appendix B.

Subtheme 3: Feelings

The subtheme takes a deeper look into the participant's emotional responses regarding ICT as a curriculum delivery tool. This includes their fears and anxieties that may hinder them from interacting with ICT. Feelings in practice involve teachers experiencing anxiety or fear when using ICT due to various concerns, including but not limited to the inability to deal with technical issues or a lack of skill in using the technology.

For example, when asked about their experience with technology before the training, Laila's response expressed her initial feeling of fear towards the innovation (Figure 4.2.); For the same question, Priya expressed how she initially found the innovation to be "*tricky*" (Appendix B, p. 12). This suggests that she found the innovation to be challenging at first. When asked about the challenges they experienced during the training, Laila further expressed a feeling of being overwhelmed (Figure 4.3). These responses indicated their feelings towards the use of technology before the ICT training, either finding it scary, uncomfortable, or overwhelming.

Figure 4.2: *Laila's response to the question, "What was your experience with technology before we started the training?"*

Laila:

On my own admin. My own admin. Because yeah, actually I'm scared of using it cause I'm not good at it. So, and the other thing, the main things that we don't have, the resources, we don't have.

Figure 4.3: *Laila's response to the question, "What were the challenges you experienced with the technology during the training?"*

Laila:

Yo, it was a lot. Cause as most of the things I didn't know, as I said, Technology, like I understanding was very limited. So it was difficult for me to find some of the things, especially creating the portfolio. Yes, interactive worksheet. Some of the things, like most of the things, not some, most of them, but I do know about them. Like you go and beyond what we see on the screen and you know about that and what else. Yeah. And then what the TEAMS that we were using, it was difficult. Wifi, sometimes not working and we are left behind. You try to catch up and then, yeah, that was the problem. And the other thing that learning something new, was very like difficult for me learning something new and it's too much at the same time. So it was difficult for me to balance, but it was very interesting.

One of the participants, Thabo, however, was more enthusiastic, indicating that he had a prior “*advanced*” experience with using ICT for education (Appendix B, p. 31). Similarly, Ismail shared that he was “*well versed...[and] well developed*” by using ICTs for teaching before the start of the ICT-TPD training programme (Appendix B, p. 1).

The ‘Perceptions’ theme reveals several perspectives on ICT integration in education. Participants such as Sarah and Laila are enthusiastic, although Thabo is dissatisfied with some aspects of the course. Some, such as Laila and Priya, are initially afraid or uncomfortable with using technology, which may indicate possible challenges that participants could experience in the implementation of ICTs for innovative teaching. Thabo and Ismail, on the other hand, have past experience in the use of ICTs, which may indicate a better grasp and experience in the TPD programme. These findings shed light on participants’ diverse perspectives, revealing both challenges as well as the potential for effective and innovative ICT implementation.

Digital Competence

Digital competence in this study refers to an individual's ability to use digital tools confidently and effectively. It has to do with the skills, knowledge, and capacity, or lack thereof, that are required for the effective use and engagement of ICT tools. The words and phrases that emerged in the participants’ interview responses were, ‘*we had never*’, ‘*limited*’, ‘*overhead projectors*’, and ‘*I know how to...*’. The Digital Competence theme only looked at the participants’ familiarity with ICT tools in their pedagogic practice, how proficient they were, as well as their ability to use ICT tools innovatively within their professional space of teaching and learning. This theme had three sub-themes, *ICT familiarity*, *ICT proficiency* and *Innovation in ICT* usage. The familiarity and proficiency subthemes have similarities and could mistakenly be used interchangeably. However, it is important to note the distinct difference between the two; ICT familiarity refers to the *knowledge of* the tools in teaching, while ICT proficiency refers to the *ability to* use the tools in teaching.

Subtheme 1: ICT familiarity

In this context, ICT familiarity, which is the basic knowledge of digital interactions using ICT tools in education, would be noted by how teachers are comfortable with, however not limited to, running basic digital errands, like sending emails, using online resources such as search engines, and browsing websites. This sub-theme also includes responses that express a lack of experience with using digital tools. The responses that made up this subtheme varied, with some participants expressing a lack of experience with digital tools, while others considered themselves to be more advanced.

For instance, when asked about their experience with technology before the training, Sipho stated that he had never used the tool in his daily teaching (Figure 4.4). Similar to Sipho, Sarah responded that she has never used ICT for teaching before (Figure 4.5). These responses indicate their lack of ICT familiarity within the educational spectrum as well as their pedagogical practice. However, unlike Sipho and Sarah, Thabo had a better knowledge of ICTs as he had “*done a lot of, uh, ICT courses for educators in the past*” (Appendix B, p.31).

Figure 4.4: *Sipho's response to the question, "What was your experience with technology before we started with the ICT training?"*

Sipho:
It was my first time. First time just that I was willing to learn. With things like this one going to Four-IR, I think we have to go into a system of using technology, so I was willing to learn. I wanted to learn not only for me, for my learners also, so that they're not left behind when

Figure 4.5: *Sarah's response to the question, "What was your experience with technology before we started with the ICT training?"*

Sarah:
We had never done that before, but we had sent, uh, homework to children, but it was on paper.

Subtheme 2: ICT proficiency

This subtheme encapsulates the participant's skill and competence in utilising the digital tools effectively and efficiently in an innovative manner. For instance, ICT proficiency can be identified by the teachers' ability to create learning material using digital tools as well as the knowledge of how the tool can be integrated in the classroom. This subtheme, however, was not time-specific as it did not focus on the participants' proficiency at a particular time of the ICT-TPD programme. The responses, therefore, varied, with some highlighting the convenience and improvements experienced by participants, such as the ability to create Google Forms and interactive worksheets, leading to more efficient teaching methods.

In the interview responses, Sipho emphasised the convenience afforded by the ICT tools. When asked about the aspect of the training they benefited from the most, he answered, "*creating a Google form*", explaining how it was time-efficient and easy to use, as well as share with his colleagues (Figure, 4.6).

Figure 4.6: *Sipho's response to the question, "What aspects of the training do you think you benefited the most from?"*

Sipho:
 I, I think, uh, the one for creating a Google form. I think as far, uh, this one helped me a lot, even as now as I've said. Now I don't have to sit down, type something, print it out, send it to teachers.
I can easily do it and then the teacher can easily go to it, uh, especially when they're here, school, get the information at the back end, whatever I wanna do. Even in the office when you're visiting something with the principal, we need the information even from the parents. It's easy to just create something for them. You ask... So I think when it comes to the part creating of, uh, interactive worksheets, paper learners can just go like online, something like online class. They don't have to just look at the pdf, have to sit down and write it. Take a picture, send it back. They can just do it now, get their answers and then send me answers, which I would see as I think Interactive worksheets and, uh, creating Google Form.
 I did benefit a lot and I'm using this now.

Thabo, when asked the same question, stated that both his familiarity and proficiency had improved in the knowledge and use of interactive worksheets and Canva (Figure 4.7). This indicates that while he had considered himself to be well knowledgeable with the use of ICTs in education, he did, however, learn and gain better proficiency in the use of MS Word for interactive worksheets as well as gained familiarity with Canva.

Figure 4.7: *Thabo's response to the question, "What aspects of the training do you think you benefited the most from?"*

Thabo:
 Um, the interactive worksheets. I think that is got, uh, is like, uh, basically it's got potentially actually going terms of now how we remediate, uh, and mediate, you know, our content when, when it comes to teaching and learning.
 That is the, the one, the interactive worksheet. The Canva also, uh, uh, was the PowerPoint presentation when you actually develop material from slides and Canva. It also does, you know, like, uh, work for me, it worked for me. Um, when, when I developed some, some, some activities, they, and then parent learners actually, um, answered some questions.
 Actually I could see that there was like, basically, You know, like, it was not like unilateral, but it was like, you know, like cycling the, like that, that's, I say I, I, I developed material after that, learners already learned in class learners, uh, sent, uh, the email to the parents, parents responded, help their kids to respond, and then that was like a cyclic kind of thing.

Innovation in ICT Usage focuses on the creative and innovative application of digital technologies within the context of digital competence. This sub-theme explores how individuals with digital competence can harness ICTs to innovate and enhance their teaching. For this subtheme, the participants demonstrated how they used digital tools innovatively to enhance their students' learning experiences, such as by creating educational videos and using platforms like Google Forms for homework assignments. The challenges related to technology, such as load-shedding, were also acknowledged, with the participants actively seeking solutions to ensure their students' continued access to the digital resources. In this context, teachers' innovation would indicate various ICT abilities, including that of creating digital material such as educational videos for students to access outside the classroom.

For instance, some of the responses in the interview indicated how the teacher participants were thinking creatively about how to reach their students beyond the classroom, even with their limited resources. Sipho, for example, shared how he was able to use Google Forms to create lessons which learners could complete at home using only their cell phones (Figure 4.8).

Figure 4.8: *Sipho's response showing his innovative use of ICT.***Sipho:**

It was my first time. First time just that I was willing to learn. With things like this one going to Four-IR, I think we have to go into a system of using technology, so I was willing to learn. I wanted to learn not only for me, for my learners also, so that they're not left behind when they see me standing, they see me with a textbook and show so they can know. Even when they are at home, I can still conduct lessons nicely, understand, uh, make them understand, make them ask question, and then create something for them to do. At the same time, answer it, take notes, then... So, I would send it and they would have to write it down. They can just use their phone to answer through it and then send it back to me, like take them five or 10 minutes.

So I think I've learned so much from this journey.

Similarly, when asked about the challenges they faced with the technology during the training, Ismail highlighted the issue of load-shedding. He had been sharing work with his students via WhatsApp, however, the constant load-shedding limited the access time that students had with the work. In his response he expressed how one has to think proactively when using digital tools that rely on electricity in a context like South Africa (Figure 4.9). This indicated how he was actively considerate of how to deal with the challenges in order to ensure that students were receiving the work regardless of factors such as loadshedding.

Figure 4.9: *Ismail's response to how he dealt with technology-related challenges during the training.***Ismail:**

Uh, the challenges that I experienced with the technology I, I. During that period, I wouldn't say I experienced, um, challenges. I think basically, well, the one sort of like limitation to an extent would be that, you know, the learners had restricted usage of the WhatsApp platform because they had to use it through their parents.

Yeah. So that was, um, just the one challenge that I did have. Uh, so it wasn't necessarily a, a limitation or a challenge as such. It was just like a restriction. I could have certain hours that I could obviously engage with, with the learners, and then it had to be monitored, which is justifiably so. But yeah.

But that was basically the main challenge that I experienced. And, um, yeah, also another challenge that has surfaced, you know, obviously heading towards the project was that of loadshedding. That's, uh, a governmental problem. And unfortunately that that affects all of us. Yeah. So that does, uh, prohibit us. It does restrict. And that was one of my challenges was, was basically the loadshedding, because the, the hours where you can actually engage with these tools, uh, are not so flexible. You've gotta accommodate a loading schedule instead of the schedule accommodating us.

The analysis of the digital competency theme demonstrates that participants had varying levels of familiarity and proficiency with ICT technologies in education. While some acknowledged having little previous exposure, others, such as Thabo, displayed better levels of proficiency due to prior ICT training. Participants demonstrated improved proficiency throughout the training programme, as evidenced by their capacity to design learning materials and incorporate

tools into their method of instruction. Sipho's use of Google Forms for remote learning, as well as Ismail's proactive approach to tackling issues like load-shedding, demonstrate the innovative use of ICT technologies to improve education in the face of challenges. This analysis emphasises the significance of measuring baseline knowledge prior to providing an intervention, in order to provide focused training to improve abilities, and encouraging innovation in ICT usage in order to effectively incorporate technology into pedagogical practices.

Motivation

The theme of motivation refers to the driving force that inspires teachers to engage with and adopt ICT in their teaching practices. It encompasses their inner drive, incentives, and reasons for incorporating technology into the classroom. Motivation is important in innovation adoption because it encourages individuals to embrace change, sustain their efforts, perform better, maintain positivity, adapt, as well as promote innovation to others. Some of the words and phrases that emerged in this theme were '*revision*' (Appendix B, p. 8) which came as a motivating benefit from collaboration because participants were constantly refamiliarising themselves with the skills and content; another example comes from the phrase, '*the learners had restricted usage*' (Appendix B, p. 2) which indicates possible reasons that may have demotivated the participants from continuing with the integration of ICT in their teaching. This theme on motivation had five subthemes that directly impacted the motivating - or demotivating - factors that were crucial in the innovative implementation of ICT in teachers' curriculum delivery. These subthemes are, *Support*, *Collaboration*, *Resource constraints*, *Resilience in the face of challenges*, and *Self-improvement and Professional growth*.

Subtheme 1: Support

The subtheme 'support' refers to the assistance, guidance, and encouragement that is provided to teachers with the intention to motivate them in the effective use of ICT. It can come from colleagues, mentors, administrators, or educational technology specialists. This theme also covers factors that may have made the participants feel like they were not sufficiently supported. The responses in this theme indicated that some participants felt adequately supported, while others, like Thabo, felt "*isolated*" (Appendix B, p. 34) and "*confused*" (Appendix B, p. 33) due to unclear communication during the training. However, Thabo also expressed how the idea of having participants bring their devices to the training assisted in providing engagement (Figure 4.10).

Figure 4.10: *Thabo's response regarding poor structural communication***Thabo:**

Uh, the level of support that was provided.

Actually, I like the idea of, um, uh, trainers actually bringing their own resources into the school. So basically, Was also like key in terms of bringing their laptops and actually showing us from, you know, from scratch. Mm-hmm. How to actually open different programs and how to actually access, you know, certain forms, Google forms, things like that.

So that, for me was supportive, uh, in a sense that they were already ready when you came to class. Um, and also the, the communication. Okay. But it wasn't really, uh, too, didn't actually, um, meet my expectations in terms of now communication on a, on a weekly basis. Okay. Uh, yes. Every now and then, um, ma'am will actually send, you know, like, uh, a WhatsApp or, um, a, a communication through Microsoft. Was it uh Microsoft Teams?

Contrary to Thabo's experience, Sarah felt sufficiently supported both in the training programme by facilitators, as well as at home. She emphasised having received the most motivation from home, her husband, because he had a lot of computer background, "*my husband had done, uh, the computer training in the US...He was like, you go for it. You go for it*" (Appendix B, p. 21).

Subtheme 2: Collaboration

Collaboration represents the positive influence that results from teachers working together with colleagues to share ideas, experiences, and resources related to ICT integration in teaching. For instance, teachers can collaborate in sharing insights on effective strategies for using ICT in their teaching. They can also collaborate, share challenges and experiences, as well as collectively work towards solutions.

In the study's ICT-TPD training programme, participants were encouraged to engage in PLC groups. Priya, who struggled with accessing and using the technology, felt uplifted when participating in the PLC meetings, stating, "*Where you are struggling, they'll come and help you. Looking on what they did*" (Appendix B, p. 16). Similarly, Laila emphasised how she benefited a lot from the revision aspect of the PLC discussions, stating that the PLC groups provided an opportunity for her to revise on the skills taught in the training sessions (Figure 11).

Figure 4.11: *Laila's response on the benefits of PLC groups***Laila:**

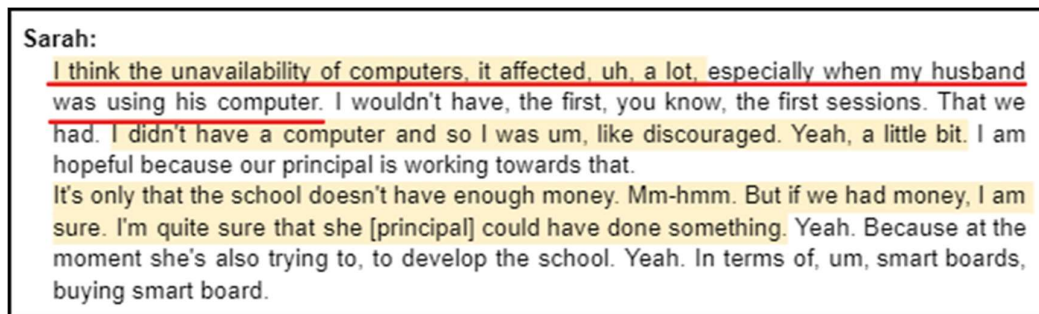
Um, we had to sit after school and go back to what we did in class. Yeah. It really helped that one. Yeah. Going back to what we did. Learning from others that no, we did this. But normally in class I used to take down my own notes, use the computer, also take down. Then when after that we have our PLCs, then we sit and we go back and say, "ma'am said this, that," yeah, it was like revision, it's that.

Subtheme 3: Resource constraints

Resource constraints refers to the negative impact that results from limited access to ICT tools, software, or infrastructure. Teachers who remain motivated in this instance, would find innovative ways to maximise whatever basic resource they have to continue integrating ICT in their teaching. Although in some cases, teachers may be demotivated due to lack of resources.

For instance, although most of the participants had limited resources, they still found ways to keep abreast of the training contents and engage with the skills. Laila, for example, did not have a laptop of her own during most of the training and also had struggles with the “Wifi [that was] sometimes not working” which resulted in her being “left behind” (Appendix B, p. 7). Similarly had to borrow her husband’s computer to complete the activities from the training (Figure 12).

Figure 4.12: Sarah’s response highlighting the unavailability of resources

**Subtheme 4: Resilience in the face of challenges**

This subtheme reflects teachers’ ability to stay motivated in the use of ICT despite encountering obstacles or setbacks in their ICT integration efforts. It involves determination and adaptability in the face of ICT integration challenges by, for example, seeking alternatives through improvisation.

For example, Sarah highlighted how she often felt discouraged because she did not have her own computer, “I didn't have a computer and so I was um, like discouraged. Yeah, a little bit. I am hopeful because our principal is working towards that.” (Appendix B, p. 25). However, even through these resource constraints, she showed resilience until the end of the training with the hope that things would get better. Similarly, most of the other participants also had limited resources, however, continued with the training until the end. These challenges are noted in the previous sub-theme of resource constraints.

Subtheme 5: Self-improvement and Professional growth

The self-improvement and professional growth sub-theme relate to a teacher's intrinsic motivation to continuously develop their skills and knowledge in ICT integration for the benefit of their students. For instance, this sub-theme would be indicated by the teachers’ reason to continue with the training programme.

Sarah, for example, highlighted her pride in the ability to create digital learning material and further stated how she thought she could use the skills she got from the ICT training, to create digital material, to someday make a profit (Figure 13).

Figure 4.13: Sarah's response showing her motivations.

Sarah:
 At home, I usually go through the, the lessons that we did. And the work that I did.
 Mm-hmm. And so I'm fascinated, you know, I'm so interested that sometimes when I look at it and I say, ah, I did this.
 And I also said to my and to my children, I have all the children who are married and they have young children as well who are in school right now. So I would send them the lessons. [Interviewer: That's nice.] Can you let my grandchildren listen to this? So I enjoyed power, I enjoyed it. And when we, the interactive, which I also enjoyed that.
You know, in life when you grow old, but you still want to earn some money. Yes, I can use that. I can use that.

Similarly, Thabo was seeking Self Development and Professional Growth as noted in his response, *"I was just curious. I'm, I'm, I'm, I was just curious to know what it is you are bringing forth, to us educators. So I was hoping to get more, but obviously there are things that I, I learned in terms of, uh, Google forms. I, I never knew about the Google forms, the Canva that you introduced us to, something which is also exciting that I like to use also in the long run in terms of presentations, I actually learned"* (Appendix B, p. 33).

The analysis in this theme reveals a variety of factors that either motivate or demotivate participants in the innovative use of ICT. First, the importance of support is emphasised, with some participants feeling appropriately supported while others, such as Thabo, felt isolated as a result of unclear communication during training. Collaboration has a positive impact, with participants benefiting from shared insights and collaborative problem-solving within PLC groups. Resource limits present challenges, but resilient participants like as Sarah find methods to overcome them, exhibiting adaptability and determination. Finally, self-improvement and professional progress are intrinsic motivators, as demonstrated by Sarah's desire to generate digital learning resources for future profit and Thabo's interest in continual learning. This theory emphasises the multidimensional character of motivation and its critical role in driving teachers' adoption of the ICT innovation in education.

Workload

Workload refers to the overall demands and responsibilities that teachers face in their professional roles. It encompasses various aspects, including time constraints and priorities, which can significantly impact a teacher's ability to effectively integrate ICT in their teaching. Some of the phrases and words that emerged from the interview were 'we were tired', 'time' and 'after hours'. These results are considered in detail below within the two sub-themes *Time constraints* and *Priorities*.

Subtheme 1: Time constraints

This subtheme relates to the limited time available to teachers to commit to their professional demands, while also constructively engaging in the ICT training programme. For instance, teachers usually have extra-mural activities after school, which may be difficult to reschedule for the purpose of attending the ICT training.

In the interview, Sipho emphasised how in order to complete the activities prescribed in the ICT training programme, he would have to stay on the school premises until late. He struggled juggling his professional commitments together with that of the ICT training programme (Figure 4.14).

Figure 4.14: *Sipho's response concerning time constraints.*

Sipho:
 I, I think, uh, I can say maybe not having, uh, internet or wifi, sometimes laptop with people can, and also it's time. I think this training needs to have time.
You need to concentrate. You need. Sit down and then like practically do it. With our teaching term and admin term, there's no time. So I'll have to put more work after, sit down here, because I don't have any wifi at home or no access to the internet. So I have to sit around, stay around the school. If I have to be connected, go late and I'm going with kids, kids to be waiting for me until late.
 So I think that was only issue like, uh, internet and also getting maybe if the laptop is broken, no access of when I take it home, so I have to sit here at school when after hours and then, uh, do maybe some assignments that we have to do.

Similarly, Priya shared the same issue with time constraints, suggesting that the training could have taken place during the school holidays, similar to how the teacher unions, such as NAPTOSA, conducted their professional development workshops. However, Laila suggested the training could have been allocated two days in a week to mitigate the problem of time. Their responses are given in Figure 4.15 and Figure 4.16 respectively.

Figure 4.15: *Priya's response concerning time constraints suggestions.*

Priya:
 I think, I think holidays... so if it's holidays, one week coming, then the rest of the week will give us time. [Interviewer: Okay.] Then you'll see them coming. Yeah.

Figure 4.16: *Laila's response concerning time constraints suggestions.*

Laila:
 I, uh, ish, I don't know, maybe twice per week. Cause now weekends, we're tired during the week. We were here at school and then weekend. You just want to relax and then do the work. We also can take all work home. Maybe you should have maybe came maybe twice per week or maybe thrice. I don't know.
 Maybe it was gonna work.

Subtheme 2: Priorities

Priorities as a sub-theme reflects the choices that teachers make in allocating their time among various professional and personal responsibilities, such as ICT training and integration versus using that time to attend cluster meetings and or staff meetings as well as using the time to attend to personal affairs.

Most of the participants complained about the workload and emphasised the idea of priorities. Many of them felt they had to choose between their professional commitments and that of the ICT training, with the ICT training often falling short of their time. For example, Sarah mentioned how her weekends were often reserved for personal errands (Figure 4.17).

Figure 4.17: Sarah's response regarding the workload

Sarah:

I think holidays could have helped. Mm-hmm. Because, uh, on Saturdays, if teachers, you have that Saturday for whatever week you have at home to do other things, or if you have visited. And so forth. But during the holidays, I think a week could have been better.

Similar to Sarah, Sipho mentioned that while it might have seemed like they were lazy to do the work from the ICT training, that was not the case. Instead, the issue was with time and while they tried to juggle all the work, Sipho, for example, had to focus on work commitments for the following day, *"sometimes we don't get, like, we literally don't get time. We have to try, but since now we have other things have to do tomorrow, I'm sitting there doing, so... we don't get enough time"* (Appendix B, p. 29).

The workload theme analysis illustrates the challenges that participants encounter in balancing their professional responsibilities with ICT training and integration. Time limits are clear, as teachers struggle to balance training with other commitments such their assigned extracurricular activities, as Sipho and Priya have discovered. Furthermore, the sub-theme of priorities emphasises the difficult decisions participants must make between ICT training and other professional obligations, as emphasised by Sarah and Sipho. These findings highlight the relevance of flexible training schedules and organisational assistance in reducing workload demands on participating teachers and promoting effective ICT integration in teaching practices so that teachers have all the opportunities and time to enhance their ICT skills for innovative delivery of the curriculum.

Course Delivery

Course delivery involves the methods and strategies that were employed by instructors to effectively convey the course content and engage participants. In this instance, however, it encompasses the participants' perception of how effective or ineffective the ICT training was by looking at some factors that have either hindered or assisted in achieving the objectives of the training programme. Some of the phrases and words that emerged in this theme were

‘needed some more time’, ‘maybe twice a week’ and ‘breakdown your items’. These are further detailed according to the different sub-themes on *Pace*, *Time Allocation*, *Guidance/Facilitation*, *Instructional Approach*, and *Instructional Material*, below:

Sub-theme 1: Pace

Pace, as perceived by participants, relates to their assessment of the speed at which the course content was presented. In this regard, it is indicated by teachers’ perception of whether the length of the course was either too short, appropriately paced, or too long. The “pace” of course delivery is critical because it influences participants’ capacity to understand the skill presented, directly impacting their learning outcomes and innovative integration of ICT skills into teaching practices. For instance, Priya believed that the delivery of the course was too fast, and she struggled to keep up with the pace. Her response is shown in Figures 4.18 and 4.19.

Figure 4.18: *Priya’s response concerning the pace and breakdown of the course.*

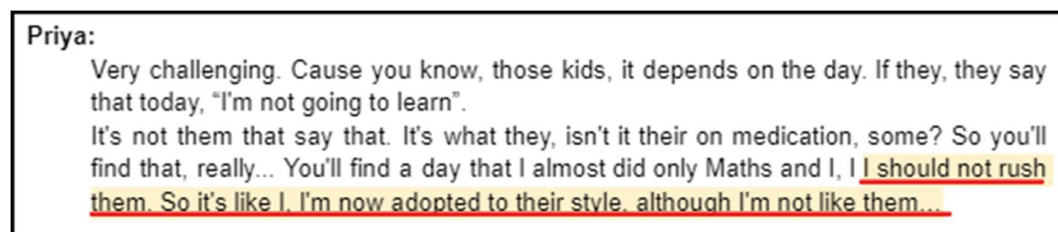
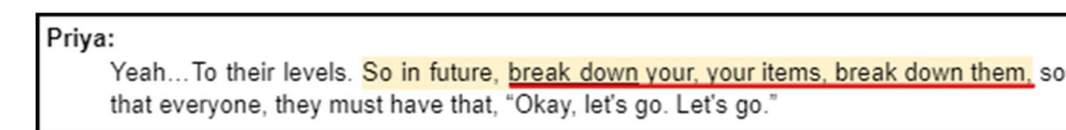


Figure 4.19: *Priya’s response concerning the pace.*



Subtheme 2: Time Allocation

This theme refers to the participants’ perception of how time was distributed among the various course activities and sessions. For instance, participants expressed how they were either frustrated or impressed with the different segments of the training sessions, such as whether or not the time allocated to explaining and emulating the skill as well as practising the skill was sufficient. This also has a direct impact on how well the participants grasp the skills presented.

In the interview, Laila emphasised the importance of presenting the content in defined segments. She felt that the delivery could have allowed more time to focus on a single skill at a time (Figure 4.20). Similarly, Priya suggested that the sessions should have been an hour, with “30 minutes teaching, 30 minutes discussing” (Appendix B, p. 14).

Figure 4.20: *Laila's response concerning the pace.*

Laila:
 Maybe because of time. Maybe just learning one concept or one particular thing at the time, and then you wait for the Yeah, it's time. Everyone to, we like everyone to be in the same like page. Wait for everyone. Now we are there. Like when you are teaching know like with like, we are starting from like, from like I am grade four or my foundation phase. You take me step by step. Like with the grade fours, I'm teaching grade fours.. You take them, step by step, now you write the date, are you done? Now let's go to this step. Are you done? Like unlike just, done date... they like, moving fast. You move with them. Yes, yes.

Subtheme 3: Guidance/Facilitation

Guidance and facilitation, as perceived by the participants, encompasses their experiences with the support and assistance which they believe was provided by facilitators during the course. It reflects how participants assess the effectiveness of facilitators in guiding them through the ICT-related skills and tasks. Although similar to the subtheme on 'support' in the previous 'motivation' theme, guidance and facilitation in this regard refers specifically to the training instructor's presence as well directly impacted by the pacing of the training sessions. Effective guidance and facilitation from instructors during ICT training are critical for participants' comprehension and engagement, with personalised support that addresses individual learning needs being especially important for best results.

For example, Priya enjoyed the facilitators' presence as she stated in her response, "*the way you have been walking around us, it was that you were, you, you, you were making the environment, uh, uh, pleasing*" (Appendix B, p.14). Ismail highlighted the facilitators' knowledge, stating that their guidance was effective because they were, "*aware of, you know, obviously the challenges, uh, in terms of, you know, time constraints, in terms of workload. So, they were very accommodative of that*" (Appendix B, p. 4). On the other hand, Laila felt that the guidance was not enough for her as she emphasised that the facilitators should have altered the delivery pace so that no one was left behind. As such, she thought the guidance was insufficient because of the inappropriate pacing (Figure 4.25).

Figure 4.21: *Laila's response concerning guidance during the training.*

Laila:
 Maybe because of time. Maybe just learning one concept or one particular thing at the time, and then you wait for the Yeah, it's time. Everyone to, we like everyone to be in the same like page. Wait for everyone. Now we are there. Like when you are teaching know like with like, we are starting from like, from like I am grade four or my foundation phase. You take me step by step. Like with the grade fours, I'm teaching grade fours.. You take them, step by step, now you write the date, are you done? Now let's go to this step. Are you done? Like unlike just, done date... they like, moving fast. You move with them. Yes, yes.

Subtheme 4: Instructional Approach

Instructional approach relates to the participant's assessment of the methods and strategies used by the facilitators to engage them and deliver the course content. It reflects the participants' perceptions of the effectiveness and relevance of the chosen instructional approaches, for instance, perhaps participants preferred collaborative activities as opposed to independent work. This includes the effectiveness of the PLC groups as an instructional approach that was used in the ICT course training as informed by literature discussed in chapter 2.3.

Thabo, for example, suggested that it was essential for the instructional approach to involve clear communication and guidance. He emphasised the importance of explaining expectations in advance rather than simply providing instructions remotely via messaging apps, as this can lead to a sense of isolation (Figure 4.22).

Figure 4.22: *Thabo's response concerning the instructional approach.*

Thabo:

To say that this is what you need to do and so forth and so forth. I, I, I, I, I think maybe, uh, maybe if, if possible, if, if, if, if before, before ma'am leaves the, maybe say the development ma'am develops a program today, initiates everything, uh, develops everything, say on a Monday before leaving. It'll be better to actually, uh, explain to say, you know what, this is what I expect next week from you. Not just to leave and then next week and then send via WhatsApp. Say, please follow up on this and this and this. **[Interviewer: Oh, yes.]** And, and it becomes almost distant, like, uh, you know, distant learning. Which we sometimes becomes almost like isolated. You come, you feel isolated.

However, contrary to Thabo's sentiments, Sarah emphasised and appreciated the important role played by the concept of collaboration, as the PLC groups helped reinforce the course content and skills from the training sessions (Figure 4.23).

Figure 4.23: *Sarah's comment on PLC groups*

Sarah:

It helped a lot, especially when, during the time that we were with you. The time was short, isn't it? So some things would pass without the proper understanding, the deep understanding of the thing. So when we met, uh, with a group, Some things would come more clearer because we would explain. You know, when you are peers, you, you push until you understand the thing.

Subtheme 5: Instructional Material

This subtheme encompasses the participants' evaluation of the resources and materials provided by the facilitators to support their learning. It reflects participants' assessments of the usefulness and quality of digital resources that may or may not have been provided to guide their learning.

For instance, Ismail highlights the value of the instructional materials in the form of the various free, accessible and informative online platforms. He appreciates the discovery of these resources and continues to use them for educational and personal purposes, emphasising their significant benefits (Figure 4.24).

Figure 4.24: *Ismail's comment on the instructional material*

Ismail:
 Um, I, I'd say the aspects that I most benefited from was the, the facts that, uh, the training opened my eyes to, to the various platforms that we do have that are available to us, uh, that, you know, don't necessarily require, uh, monetary commitment.
 Um, you know, there are platforms that are quite free. Yeah. Uh, there are platforms that are quite also informative as well, and platforms that are also available to, to the,

Similarly, all the other participants shared the same sentiments regarding the platforms they were introduced and used in the training. Some of the responses were from Laila, *"I didn't know that I could I can do that interactive worksheet, creating those groups, sending work to the learners. You get the responses then and there, and the kids were very excited"* (Appendix B, p. 10); and Thabo *"I learned in terms of, uh, Google forms. I, I never knew about the Google forms, the Canva that you introduced us to, something which is also exciting that I like to use also in the long run in terms of presentations, I actually learned"* (Appendix B, p. 33).

The analysis of the course delivery theme reveals numerous significant factors that influence the success of an ICT-TPD training, such as the above-mentioned subthemes. Participants' perceptions of the pace and time allocation have a direct impact on their comprehension and engagement, with suggestions for changes such as longer sessions or segmenting content to improve focus. Guidance and facilitation are similarly critical, with participants valuing instructor presence and support suited to their specific needs, while concerns about pacing influencing guidance efficacy were highlighted. The instructional style and material are also important, with participants indicating that clear communication, collaborative activities, and access to helpful online resources contribute to good learning experiences.

Sustainment

Sustainment refers to the long-term continuation and effectiveness of the ICT educational practices and skills that may extend beyond the initial training period. It involves strategies to ensure lasting benefits and impacts. For instance, in practice, this may take the form of ICT resource allocation or mentorship programmes. Although this was not a very prominent theme, two participants, however, emphasised its importance.

For example, Ismail, at the end of his interview emphasised the importance of ongoing workshops to support educators. He suggested that if this type of ICT training becomes a continuous programme, held regularly or periodically for newly appointed educators especially, it would contribute to sustaining and advancing their teaching practices over time (Figure 4.25).

Figure 4.25: *Ismail's comment on the value of continuous ICT support***Ismail:**

Um, I, I'd definitely say that, uh, this workshop was quite beneficial and we learned a lot and I, I think it's, it's very important to have workshops like, uh, these to, to accommodate, you know, um, educators that are fresh from, uh, you know, university. So that we, we have a uniform approach and that from the onset, they are aware of, you know, what the, the end goal is. Yeah. To ensure that, you know, from the moment they step into the classroom, they've got to have that Fourth-IR approach. They've got to have that, uh, technological advancement approach as well. So that's, that's the one thing I'd like to say. So if this could be a continuous program and workshop that's implemented maybe on a regular basis, maybe not every year, but maybe every second year where new newly appointed educators are trained, and that would be beneficial.

Priya shared similar sentiments by emphasising that there should be another ICT training programme offered, although under better conditions. In her response, she stated, *“Please. Please. You should not leave us on the island. Come serious. Come again. Yes. Then you'll see that how, how people are not participating. Especially, it could be the same thing now. Yeah. Same of what you taught us. Really!”* (Appendix B, p. 17).

The sustainability theme emphasises the need for long-term effectiveness in ICT teaching practices. Participants such as Ismail and Priya emphasised the importance of ongoing support and training activities to help educators retain and enhance their abilities. Ismail advised holding frequent workshops for new educators, while Priya urged for another ICT training programme with better conditions to maintain participation. These findings emphasise the importance of ongoing efforts to promote ICT integration in education and encourage sustainable innovative practices in teachers' curriculum delivery.

Notably, the results from the interview dataset indicates that the positive perceptions can lead to an active adoption of ICT, while the negative perceptions, fears, and anxieties may hinder such engagement; Digital competence was varied among the participants, with some of them being familiar and proficient with ICTs while others are less experienced; Motivation was influenced by factors such as facilitation support, participants' collaboration, resource constraints, resilience, as well as a desire for self-improvement. Teachers' intrinsic motivation to enhance their ICT skills for the benefit of students underscores the significance of motivation in successfully integrating ICT into education; Workload and time constraints posed challenges to participation in the ICT training as this was one of the main factors that hindered participants from constructively engaging in the training; Course delivery, instructional approach, and instructional material impacted participants' learning experiences. The effective guidance, collaborative methods, and quality materials fostered the participants' engagement. The teachers who felt supported and engaged were more active, while concerns about delivery hindered the participation for some; Finally, the importance of sustainment and continuous support through the ongoing workshops was highlighted as a key factor in ensuring the long-term effectiveness of teachers' ICT integration in teaching practices.

In essence, the interview results have revealed several key themes that are related to the teachers' perceptions, digital competence, motivation, workload, course delivery, instructional approach, instructional material, and sustainment. These themes provide a better understanding of how to effectively employ an ICT-TPD programme that will yield favourable outcomes for teachers in their journey to delivering innovative lessons.

4.3.3. Post-training Survey Results:

This section presents the post-training survey results and feedback obtained from the participants who engaged in the ICT teacher professional development training programme. This post-training survey was completed anonymously. The analysis of these results offers valuable insights into the effectiveness of the training approach and its impact on the participants' experiences and perceptions. The feedback provided by the educators sheds light on various aspects of the training, such as its *engagement* level, *clarity* of instructions, *relevance* to their teaching practices, and *suggestions* for improvement. These findings are important in assessing the training programme's success and identifying areas where improvements can be made to better serve the needs of the educators (as participants and students in the programme) and promote innovation in their curriculum delivery through ICT. This section looked at the participants' responses and thematically categorised them to gain an understanding of their post-training perspectives and whether or not they found the programme beneficial. The emergent themes from this section of the data were, *engagement with ICT tools*, *clarification and pacing*, *relevance of ICT resources*, and *suggestions for improvement*. All the responses for the post-training survey can be found under **Appendix D**.

Engagement with ICT Tools

This theme encapsulates the responses that are related to the engaging nature of the specific ICT tools used in the training. Participants found the engagement with a range of ICT tools, such as interactive worksheets, Google forms and PowerPoint, to be a significant aspect of the training. This theme aligns with the research objective of reflecting on the delivery of the training programme, thus assessing how engaging teachers were with ICT tools for curriculum delivery.

For example, when asked “What aspect of the overall training did you find most engaging?”; Some of the responses given were that *"The use of the power point during the lesson presentation was most engaging"* and *"Creating online learning materials such as worksheets for the learners"*.

Clarification and Pacing

The responses in this theme emphasise and focus on the clarity of instructions given during the TPD training, the pacing of the training, and the need for clarifications or adjustments to enhance understanding for future possible ICT training programmes. This theme relates to the objective of reflecting on the delivery of the training programme.

For example, as an emphasis to the theme of clarification and pacing, the responses quoted from the survey include, *"Informing the participants (teachers) on time..."* and *"Clarification of concepts or notes... the pacing... it was too fast... taking us one step at a time.... not doing a lot of information at once... (to enhance the understanding)"*.

Relevance of ICT Resources

Responses under this theme highlighted the participants' perception of the ICT training's relevance. The responses given indicated the teachers' perception of the ICT tools which they found most useful to integrate in their classrooms. Unfortunately, however, the responses were not very detailed. This theme directly relates to the research objective of assessing the extent to which the training approach resulted in teachers' innovative delivery of the curriculum.

For example, when asked, "What aspect of the overall training did you find most relevant?"; Some of the responses given were, *"Informing educators of all available ICT resources and how relative these tools are to the classroom spaces and education"* as well as *"The use of ICT in the classroom environment..."*.

Suggestions for Improvement

This theme focuses on participants' suggestions for enhancing the training experience for possible future ICT training programmes. The participants offered suggestions to improve the training, which included the important aspects of the time allocation given to the programme, as well. Other suggestions included a need for more ICT related tasks, improving communication with the participants, as well as determining ICT resources and infrastructural availability of teachers prior to commencing the training. This theme addresses the research objective of reflecting on the delivery of the training programme.

For example, when asked, "How would you suggest the overall training can improve for a better experience next time?"; The responses given included the following suggestions, *"If the training could be done during the holidays, I think it will be most effective because teachers will not be overwhelmed with work"*, as well as *"Be given more tasks to complete"*.

In essence, the post-training survey results provided an overview of the participants' experiences and perceptions regarding the ICT-TPD training programme. The feedback and the emergent themes in the post-training survey provide insight into the training programme's success and areas for improvement, and ultimately contribute to the promotion of innovation in their curriculum delivery through ICT. The subsequent sections, chapter 5, of this study will discuss these thematic categorisations and analyses in relation to how these findings respond to the research question.

CHAPTER 5: DISCUSSION

5.1. Introduction

The overarching research problem and purpose stemmed from the slow adoption and integration of Information and Communication Technologies (ICTs) by primary school teachers in South African state-led primary schools, particularly in the Gauteng province. The problem is linked, among other factors, to the ineffective training approaches used in Teacher Professional Development (TPD), as well as resistance from the teachers to adopt the innovation, despite the various national initiatives that have been presented, aimed at strengthening the use of ICT in pedagogical practices (Department of Education, 2004; Vandeyar, 2014; Mathevula & Uwizeyimana, 2014; Dlamini & Mbatha, 2018).

The main aim of this study was to evaluate the effectiveness of an ICT Teacher Professional Development (ICT-TPD) programme (*which is informed by Rogers' Diffusion of Innovation theory, the Constructivism theory, in combination with the Self-Determination theory, Gradual Release of Responsibility, Community of Practice theory and the Concerns-Based Adoption Models*) in enhancing primary school teachers' innovative use of ICTs in their curriculum delivery. To achieve this aim, the study's objective was to evaluate the impact of an ICT-TPD programme on primary school teachers' innovative ICT use in their classrooms by examining the training approach used in this research's training programme, the teachers' pre-training innovation levels, the delivery of this ICT-TPD training, as well as teachers' potential curriculum delivery innovation as a result of the training. This objective was guided by the overarching question of how the training programme's approach potentially fostered innovation in ICT-based teaching and learning. This research study employed a Longitudinal Mixed-Methods approach, that integrated deductive reasoning with a sequential explanatory design. It further employed a variety of data collection and analysis techniques, from thematic analysis and inductive coding to correlational analysis and purposive sampling, to offer a comprehensive investigation of the research question.

The purpose of this chapter is to provide a triangulated discussion of the findings of the study in relation to the research aims, objectives, and questions. This discussion will integrate the results together with the existing body of literature, identify the contributions of the study to both theory and practice in South African primary education, as well as discuss the implications for policy and future research. The layout of this chapter is as follows: an analysis and interpretation of the main findings, a discussion on the implications of these findings for the broader educational context, and finally, a synthesis of the study's contributions to existing research and suggestions for future investigations.

5.2. Overview of key findings

This section provides a brief overview of the key findings from the results presented in chapter four. The overview summary is only in relation and response to the research questions as presented in the first chapter. The study constituted one main research question, *In what way does a training programme focusing on developing online materials promote innovation in the*

use of ICT for teaching and learning? as well as three sub-questions, (1) *What are the teachers' levels of innovation before the training?* (2) *What processes and strategies characterised the implementation of the course delivery within the ICT training programme?* and (3) *In what way has the training approach used in the ICT training programme resulted in teachers' innovative delivery of the curriculum?* The following summaries first provide a brief background of the teachers' levels of ICT innovation before the ICT-TPD intervention, the delivery process of the course, as well as the resultant impact of the course on the teachers.

Teachers' level of innovation prior to the training:

The findings presented in chapter 4 indicate that the participants had a low familiarity with digital tools and internet access before the ICT training. They predominantly accessed the internet through their cell phones, the school Wi-Fi, and only a few through their home Wi-Fi. The participants were mostly familiar with Microsoft TEAMS for virtual conferencing, as prescribed by the Department of Education DoE during the Covid-19 lockdown, and primarily owned or had access to cell phones and laptops for digital devices. Their knowledge and familiarity with the South African ICT in Education Policy and specific ICT teaching tools varied, with some having considerable familiarity with the policies, while others had little to none. As such, these findings suggest that while there was some basic familiarity with some ICT tools, these were not used innovatively in their pedagogical practice.

The course delivery process:

The *CBAM* framework (as guided by the constructivism theory) and Rogers' Diffusion of Innovation theory informed the study's overall theoretical basis. The *CBAM* emphasised the ICT training's longitudinal aspect and longevity, emphasising constant support and recognising innovation as an ongoing process. The *CBAM* phases of concern guided the identification of participants' ICT familiarity, resulting in targeted beginner-level training (through the Bruner's scaffolding) augmented by resources such as laptop computers. Rogers' *Diffusion of Innovation* model, with focus on the *Attributes of Innovation*, was combined with the *CBAM* to understand the factors impacting participants' acceptance or resistance of ICT adoption in curriculum delivery and through the constructivist and CoP lens, to try and mitigate the factors. Essentially, however, the GRRM guided the practical lesson *delivery* of the training:

The GRRM was used to structure the manner in which the content was delivered in the training sessions. This model provides an instructional method that consists of four stages of instructional delivery in the ICT training sessions: The first stage (*I do*) involves the instructor modelling the learning task and explaining the lesson's thought process aloud; The second stage (*We do*) involves the instructor guiding participants through the task, asking questions, prompting, and providing participants with feedback; The third stage (*You do it together*) involves the participants working together in their Professional Learning Community (PLC) groups to practise the skill with minimal teacher intervention; and The fourth stage (*You do it alone*) is the independent practice stage, where participants work independently, demonstrating mastery of the skill without assistance.

Impact of the ICT-TPD training programme:

The results presented in chapter 4, particularly the results triangulated from the interview data, post-training survey responses, and the criterion-referenced rubric results, suggest that the ICT training programme had a favourable impact on participants. While the interview feedback revealed varying levels of confidence and applicability of the innovation by the participants, the post-survey data indicated an improvement in the participants' ICT proficiency and their predisposition towards ICT integration in their pedagogical practice. The criterion-referenced rubric outcomes confirmed this by demonstrating significant improvement in the participants' digital abilities. As a result, the training can be seen as effective in developing the participants' innovation in their use of ICT, albeit there are some areas that require further support and refinement to be able to achieve a holistic and universal applicability of this type of ICT-TPD training programme.

In essence, based on the data, the delivered training programme has demonstrated a positive impact on promoting innovation in the use of ICT for teaching and learning **among participant primary school teachers**. The participants' feedback, coupled with the results from the criterion-referenced rubric, indicates that there has been a discernible shift in the teachers' perspectives on ICT integration post-training. While teachers acknowledged the transformative potential of ICT, they initially expressed reservations. However, post-training observations and responses evidenced an uptick in their confidence levels, along with a more nuanced understanding of innovative ICT application in curriculum delivery. Nonetheless, the variance in adoption rates and innovativeness post-training among participants suggests and emphasises the necessity for ongoing ICT-TPD support and provision of resources to ensure a continuance in the use of ICT for teaching and learning. Furthermore, the data has also shown that the ICT teacher training programme's success not only relies on the individual programme itself, but also on other factors such as the teachers' attitudes, resources, workload, and priorities.

These findings are discussed in further detail in the following section 5.3, the interpretation of the findings in relation to the research questions. The structure will be similar with that of the results presented in chapter 4, by presenting an interpretation of the quantitative results first and the associated data (initial survey, and criterion referenced rubric), then followed by the qualitative results and the associated data (interview responses and the post training survey). Each of these findings' discussions will include an analysis of how the results are similar or different from existing or previous studies.

5.3. Discussion of the findings in relation to the research questions

In this study which stemmed from the prevailing issue of the slow ICT adoption by primary school teachers in the Gauteng province of South Africa, there were parallels drawn between the results' findings and the existing literature on teachers' perceptions towards ICT-TPD. Despite national initiatives aiming to support the use of ICT in pedagogical practices, there has remained a noticeable lag in its integration. This gap, as noted in chapter 1, is often, amongst other factors, attributed to ineffective TPD training programmes and approaches and an apparent reluctance from educators to heed the call for ICT use in their pedagogical practice

(Department of Education, 2004; Vandeyar, 2014; Mathevula & Uwizeyimana, 2014; Dlamini & Mbatha, 2018). This study, which was centred on evaluating the efficacy of an ICT-TPD programme and its chosen approaches, revealed that while teachers do see the transformative potential of ICT, there, however, are still some challenges that persist in innovatively integrating these tools into their own curriculum delivery. The findings suggested that participants, albeit initially hesitant, began to recognise the value of the ICT training in enhancing their pedagogical capabilities and elevating their pedagogical confidence levels. However, similar to global trends, there was a diversified range in the adoption and innovativeness (Rogers, 1963) post-training among the study's participants (Sahin, 2006). This reinforces the existing narrative that consistent professional support and resources are crucial to fully realise ICT's potential in the teaching profession. The emphasis remains on the need for tailored, and effective training approaches that not only equip educators with the technical skills but also inspire innovative pedagogical ICT use. This section delves further into these findings and is followed by a triangulation of the finds from both the quantitative and qualitative data sets.

5.3.1. Teachers' levels of innovation before ICT-TPD intervention

To respond to the first research sub question, “*What is the teachers' level of innovation prior to the training?*”, a quantitative survey was conducted to determine teachers' levels of innovation in their use of ICTs food teaching. The purpose of this question was to determine the participants' baseline or reference point before receiving any intervention, in this case the ICT-TPD training programme, was provided. Campbell and Stanley (1963) highlighted the significance of pre-tests or baseline measurements in experimental and quasi-experimental research designs to *ascertain the true impact of an intervention*. Ertmer et al (2012) similarly highlighted and emphasised the need to comprehend teachers' initial beliefs and practices concerning ICT integration, signifying the importance of baseline measurements in such educational research. While this study was not based on a quasi-experiment design like Campbell and Stanley's research (1963), theirs and Ertmer et al's (2012) logic remains fundamental in this study as the pre-tests or baseline measurements helped determine any changes that had or had not occurred in the study as a result of the ICT-TPD programmes' impact.

In order to understand the significance of this research sub question in the context of answering the main research question, “*To what extent does the selected training programme promote innovation in the use of ICT for teaching and learning?*”, it is important to first explain what innovation is in the context of this study. It is also as well as highlight the relationship between *access* to digital (ICT) tools and ICT pedagogical innovation:

Innovation:

Innovation, as defined by Rogers (Sahin, 2006, 14) refers to “an idea, practice, or object that is perceived as new by an individual or other unit of adoption”. In the context of this study, innovation specifically refers to the novel utilisation of ICT tools and strategies to enhance teachers' curriculum delivery in the classroom (Ndlovu & Makonye, 2022). It

signifies a departure from traditional teaching methods, by integrating technology-based approaches that offer potentially improved learning outcomes and experiences for students (Mishra & Koehler, 2006).

Relationship between access to digital tools and ICT pedagogical innovation:

Bingimlas (2009) argues that access to digital tools in education is a foundational prerequisite for any potential integration of technology into teaching. Without the basic tools, teachers cannot be expected to integrate ICT into their practice (Ertmer, 2005). However, access alone does not guarantee innovative use, as factors such as teacher training, support, and the educational context play critical roles in determining the effectiveness of ICT integration (Hew & Brush, 2007; Mishra & Koehler, 2006). Literature has shown that in contexts where these additional supports are lacking, mere access to technology often fails to lead to significant pedagogical innovation. The results in chapter 4 corroborate this point. Thus, while access is necessary, it is not sufficient on its own to drive meaningful ICT integration in education.

The data presented in chapter 4 indicated that prior to undergoing the ICT training, the participants displayed varied proficiency levels in the use of ICT tools and awareness of relevant policies. A majority of them had regular access to internet sources such as cell phones, school Wi-Fi, and home Wi-Fi, suggesting a basic level of digital integration in their lives. Their fair use of virtual conferencing platforms, especially Zoom and TEAMS, indicated familiarity with online communication tools. Furthermore, the widespread ownership and access to cell phones and laptops, but not tablets, hinted at a potential area of expansion for tech integration in their teaching methodologies.

However, when assessing the depth of their ICT competencies, there were variations that emerged; Their moderate familiarity with the South African ICT in Education Policy, the WPeEd, combined with their differing proficiencies in standard software tools like Microsoft Word, PowerPoint, and Excel, pointed to an inconsistency in their readiness to innovate using these technologies. Therefore, this highlighted the need for a targeted approach in training, as suggested by the CBAM, to ensure all teachers are equipped to harness ICTs innovatively in the classroom, based on the type of digital devices they possessed, as well as the type of software they had easy and immediate access to (Hall et al., 1973; Tondeur, van Braak, Ertmer & Ottenbreit-Leftwich, 2016).

The information gathered in this survey also provided a better understanding of the participants' training needs in terms of what they are and are not familiar with where ICTs are concerned, as well as what components of the training they would potentially benefit from the most. For instance, the training programme, unfortunately, did not have the funds to provide the necessary resources such as laptops for each participant, as such participants had to bring their own laptops. This survey, therefore, made us aware of how many teachers would be able to cater for themselves in obtaining a laptop, as well as how many teachers the study could potentially assist with the laptops. Fortunately, due to this Dissertation programme having been funded by the National Research Foundation (NRF), the study was able to rent out and provide six laptops for participants who did not have access to a laptop or whose laptop was non-

operational. Furthermore, based on the data collected from this survey, it would be most beneficial to the participants to tailor the instructional material to fit their needs, i.e. by using software that they would continually have access to and be able to use post-training.

In unison to the survey's findings, the interview responses indicated similar results about teachers' levels of innovation prior to ICT-TPD intervention. When asked about their experience with technology prior to the ICT-TPD training, the responses suggested that a majority of the participants had limited familiarity with using technology for teaching. Responses from participants such as Laila, Priya, Sarah and Sipho explained that they had never used ICTs to deliver their lessons, highlighting the need for targeted interventions to build foundational knowledge. This is compared to only two respondents, Ismail and Thabo who stated their confidence in using ICTs for curriculum delivery.

Similarly, data collected from the field notes, particularly at the early stages of the ICT-TPD, highlighted teachers' discomfort and lack of familiarity with ICT in education. The field notes recorded a sense of unease at the start of the ICT-TPD training, however, also noted a sense of eagerness to learn more about the intervention. Most of the teachers' exposure to ICTs was prevalent during the Covid-19 global shutdowns, where teachers were encouraged to continue curriculum delivery electronically. However, most teachers admitted to feeling lost and uncertain about how they were delivering the content, as they were doing it mostly out of obligation.

The initial digital survey conducted in this study, together with the responses from the interview, highlights varied levels of ICT familiarity, proficiency, and access to ICT resources among teachers. However, with the majority showing limited experience, placing them predominantly, in the exploration level (refer to Table 4.10). There was, however, no physical digital material developed by the teachers at this stage (before the training) for which to measure their competence against. These findings, however, resonate with the existing literature that identifies infrastructure and prior exposure as significant determinants in the effectiveness of ICT integration in teaching (Buabeng-Andoh, 2012). The reported predominantly lack of competence reported in the pre-training survey and the interview responses align with research that suggests that a diverse range of digital literacy among educators is influential in their readiness to innovate using ICT in the classroom (Voogt et al., 2013).

In essence, the participants' level and type of digital access as well as ICT familiarity, based on the results suggested that the training would provide educational ICT training from a beginner's level, providing pedagogic functionalities that would allow them to use their cell phones - a device which they all had access to, their laptops - which the majority could access, as well as making use of Microsoft Office tools - which is a software tool which they all had access to and was familiar with. This, as reported in the interview responses, is what assisted them in building their foundational knowledge of using ICTs to supplement their teaching.

5.3.2. ICT-TPD training programme's conceptual framework

The training approach used in the ICT-TPD programme applied theoretical understandings from *Rogers' Diffusion of Innovations Theory* which examines how innovations spread in social systems as influenced by the five *attributes* (characters) of the innovation as well as the adopters' own circumstances (Rogers, 1963); The *Constructivism Theory* in combination with the *SDT* (which explores individuals' motivations behind their pursuits), and *CoP* (which explores the impact of collaboration for learning). The ICT-TPD training programme was delivered in combination of these theories, practically explored through the *GRRM* which is concerned with the gradual transfer of cognitive responsibility from the teacher to the student.

The practical delivery of the respective training sessions was conducted in four stages: the focused instruction (teacher does), guided instruction (teacher instructs and shows student), collaborative learning (students work in groups), and the independent learning stage (student works independently) (Pearson and Gallagher, 1983 as cited in Elliot et al., 2019). The GRRM, from a Constructivism perspective emphasises the importance of students' active learning as well as shifting the learning responsibility from the teacher to the student (Harlow et al., 2006; Elliot et al., 2019); The Concerns-Based Adoption Model (CBAM) is often used as a tool to assist educational leaders and practitioners in understanding and facilitating the process of adopting and implementing educational innovations (Hall, Wallace & Dossett, 1973), while the SDT explores the motivations behind the adoption of an innovation. These theories were used to develop a conceptual framework model which was used to determine the ICT-TPD training method, refer to the *Figure 2.3* in chapter 2 for this framework.

In the data provided, the study observed varying levels of ICT familiarity, proficiency, and innovation among the teachers prior to the ICT-TPD training. Triangulating this with Rogers' theory, an analysis can be made on how the attributes of the training approach influenced the diffusion of ICT innovations among the teachers (Sahin, 2006). For example, if the training approach emphasised hands-on experiences, peer collaboration, and demonstrations of innovative ICT practices - which closely relate to Rogers' Attributes of Innovations - then the expected results would include a greater adoption of these practices among teachers post-training, thus placing them in either the integration level or innovation level of the CRR (refer to Table 4.10).

Table 5.1 below illustrates a holistic summary of how the conceptual framework (Figure 2.3) would have looked like in practice. It indicates the interconnectedness of Rogers' Attributes of Innovation, GRRM and CBAM.

Table 5.1: Interconnections between Innovation Adoption Models and Teachers' ICT Competencies (Sahin, 2006; Hall et al., 1973; Killian, 2015)

Rogers' Attributes of Innovation	Teachers' ICT Competencies	CBAM (Sustainability and Support)	Gradual Release of Responsibility Model
Relative Advantage	Familiarity and proficiency facilitate the perception of ICT benefits, aiding in easier adoption.	Teachers' concerns about ICT are addressed through sustainable support systems, enhancing adoption and implementation.	Teachers' familiarity and proficiency enable them to gradually release responsibility for ICT integration to students, fostering independent usage.
Compatibility	ICT familiarity and proficiency align with existing practices and curriculum, easing integration.	Compatibility between ICT initiatives and teachers' needs is ensured through ongoing support, fostering sustained usage.	Teachers align ICT integration with instructional goals and student needs, gradually transferring responsibility for ICT use to students.
Complexity	Proficiency reduces the complexity of adopting ICT innovations, making integration smoother.	Support structures address teachers' concerns about the complexity of ICT integration, facilitating sustained usage.	Teachers scaffold ICT use, starting with guided instruction and gradually shifting to independent student application.
Trialability	Familiarity encourages experimentation with ICT innovations, promoting exploration.	Teachers are supported in experimenting with ICT practices, allowing for trial-and-error learning and adoption.	Teachers model ICT usage during guided instruction, providing opportunities for students to practise independently.
Observability	Familiarity and proficiency enable teachers to observe ICT benefits, such as improved outcomes.	Observable benefits of ICT integration are highlighted through support mechanisms, encouraging continued usage.	Teachers demonstrate ICT usage during modelling, allowing students to observe effective application before independent practice.

Based on Constructivism and SDT, an analysis can be made on how the training programme fostered active engagement and intrinsic motivation among the teachers (Olusegun, 2015; Deci & Ryan, 2000; Main, 2021). For instance, if the training sessions incorporated opportunities for participants to explore ICT tools in meaningful contexts, allowed for autonomy in learning, and provided feedback that enhanced their sense of competence, one would then expect to see increased motivation and engagement from participants thus leading to higher levels of ICT innovation post-training.

In the context of the GRRM, the study analysed how the training sessions facilitated the transfer of cognitive responsibility from the trainers to the participants. For example, if the training sessions followed the stages of focused instruction, guided instruction, collaborative learning, and independent learning, as outlined in the GRRM (Killian, 2021), the study would expect to see teachers gradually assuming greater responsibility for their own learning and implementation of ICT innovations. Similar to constructivism and SDT, this would be reflected in their increased confidence and autonomy in using ICT tools for curriculum delivery (Deci & Ryan, 2000; Main, 2021).

With the CoP theory, an analysis would be made on how collaborative learning activities during the training programme contributed to the development of a supportive PLCs among the teachers (Lave & Wenger, 1991). For example, if the training sessions included group discussions, sharing of best practices, and opportunities for peer mentoring, then one would expect to see teachers collaborating more effectively, sharing ideas, and collectively problem-solving, which would ultimately lead to greater ICT innovation in curriculum delivery. The CoP theory would further amplify the attributes of innovation as presented by Rogers (1963; Sahin, 2006; Lave & Wenger, 1991).

In delivering the training, CBAM provided a framework for understanding the stages of concern that individuals may experience when adopting and implementing educational innovations (Hall et al., 1973). By considering CBAM, the study could explore the teachers' concerns and levels of commitment to the ICT-TPD training programme. For instance, if the training programme addressed teachers' concerns about time constraints, technical support, and pedagogical integration of ICT tools, we would expect to see a higher level of commitment and engagement from the teachers (Hall et al., 1973). Additionally, CBAM can help identify any resistance or barriers encountered during the implementation of ICT innovations and inform strategies to address these challenges effectively.

5.3.3. ICT-TPD intervention impact

To determine whether the ICT-TPD training programme offered to the primary school teachers had an impact on their innovative delivery of the curriculum, the participants submitted a Google Sites e-Portfolio that contained digital content material which they had created during the course of the training. These materials included MS Word interactive worksheets, interactive PowerPoint slides and videos, automatic assessments from Google Forms, as well as slide presentations from other online applications such as Canva. To determine if the

teachers' levels of innovation had changed or improved after the ICT-TPD intervention, the material in the e-portfolios was assessed using a criterion-referenced rubric, presented in section 4.2.2. Additionally, teachers were invited to a post-training interview, presented in section 4.3.2, where they unpacked their experience in the ICT-TPD programme as well as how much they believed they had improved. Moreover, they were invited to complete a post-training survey, presented in section 4.3.3, that included their suggestions of how they believed the programme could improve in future. All this data was augmented by the available field notes collected during the course of the ICT-TPD training programme.

The results obtained from the analysis of the Criterion Referenced Rubric (CRR), as outlined in Chapter 4, highlight a positive trajectory in participants' competency levels for innovative curriculum delivery facilitated by ICT integration. This means that there is an evident improvement in their innovation levels post-training compared to pre-training when the majority of the participants reported their inexperience with ICTs in education (as discussed in section 5.3.1). These findings align with prior research which indicated that professional development initiatives that focus on ICT integration leading to improvements in teachers' pedagogical practices (Smith & Sivo, 2016; Dimitriadis et al., 2009; Dlamini & Mbatha, 2018; Dlamini, 2022; Hennessy et al., 2022). It is evident that the educators engaged in this study, through the assistance of the ICT-TPD intervention, have enhanced their digital proficiency for instructional purposes, which indicates their preparedness to integrate technology effectively into their teaching methods (Ertmer, 2005). This readiness is crucial for fostering collaborative learning environments and elevating student engagement, which further reflects the principles advocated by constructivist learning theories (Main, 2021). However, the presence of participants with lower competency levels in specific domains also highlights the importance of tailored support mechanisms and customised professional development programs to address individualised needs and ensure equitable progress (Mathevula & Uwizeyimana, 2014; Mapuva, 2017). By capitalising on participants' existing competencies while addressing identified challenges, educators can harness the potential of ICT resources to create transformative learning experiences for students, thus improving innovation in curriculum delivery (Dimitriadis, Goodyear & Retalis, 2009; Voogt et al., 2013).

Similarly, the post-training interview was conducted to respond to the third research sub-question on the impact the ICT-TPD training programme had on participants. The purpose of this question, from a qualitative data understanding, was to determine, based on the participants' perceptions and experiences, how they felt and believed the ICT-TPD training programme was successful in providing the necessary and applicable educational ICT skills which they could employ in their classrooms. The success element in this subquestion was measured against the participants' post-training ability to creatively integrate ICTs as a teaching and learning tool (Dimitriadis et al., 2009). This ability was also determined by their personal perceptions given in their interview responses, to be discussed, as well as measured through their e-Portfolio results assessed in chapter 4.2 and discussed in the previous paragraph.

A thematic analysis technique was used through *in vivo* coding to analyse the findings of the interview questions. The themes that emerged from the participants' comments are detailed in Table 4.15 found in section 4.3.2 of chapter 4. These emergent themes from the post-training interview responses have been used to gain a better understanding of the training approach's overall impact and ramifications. The following discussion of the interview responses is conducted by providing a brief discussion of each main theme and its subsequent subthemes as outlined in Table 4.15, as well as structured in section 4.3.2 of the results chapter. The main themes of discussion are *Perceptions*, *Digital Competence*, *Motivation*, *Workload*, *Course Delivery* and *Sustainment*.

Perceptions and Competencies

Perceptions and Competencies, as previously noted, refers to how people see and understand something, as well as their ability to confidently use digital tools in a critical and constructive way, respectively. In this study, perceptions related to participants' thoughts around ICT are in education and how they believed it could be useful in their teaching. While competencies related to participants ability to create, curate, and integrate digital material for innovative teaching. Literature suggests that teachers' innovativeness with pedagogical ICT tools relies on and relates to their perceived usefulness of the tool (Ertmer et al., 2012; Sahin, 2006). While this study did not necessarily focus on the psychological factors that contributed to teachers' resistance from employing ICTs in their classrooms, it was, however, interesting to see that it is inevitable to consider teachers' perceptions as one of the determining factors of the extent to which teachers either integrate or reject the use of ICTs in their pedagogical practice (Tondeur et al., 2012). Similarly, individuals' perceptions are also influenced their own competencies, as Tezci (2011) notes, that teachers with higher levels of digital competence are often more confident and proactive in utilising ICT tools for educational purposes in their pedagogical practice as they would have eliminated the fear factor of using ICTs, which is often one of the reasons that teachers shy away from using the digital tool.

The interview results from this study produced subthemes, as noted in Table 4.15 and presented in section 4.3.2. These sub-themes provided insights into the participating teachers' beliefs and attitudes towards the use of ICTs in their classrooms. As noted by Tondeur et al, "in a classroom, the teacher perceives and defines a teaching situation, makes judgments and decisions, and then takes related actions" (2012, p.556). Positive outlooks are frequently based on a belief in the transformational capacity of ICT to improve educational delivery and participation, thus the enthusiasm to employ it. Negative outlooks, on the other hand, can result from a variety of circumstances, including, but not limited to, the perceived complexity of the technology, a lack of proper training, or previous failures in technology integration (Tondeur et al., 2012). Emotional reactions or feelings are another element in this intricate decision-making process.

Educators may feel a range of emotions, from joy and interest to fear and anxiety, all of which have a part in the last step of adopting associated actions, such as whether or not to include ICT resources into teaching practices (Ertmer, 2005; Ertmer et al., 2012). These too may stem from their realised digital competencies or lack thereof (Tezci, 2011). This was also noticed in the field notes, which, throughout the early phases of the training sessions, revealed the majority

of the teachers' obvious and voiced feelings of uneasiness and concern about the use of ICT. This was due to the fact that the majority of participants, particularly those of the older generation, felt inept in the use of ICT technologies. However, as the field notes reflected, gained more confidence in using the digital tools, the fear subsided - as suggested by Tezci (2011).

Rogers' Attributes of Innovation, which contain five attributes as discussed in chapter 2.3.1, recognises individuals' perception of the innovation as a crucial factor that contributes either to one's adoption of an innovation, or rejection thereof (Sahin, 2006). Rogers refers to individuals' perception as the 'relative advantage' - i.e. how useful the individuals consider the innovation's application to be. (Rogers, 1963; Sahin, 2006). The relative advantage attribute includes the extent to which the innovation is cost-effective as well as readily available (Sridharan, Maheshwari & Mundhada, n.d.). As such, teachers are more likely to adopt the use of the ICT innovation in the delivery of the curriculum if they perceive the ICT tool as being useful or advantageous to enhancing their teaching, as well as affordable and easy to gain access to. Similarly, as individuals discover the advantage of using ICTs to augment their teaching, this encourages them to apply the innovation in their classrooms, thus amplifying Rogers' Compatibility attribute of the innovation, becoming most likely to integrate the technology (Rogers, 1963; Sahin, 2006).

This was particularly noted in the field notes as well as augmented on the initial survey; the survey indicated that all the teachers owned a cell phone, none of them owned a tablet and at least 4 of the 6 participants had regular access to a laptop. Their cell phones, which they were quite proficient in operating - thus indicating their competence in using the tool - became their first line of ICT integration, indicating the *compatibility* of the tool as well as its *relative advantage*; the field notes recorded that many of the teachers used WhatsApp as a central point of communicating with their students outside of schooling hours to share the digital material they had developed in the ICT-TPD training. This type of digital engagement stemmed from their perceived usefulness of the cell phone in delivering their objectives (Sahin, 2006).

Additionally, teachers' initial fears and anxiety towards the innovation disappeared as they became familiar (*competent*) with other digital tools introduced in the ICT-TPD training, indicating the role that familiarity plays in teachers' perceptions of ICTs (Deci & Ryan, 2000). The field notes show that teachers' initial unease and nervousness reduced as they became more comfortable with the technology. Sarah stands out as one of the participants who made the most significant improvements; she went from being reluctant to integrate ICTs to providing weekly interactive worksheets and PowerPoint presentations to her pupils. This further indicates how different factors have to be addressed as relating to individuals' idea of an innovation's relative advantage. It is, therefore, important for future researchers to consider all these possible factors, as well as attempt to mitigate them, to yield a more comprehensive understanding of teachers' adoption of ICT innovation in curriculum delivery and to enhance the effectiveness of ICT professional development programs in primary education.

Motivation

The theme of ‘motivation’ emerged as one of the important points of discussion for this study, as well as for understanding how an effective ICT-TPD programme can directly and positively influence and encourage teachers’ adoption of an innovation. In the context of this study, the theme encapsulates factors, either intrinsic or extrinsic, that influence teachers’ willingness and enthusiasm to integrate and use ICT tools in their teaching practices. It is worthy to note its connection to the overarching research problem identified by this study, ‘the reluctance of teachers to adopt ICTs in their teaching practices despite ministerial initiatives to improve access to the digital tools’. This research inadvertently encourages researchers to explore possible *motivations of teachers* in adopting the ICT innovation, to help minimise and eventually eradicate this reluctance by teachers towards ICT tools and usage on their pedagogic practice. There are five sub-themes that emerged from this theme, namely, *Support*, *Collaboration*, *Resource constraints*, *Resilience in the face of challenges*, and *Self-improvement and Professional growth*.

The self-determination theory (SDT), which is a macro theory of human motivation by Deci and Ryan (2000), asserts that people are driven to grow and change by innate psychological needs. This theory suggests that understanding people’s motivations is not just about external rewards or pressures, but also about fulfilling these innate needs. Deci and Ryan (2000) further outline the theory’s three fundamental psychological needs: **Competence** which is the need to feel effective and capable; **Autonomy** which indicates the need to control the course of one’s life; and **Relatedness** which is the need to have a sense of belonging and connectedness with others. Similar to the SDT theory, this study’s intrinsic motivations and subthemes suggest the teachers’ needs to belong and have competence in a fast-growing ICT driven environment. The intrinsic motivations in this study were, ‘*Resilience in the face of challenges*’ reflects an inner drive and determination to overcome obstacles, suggesting the teacher’s eagerness to succeed in the integration of ICT despite the many challenges that arise; and ‘*Self-improvement and Professional growth*’ which is indicative of teachers’ internal desire for personal and professional development, thus showing the teachers own aspiration to enhance their pedagogical skills and knowledge, and remain relevant in a world defined by technological advancements.

The extrinsic motivations are; ‘*Support*’, which is an external factor that is influenced by the assistance, or encouragement that one receives from others, such as one’s peers, family, professional administrators, or any other stakeholders; ‘*Collaboration*’, which may be partially intrinsic, but in this instance falls mostly under extrinsic, is indicative of the external social interactions and shared experiences that can motivate the teacher’s adoption and continual use of ICT tools; and finally, ‘*Resource constraints*’ which is an external barrier that is often beyond the teachers’ control. Resource constraints are negative extrinsic motivators as they are indicative of a lack to provide resources that are essentially crucial to the employment of ICT in teaching and learning and continues to demotivate and hinder the teacher from using the tools effectively.

The motivation factors deduced from the interviews coincide with the field notes and post-training survey. The field notes recorded the positive impact of the PLCs (that encouraged collaboration) and negative impact of resource constraints (that demotivated teachers' participation). This was further supported by the results from the post-training survey, which revealed teachers' need for relevant resources as this would encourage and improve their engagement with the ICT tools.

As suggested by Deci and Ryan (2002), the knowledge of motivations is not just about them, both intrinsic extrinsic motivations, but rather about doing something about this knowledge and meeting the needs expressed by the SDT. Thus, in this study, the interview results indicated the interconnectedness of subthemes outlined under the overarching theme of 'motivations', i.e. the intrinsic motivations cannot be assessed in isolation from the extrinsic motivations. Therefore, keeping in mind the main research question, "*To what extent does the selected training programme promote innovation in the use of ICT for teaching and learning?*" The results have suggested that where extrinsic motivations (support, collaboration, and resources constraints) are concerned, teachers' ICT competence can be enhanced when they get continuous and personalised assistance, as per their ability needs, from school administration and technical personnel, or any other relevant personnel (Deci & Ryan, 2000). This supportive environment can aid in the internalisation process of the skill, in which the teachers grow to value and are interested in incorporating ICT into their teaching practices, thus shifting from external justification to internal valuing of their activities (Ryan & Deci, 2000).

Additionally, where collaboration is concerned, when teachers work together in growing their ICT skills, this can be internalised as a sense of relatedness, which, according to SDT, is a key component of intrinsic motivation (Ryan & Deci, 2000). When instructors collaborate, exchange experiences, and watch their colleagues effectively integrating ICT, their intrinsic incentive to innovate in their curriculum delivery can increase (Niemic & Ryan, 2009). Finally, overcoming resource limits through professional growth can result in a more confident sense of professional self. Teachers' progress and upskill can move from an extrinsic requirement as prescribed by the educational department, to an intrinsic desire to further better their teaching as they become more proficient at using limited resources in new ways (Gagné & Deci, 2005). Lastly, the two intrinsic motivations, *Resilience in the face of challenges*, and *Self-improvement and Professional growth*, continue to increase as a result of the improvement in professional support, constructive collaboration among teachers and learning to use the limited resources innovatively or when stakeholders begin to provide these resources.

Under this theme of motivations, Rogers' Diffusion of Innovation and Attributes of Innovation theory (Rogers, 1963; Sahin, 2006) explains the expected adoption pattern for ICT integration in education, which is consistent with intrinsic motivations that drive teachers' decisions to accept innovations (Tezci, 2011). For example, the teachers' resilience in the face of problems demonstrates their commitment to overcoming ICT implementation barriers, which is similar to Rogers' concept of overcoming resistance to change (Rogers, 1963). Furthermore, the quest of self-improvement is consistent with the characteristics of early adopters in Rogers' model, who are motivated by the rewards brought about by the innovation and desire to develop their

skills in order to remain at the forefront of educational practices (Teo, 2009). Similarly, this coincides with the CBAM which emphasises that individuals progress through stages of concern that range from personal concerns - such as self-efficacy, and the impact ICTs on one's teaching, to organisational concerns - such as resource availability and administrative support educational managers and stakeholders (Hall et al., 1973). Lastly, the constructivism approach emphasises learners' active participation, which aligns with the teachers' autonomy in creating their professional growth and practices through their participation in the ICT-TPD (Main, 2021). The observed intrinsic motives demonstrate the teachers' dedication to overcoming obstacles and continuously improving, which aligns with constructivism's ideals that emphasise individuals' role as agents of active problem-solving and lifelong learning (Main, 2021).

Workload

There is no doubt that teachers often have to deal with large amounts of workload, from lesson planning, to attending staff meetings as well as leading extracurricular activities. Consequently, the workload theme was quite prevalent in the responses given by the teachers. Both in the interview as well as post-training survey responses. Workload, in the context of this study addresses a critical aspect of the teaching profession, as well as the prescribed roles of teachers as professionals, especially in the context of integrating ICT in their educational practices. Teachers are traditionally tasked with significant amounts of responsibilities, and the incorporation of ICT tools adds another layer to their already bombarding workload. Two sub-themes emerged from this theme, namely: *time constraints* and *priorities*. These themes discuss the practical challenges that teachers face on a daily basis, and how these challenges influence their capacity and willingness to integrate ICT into their pedagogical practices. Similarly, in the post-training survey, participants expressed the need for future ICT-TPD programmes to be considerate of the time in which the programme takes place, suggesting that school holidays may be a better option.

In understanding this overarching theme of 'workload' and its application to teachers' circumstances during the training, the sub-themes are key to understanding the challenges that teachers face during the training period. They show that even though some teachers are eager to fully participate in the ICT training, their heavy workload that includes administrative and teaching duties often gets in the way of them attending PD programmes. As a result, teachers find themselves having to constantly choose between commitments and prioritise tasks according to personal relevance, often focusing on the most immediate and important ones (Albirini, 2016; Bernadine, 2019). Time, which is a resource that is always in short supply, especially for teachers, poses a constant challenge as teachers try to balance between the different demands from their professional responsibilities, together with their personal life (Albirini, 2016; Bernadine, 2019; Hart, 2023). Integrating ICT into teaching is not just about using technology during lessons. It also means that teachers should be investing a lot of time in learning and pedagogically using new technologies, creating subject-specific digital materials, and adjusting their lesson plans to integrate these tools seamlessly.

The sheer number of tasks expected of teachers often forces them to make tough decisions about what to prioritise, what to commit to and what to neglect or ignore. For example, when urgent tasks like grading or administrative work come up, integrating ICT might get pushed down the teachers' list of important tasks. For example, the teacher who participated in this study emphasised the limited time they had in truly engaging with task requirements of the ICT-TPD programme offered to them. Many of them suggested that the ICT-TPD programme should, for future purposes, be held during school holidays when their administrative tasks are minimal. This decision-making process of priorities is shaped by many factors, including how *immediately* beneficial the technology seems to the teachers, how easy it is to integrate, and whether there is sufficient support for ICT tasks without creating additional daunting tasks (Albirini, 2016; Bernadine, 2019). The Technological Pedagogical Content Knowledge (TPACK) framework sheds light on the complexity of bringing technology into education, highlighting the need for teachers to develop their knowledge in content, teaching methods, and technology all at the same time (Mishra & Koehler, 2006). Additionally, the Concerns-Based Adoption Model (CBAM) explains the concerns that teachers go through when starting to use new innovations, as well as what ICT training officials can mitigate these concerns. It is, furthermore, indicative of how important it is to manage time and set priorities right during training sessions so that teachers get the most out of the training (Hall & Wallace & Dossett, 1973; Bernadine, 2019).

Given these points, it is imperative to not just understand, but to also actively tackle the complex issue of teachers' workload. This involves a well-rounded approach to the ICT-TPD training implementation that offers professional development opportunities, provides resources, *plans time wisely*, and builds a supportive environment that appreciates and values the hard work teachers put into incorporating ICT into their teaching methods (Lawless & Pellegrino, 2007).

Course Delivery

Course Delivery, as another important theme of discussion, refers to the structure of the course being delivered to the teachers as part of their ICT training. The theme discussed several crucial aspects that collectively influence the effectiveness of integrating ICT into teaching and learning. There are five sub-themes that emerged in this theme: *Pace*, *Time Allocation*, *Guidance/Facilitation*, *Instructional Approach*, and *Instructional Material*. These subthemes are all interwoven, and each subtheme plays a crucial role in ensuring the success of any ICT-TPD programme for the benefit of the participating teacher.

The *pace* of the course is a determinant factor that influences how well teachers internalise the new ICT tools and concepts presented to them during the PD training. A balanced pace is essential for the following reasons; a pace that is too rapid might overwhelm teachers, which will hinder their understanding and resultant application of the ICT tools, while on the other hand, a pace that is too slow risks teachers being disengaged or having a sense of stagnation as though they are not making any progress (Jung, 2005; Tondeur et al., 2016; Van der Merwe-Muller & Dasoo, 2021). An aspect that is equally important is that of *Time Allocation*, which highlights the importance of allocating sufficient time not only to direct instruction but also to

engage in hands-on practice, collaborative discussion, and reflective exercises, which are all important from a constructivism lens. This was noted in from the teachers who participated in this study, as some hoped that the ICT training would have longer sessions to incorporate the hands-on time, while others expressed that the lifespan of the training took too long. This is indicative that there needs to be an effective balance where time is concerned. This holistic approach to time management allows for more comprehension and a more meaningful application of ICT in teaching practices (Jung, 2005). Additionally, as stressed by foundational theories of this study (constructivism, community of practice, Rogers's diffusion of innovation), the role of *Guidance/Facilitation* cannot be overstated. The effective facilitation of a successful TPD programme goes beyond the mere transmission of information; instead, it encompasses the provision of continuous support, addressing emerging concerns, and nurturing a conducive learning environment where teachers feel empowered to experiment and inquire through the use of these digital tools (Baker & Westrup, 2003). This supportive environment is crucial for fostering a sense of confidence and ownership among teachers as they navigate through the complexities of ICT integration.

The sub-theme of *Instructional Approach*, which suggests the 'how' behind the implementation of an ICT-TPD also has a significant impact on the course's effectiveness to help teachers innovate in their use of ICTs for curriculum delivery. An approach that is interactive, participatory, and learner-centred is more likely to resonate with teachers (Wang, 2009; Waheed et al., 2011), by actively engaging the teacher with the innovative content and making it more applicable to their specific teaching contexts (Thompson & Goe, 2009). As such, the GRRM, as discussed in section 5.3.2, is important as it provided a step-by-step of how the content would be delivered to the participating teachers; in a scaffolded manner that allowed a gradual release of knowledge skill sharing, from the facilitator to the teachers (as students). This encouraged a constructive approach to learning, where ultimately, the teachers' participants were actively engaged (Lave & Wenger, 199; Killian, 2015; Main, 2021).

Lastly, the quality and relevance of *Instructional Material* are fundamental to the success of ICT integration. An effective ICT-TPD will encompass materials that are technologically and contextually relevant, and primarily use ICT for the delivery of the ICT-TPD programme to encourage and ensure a comprehensive understanding and application of the ICT tools and concepts (Harris & Hofer, 2011). This sentiment was shared by respondents in the post-training survey, as similarly stressed in the interview responses; teachers shared their excitement of having discovered new and free resources that they could adapt and use in their classrooms. The discovery of these instructional materials encouraged them to think innovatively about how to make their lessons creative and engaging for their students using ICTs. As such, materials such as interactive worksheets, interactive PowerPoint presentations, pre-recorded videos and automated assessments through Google Forms, proved essential and convenient as resources to share via WhatsApp with their students (as reported in the field notes).

In essence, it is evident that an effective 'Course Delivery' in the context of ICT integration for the innovative delivery of the curriculum by teachers post-training is multifaceted and demands a carefully considered and well-executed approach. It is not just about the content but also

about *how* the content is delivered, the support structures that are put in place, and the relevant ICT resources provided. By thoughtfully addressing these aspects of the course delivery, that can result in an impactful and sustainable integration of ICT in teaching, ultimately enriching the learning experience for both teachers and their students.

Sustainment

In this research, the theme of *sustainment* is critically important as it addresses the enduring integration of ICT in teaching practices. This theme moves beyond the initial stages of adoption and implementation and focuses on the long-term incorporation and embedding of ICT within educational settings. The aim is to ensure that ICT integration is not merely a temporary shift but becomes a fundamental, enduring aspect of the educational framework. It is important that when ICT-TPD initiatives are implemented, they are thought of as part of a long-term plan. As Rogers argues, innovation is a continuous process, therefore, programmes that aim to spark innovation ought to consider the procedural element of adopting an innovation (Rogers, 1963; Sahin, 2006).

In this context, the study recognises that continuous professional development is a cornerstone of sustainment in education. It is essential that teachers engage in an ongoing journey of keeping abreast of global educational trends by refining and advancing their ICT capabilities and pedagogical techniques. A sustainable ICT-TPD plan does not, however, refer to one-time training sessions; rather, it involves a commitment to lifelong learning and professional growth through various channels like workshops, collaborative learning, and online courses (Guskey, 2002; Bernadine, 2019). However, the journey does not stop at these individual efforts. The support of the school and the relevant educational stakeholders plays a crucial role, offering the necessary infrastructure, resources, and a culture that fosters and encourages innovative ICT use in teaching (Fullan, 2007). This support goes beyond material resources; it symbolises a commitment to the enduring use of technology in education.

Similarly, the CBAM framework underscores the different concern stages that are important to consider when adopting an innovation. This model, which is also central to the study's framework developed to inform the ICT-TPD programme, as presented in Figure 2.3 (chapter 2), underscores the continuous process related to the adoption and integration of an innovation in education. This, together with Rogers' Attributes of Innovation and the GRRM, create a framework that maintains sustainability through ongoing and continuous reflections to improve the ICT-TPD programme. To strengthen the sustainability of an ICT-TPD, other relevant theories such as Constructivism (Main, 2021), the CoP by Lave and Wenger (1991) and SDT by Deci and Ryan (2000) are integral as they collectively advocate active and collaborative learning where teachers can enhance their individual ICT practice and build a collaborative momentum for long-lasting change by joining together to share professional ICT experiences, strategies, and resources. Fostering an environment of continuous improvement and adaptability to rapidly transform the landscape of educational technology is achieved by encouraging teachers to participate in reflective practices, to assess their implementation

successes, and where necessary, change their ICT practices based on suggested feedback (Schön, 1983).

Additionally, it is imperative that ICT integration aligns closely with educational objectives and the curriculum. Ertmer (2005) suggests that when teachers perceive a direct link between the use of technology and their desired educational outcomes, their motivation to sustain and prioritise the integration of ICT naturally increases. This alignment ensures that the use of technology is integral to the educational journey, enriching learning experiences and outcomes, not just an additional component. As such, the datasets in chapter 4, from both qualitative and quantitative data, indicated a correlation between teachers perceived relative advantages of the ICT innovation, to their increased competencies and desire to integrate the innovation in their teaching (Makawawa et al., 2021).

In essence, the theme of sustainability emerges as a critical feature of this research, that emphasises the long-term innovative integration of ICT into teaching practices beyond the early stages of adoption. Recognising innovation as an ongoing process, the study, under this theme, emphasises the significance of long-term planning and a commitment to professional development for educators. Therefore, using integrated frameworks such as CBAM, Rogers' Attributes of Innovation, and the GRRM, as well as theories like Constructivism, CoP, and SDT, allows for a more complete approach to incorporating ICT in education throughout time.

This section, on the impact of the ICT-TPD intervention on the teachers who participated in the study, examined how the datasets presented in Chapter 4 were indicative of the clear improvement in teachers' levels of ICT innovation following the implementation of the ICT-TPD training. Through an examination of themes such as perceptions, competencies, motivation, course delivery, workload, sustainment, engagement with ICT tools, clarification and pacing, relevance of ICT resources, and suggestions for improvement; it is clear that the ICT-TPD programme has played an important role in improving teachers' competencies and motivating them to incorporate ICT into their teaching practices for innovative course delivery.

According to the findings, the teachers demonstrated resilience, dedication to professional development, and a desire to improve continuously in their integration of ICTs. However, this was not without challenges that stemmed from resource and time constraints. Furthermore, the triangulation of data with established theories such as Rogers' Diffusion of Innovation, Constructivism, Self-Determination Theory, CBAM, and GRRM highlights the importance of ongoing professional development, collaborative learning, and alignment with educational objectives in promoting the long-term integration of ICT in education. Therefore, recognising the intrinsic motivations driving teachers' adoption of ICT innovations, as well as addressing barriers through targeted support and resources, educators and policymakers can improve the effectiveness and sustainability of ICT-TPD programmes, and ultimately enrich learning experiences and outcomes for primary school students.

5.4. Comparison of the results with existing literature

The results in this study demonstrated the participants' initial enthusiasm for the ICT-TPD intervention, which was, however, followed by a substantial reduction in attendance numbers as the course progressed. This, according to existing literature, is a common theme in professional development literature (Bernadine, 2019; Van der Merwe-Muller & Dasoo, 2021). Studies frequently identify sustained participation as a challenge to TPD, thus attributing the declining numbers to factors such as workload or motivational issues, as discussed in section 5.3 (Desimone, 2009) (Tondeur et al., 2016; Van der Merwe-Muller & Dasoo, 2021). This challenge, as argued by Tondeur et al (2016) emphasises the need for understanding the factors that affect teacher commitment within the framework of an ICT-TPD as well as ICT integration.

Additionally, the age range of study participants is consistent with findings from the literature that highlight distinct technological competencies for different age groups. It seems that digital competency and age are related, with older people typically finding it more difficult to adapt to new technologies (Pick & Sarkar, 2016). Moreover, people's receptivity to new innovations is influenced by their geographical upbringing as well as the school they attended (Lengyel, Bokányi, Di Clemente, Kertész & González, 2020). Age and location, however, were not fully examined in the context of this investigation. However, more research into these linkages could offer important insights into comprehending the nuances of digital competency among educators, considering the potential impact of these qualities on technology adoption (Albion et al., 2015).

The study's qualitative data further highlights themes such as perception, digital competence, and motivation, which are essential for understanding the process of ICT integration in education, as discussed in section 5.3. The discovered favourable attitudes and feelings towards ICT are consistent with literature on the crucial role of teachers' attitudes and beliefs in the successful integration of technology in education (Ertmer et al., 2012). Teachers, as literature argues, are more likely to adopt an innovation if they have a positive 'relative advantage' perception of it (Sahin, 2006; Vandeyar, 2014; Tondeur et al., 2016). Furthermore, the themes of motivation, such as support and resilience, are consistent with research highlighting the role of both external and internal motivators in encouraging teachers to incorporate ICT into their instructional practices (Deci & Ryan, 2000; Gagné & Deci, 2005; Teo, 2009).

Additionally, workload and course delivery issues, particularly that of time restrictions and instructional approaches, are consistent with literature on hurdles to ICT integration in education (Bernadine, 2019). It is noted that time constraints and insufficient training might considerably impede the effective use of ICT in education (Bingimlas, 2009). As a result, an effective ICT-TPD should be one that carefully evaluates the allocation of time so that participating teachers are not overburdened with work responsibilities. The emphasis on sustainability in this study is consistent with literature that advocates for ongoing support and professional development as necessary for the long-term incorporation of ICT in teaching practices (Guskey, 2002; Fullan, 2007).

This section provided a brief overview of the findings from this study compared with existing literature on ICT-TPD. The study's findings indicate that the ICT-TPD programme had both good and negative effects on teachers' innovation levels. On the one hand, participants initially displayed a strong commitment to the ICT-TPD programme, expressing excitement about incorporating ICT into their teaching methods. This early dedication shows a possible increase in teachers' levels of innovation, since they were willing to experiment with new technologies and methodologies. The study also identified themes such as perception, digital competence, and motivation, all of which are critical variables in promoting educational innovation. Participants' positive views and feelings towards ICT reflect an atmosphere conducive to creativity.

However, the study, as also evident in existing literature (Pick & Sarkar, 2016; Lengyel, Bokányi, Di Clemente, Kertész & González, 2020), identified problems that may have hampered instructors' innovation levels. Challenges to effective ICT integration include workload, time limits, and instructional style. These obstacles may have hampered participants' ability to fully innovate in their teaching techniques. Furthermore, the drop in participation, from the overall population size of 30 teachers, as the course progressed shows a potential loss of desire or engagement over time, which may have influenced teachers' propensity to innovate and has limited the data collected for analysis in the study.

Overall, while the ICT-TPD programme evidently, based on data collected, created an opportunity for teachers to enhance their innovation levels, although the presence of difficulties suggests that further assistance and resources may be required to fully realise this potential. Long-term teacher innovation requires continual professional development, support, and overcoming challenges to ICT integration. The research framework developed and presented in this study (refer to Figure 2.3, in chapter 2) emphasises the need for approaches that consider longevity of professional learning for teachers so that the integration of ICT for innovative curriculum delivery is sustainable.

CHAPTER 6: CONCLUSION

Implications for policy and practice

The issue of reluctance from teachers participating in the integration of ICTs in education has been widespread, and a topic of concern in recent years (Waheed et al., 2011). Particularly in light of the Covid-19 outbreak, which prompted some education ministers to reconsider their ICT in education policies and programmes for classroom use. The pandemic highlighted many of the shortfalls in many countries' education systems, suggesting that even if the fourth industrial revolution (4IR) is underway, many of them are not prepared for it, particularly in the area of education (Wu et al., 2022). Furthermore, while many countries have policies in place, they are in essence, just that, policies, on paper but not in practice (Vandeyar, 2014). For many countries, there has not been much urgency around the matter, until the pandemic forced a global shutdown that left many individuals, organisations and particularly schools, grappling to find solutions to keep abreast of the social demand required by society, education.

In South Africa, for example, previous ineffective ICT-TPD efforts were revealed, raising the question of why state-funded schools (the majority) could not continue with instruction electronically, as the private schools did. Some emerging causes for this included teacher training, notably ICT-TPD. The worry is that, while teachers were given training, some before COVID and others during COVID, the training was insufficient. According to Dlamini and Mbatha (2018), Dlamini (2022), Vandeyar (2013), Vandeyar (2014), and Vandeyar (2015), much of the training was conducted as a one-time and one-day procedure, with no follow-up or continuous training and support to ensure that teachers are kept abreast of the latest developments in e-education. (Vandeyar, 2014; (Vandeyar, 2015; Van der Merwe-Muller & Dasoo, 2021).

This study, therefore, highlights that the sustainability of well-trained ICT instructors integrating teachers is dependent on an ICT-TPD training appraisal system that recognises teachers as students while studying for a skill. For example, just as a learner does not advance a grade overnight, a teacher cannot be expected to develop and perfect a skill of ICT innovation integration over the length of a single training session. Vandeyar (2013). Coupled with this, is the issue of resources, indicating that insufficient resources or lack thereof, directly or indirectly impacts teachers' innovation adoption rate, making it slow (Sahin, 2006; Abanda, 2017). Therefore, ICT resources are imperative in the success of integrating ICTs effectively for innovative curriculum delivery. Table 6.1 provides a brief summary of the concerns that stood in the ICT-TPD programme offered, the enabling points that encouraged positive results, as well as the recommendations for future similar research.

Table 6.1: Suggestion for a successful PD

Course strategy	Constraints	Enablers	Recommendation
1. Baseline assessment (to determine factors and innovation levels)	Factors: • lack of devices = less time = experience needed to be innovative • Numbers dropped as tasks could not be done beyond training sessions •	• Social Media – WhatsApp to share and access google form • Knowledge on access to internet – homework • Possible = longer access (5days) for those who had ICT infrastructure after training	Funding: Source out funding to offer the course when students (participants) have functional laptops
2. Course Design (incl. in appendix and refer to it)	Too much content = limited time • participants had extramural and other professional commitment	• Communicated learning objectives • Content integrated ICT tools • Digital material accessible from anywhere • Collaboration with peers	Begin training at start of the year ATP - plan according to teacher plan for the year/term
3. Training strategy (focus on materials development)	Issue of resources: • Participants either had no device or faulty • Insufficient funding for prolonged device renting period for participants • Limited access to MS Office	Learning smart sharing experiences – accountability, sharing, encouragement to try it in class – numbers of ICT innovation application increased	Funding: Source out funding to offer the course when students (participants) have functional laptops
4. Course Implementation	Duration • It took long – school and department events -sessions were cancelled • Attendance was sporadic • Incentives - participants discouraged because of no incentives	Support from leadership – on days when attending, more attended	• ATP - plan according to teacher plan for the year/term • Work closely with DBE to have training incentivised with certificate of completion • CPTD points
5. Course evaluation (by teachers)	Contact time too short - not enough time to practice in the	• Relevant & applicable content • PLCs were helpful	Continue using PLC for out of class support Increase contact time

In short, this study highlights the challenges and opportunities in implementing ICT professional development courses for primary school teachers in Gauteng, South Africa. It makes practical recommendations for improving course strategy, design, training, implementation, and evaluation, highlighting the importance of revisiting and implementing foundational learning theories like Constructivism, the Gradual Release of Responsibility Model, Rogers' Attributes of Innovation, and the Concern-Based Adoption Model (Sahin, 2006; Killian, 2015; Main, 2021; Deci & Ryan, 2000; Tezci, 2011). By combining theory-driven practices and contextual insights, policymakers and educators can create successful approaches to encourage ICT innovation in teaching practices, ultimately preparing students for success in the digital age through teachers' ability to deliver content innovatively.

Limitations of the study

Limitations in research refer to the constraints, shortcomings, or factors that could potentially impact the scope, methods, findings, and generalisability of a study (Creswell & Creswell, 2017). They are the areas where the study might fall short or where its results might be limited in their applicability or validity (Creswell & Plano Clark, 2018). Identifying and acknowledging these limitations is an essential part of ethical and transparent research practice, as it helps readers, reviewers, and researchers themselves understand the boundaries and potential weaknesses of the study. The limitations in this study include:

Quantitative-Qualitative Discrepancy: There is a quantitative-qualitative discrepancy present in this study. This is due to the contrasting sample sizes within the study, where the larger population size stands in contrast to the smaller qualitative sample. This variance may raise a concern for future duplications of this study about the potential for disparities in interpreting and applying the findings between the quantitative and qualitative components of the research. The smaller qualitative sample might not fully capture and express the diversity and depth of digital competencies perspectives that may be present in the larger population. This may potentially lead to disparities in the insights gained from each approach and posing challenges in integrating and aligning their outcomes effectively. This disparity could impact the holistic understanding of the research topic and the comprehensive application of findings.

Generalisability: In research, generalisability refers to how much the results may be applicable to other settings (Saunders et al., 2009). In qualitative research, findings are often not meant to be statistically generalisable to a larger population like in quantitative research (Saunders et al., 2009). However, a larger and more diverse sample can enhance the transferability of findings to similar contexts or situations. In this study, however, the proportion of the sample size - approximately one-fifth of the population - can be problematic as the size might not adequately represent the population's true diversity and characteristics. In this instance, it is difficult to conclude whether the population of teachers have the potential to be innovative as a result of the ICT-TPD programme rendered by this study.

Localised context: All the participants were from the Johannesburg area, providing insights only to this specific region. This geographical limitation might restrict the applicability of the findings to other contexts, such as rural areas versus urban rural or township areas. Further studies could expand the geographical scope, by including a more diverse array of areas to understand the universal and unique challenges and or opportunities in ICT-TPD (Bingimlas, 2009).

Risk of Bias: A smaller sample size may increase the risk of bias due to the overrepresentation or underrepresentation of some of the perspectives, experiences and characteristics represented in the results (Creswell & Plano Clark, 2018). This can further limit the validity and reliability of your qualitative findings. However, in the case of this study, the risk of bias was minimised by ensuring to only speak to and interpret the raw results as they were presented. Although qualitative data interpretation could run the risk of bias as interpretation tends to be subjective,

the use of *in vivo coding* ensured that the interpretation was justified by direct quotes from the interviewees and that the context of the responses were clear.

Resource Availability: Resources such as a functional laptop and internet access were crucial for this study. However, many of the participants did not have immediate and unlimited access to these resources. Despite the attempt to provide resources to participants, there were still constraints regarding *unlimited* access to other necessary resources, which may have influenced the participants' digital competence and innovation. Participants were, consequently, unable to fully participate in and engage with the digital tasks.

Time Constraints: The study was conducted within a timeframe that often clashed with other professional commitments such as extracurricular activities. This could potentially limit the collection of longitudinal data and hence the understanding of the long-term impacts of the training programme. The limited duration for data collection might limit the level of insights into the sustained progress of the teachers' integration of ICT tools and innovation in their pedagogical practices, potentially constraining the ability to draw robust conclusions about the long-term impacts of the training programme.

Length of study: The predominantly on the immediate outcomes of the ICT-TPD programme. While it touches upon the theme of sustainment, there is a need for longitudinal studies that track the long-term impact, over years, of such training programmes on teachers' ICT integration and innovation in curriculum delivery. Future research could follow up with participants months or years after the training to assess the enduring effects and identify factors contributing to sustained change (Guskey, 2002).

Researcher's Experience and Skills: The researcher's skills and experiences might have influenced the research process and outcomes. Undertaking my inaugural empirical research endeavour brought some challenges, particularly in navigating the necessary processes for a comprehensive study. It is evident that my level of familiarity with research methodologies, data collection techniques, and analytical tools played a crucial role in shaping the research outcomes. As an inexperienced researcher, I encountered challenges in formulating precise research questions, selecting suitable data collection methods, and effectively managing unexpected issues during data analysis. This lack of experience occasionally introduced uncertainties and inefficiencies into the research process that potentially impacted the quality of outcomes. Conversely, seasoned researchers often possess the experience to anticipate challenges, streamline data collection processes, and interpret findings with precision. Recognizing my learning curve in this realm offers context for comprehending the study's implications and any unexpected deviations encountered during the research expedition.

Despite these limitations, this study contributes to the growing body of knowledge on improving teachers' digital competence and innovation using ICT tools. In response to these limitations, future research could focus on exploring these topics with larger and more diverse samples, over a longer timeframe, and with more resources.

Final words

This study explored the impact of an ICT-Teacher Professional Development (ICT-TPD) programme on primary school teachers in Gauteng, South Africa, particularly focusing on how the applied training influences teachers' innovation in curriculum delivery. The study utilised a conceptual framework informed by Rogers' Diffusion of Innovation theory, Constructivism, Self Determination Theory, Gradual Release of Responsibility Model, Community of Practice theory, and the Concerns-Based Adoption Model. The findings collected from quantitative and qualitative data, shed light on the complex nature of ICT integration in education and educational innovation. The study revealed that while an ICT-TPD programme is effective in improving teachers' innovation levels in ICT integration for teaching, there are, however, many factors that influence the degree to which the impact is sustainable.

In conclusion, the ICT-TPD programme in Gauteng, South Africa, represents a significant potential in advancing the innovative integration of ICT in education by primary school teachers. The findings of this study emphasise the need for a holistic approach to teacher professional development in ICT - particularly one that not only equips educators with technical skills but also addresses the other factors such as teacher perceptions, pedagogical integration of the tool, as well as infrastructural factors pertaining to resources. By acknowledging the complexities involved in primary school teachers' adoption of the innovation for curriculum delivery, educational stakeholders can pave the way for innovative teaching practices that resonate with the evolving demands of the 21st-century educational landscape. The journey does not end here; it rather opens new avenues for exploration, understanding, and improvement in the pursuit of excellence in education through the integration of ICT.

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APPENDICES**APPENDIX A: Quantitative Survey Questions**

Timestamp	4. How many learners do you teach in [Grade R]	4. How many learners do you teach in [Grade 1]	4. How many learners do you teach in [Grade 2]	4. How many learners do you teach in [Grade 3]	4. How many learners do you teach in [Grade 4]	4. How many learners do you teach in [Grade 5]
3/18/2022 22:41:31					31 - 40	31 - 40
4/4/2022 17:53:23		51 - 60+				
4/4/2022 23:26:41					41 - 50	41 - 50
4/5/2022 11:21:47						
4/5/2022 12:00:30		10 - 20	10 - 20	10 - 20		
4/5/2022 14:42:47	21 - 30					

4. How many learners do you teach in [Grade 6]	4. How many learners do you teach in [Grade 7]	5. How do you access the internet?	6. Which of the following virtual conferencing applications are you familiar with?	7. Which of the following devices do you own or have regular access to?	8. Which of the following devices do you own?	9. a) Give one word that comes to mind when you hear the word, computer. b) Explain why.
	31 - 40	I use my cellphone, I u	Teams, Zoom	Cellphone, Laptop	Cellphone, Laptop	a) Computer = 4 IR, b)
		I have WIFI at home	Teams, Zoom	Cellphone, Laptop	Cellphone, Laptop	Software
41 - 50		I use my cellphone	Teams	Cellphone, Laptop	Cellphone, Laptop	Communication Computers can be used as a mode of communication
31 - 40	31 - 40	I use my cellphone, I u	Teams, Zoom, Google	Cellphone, Laptop	Cellphone, Laptop	Technology
		I use my cellphone, Int	Teams	Cellphone	Cellphone	Technological devices
		I use the school's WIFI	Teams	Cellphone	Cellphone	Electronic communio

10. Please rate your knowledge and skills on the following: [South African ICT in Education Policy]	10. Please rate your knowledge and skills on the following: [Microsoft Word to create Content]	10. Please rate your knowledge and skills on the following: [Microsoft Word for lesson prep and	10. Please rate your knowledge and skills on the following: [Microsoft PowerPoint to	10. Please rate your knowledge and skills on the following: [Microsoft PowerPoint to	10. Please rate your knowledge and skills on the following: [Microsoft Excel to record, calculate	10. Please rate your knowledge and skills on the following: [Any online tool to teach or assess learners]
Excellent	Excellent	Good	Average	Excellent	Excellent	Excellent
Average	Average	Average	Average	Average	Average	Average
I need to learn this	Average	Good	I need to learn this	I need to learn this	I need to learn this	I need to learn this
Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Average	Average	Average	Average	Average	Average	I need to learn this
Good	Good	Average	Average	Good	Good	Average

11. Which of the following do you use in your lessons?
Select
Microsoft Word for lesson prep and assessment, Microsoft Excel to record, calculate and evaluate assessment
Microsoft Word for lesson prep and assessment
Microsoft Word to create content, Microsoft Word for lesson prep and assessment, Microsoft PowerPoint to create lessons, Microsoft PowerPoint to create Content, Microsoft Excel to record, calculate and evaluate assessment, Any online tool for to teach or assess learners
Microsoft Word for lesson prep and assessment
Microsoft Word for lesson prep and assessment

Survey Frequencies

Multiple Response

[DataSet0] C:\Users\matje\OneDrive\Documents\ICT Quanti Survey.sav

Case Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
\$Internet ^a	6	100,0%	0	0,0%	6	100,0%
\$VirtualConference ^a	6	100,0%	0	0,0%	6	100,0%
\$DeviceAccessed ^a	6	100,0%	0	0,0%	6	100,0%
\$DeviceOwned ^a	6	100,0%	0	0,0%	6	100,0%
\$ICTuse ^a	6	100,0%	0	0,0%	6	100,0%

a. Dichotomy group tabulated at value 1.

\$Internet Frequencies

		Responses		Percent of Cases
		N	Percent	
How do you access the internet? ^a	Cellphone	4	36,4%	66,7%
	SchoolWIFI	3	27,3%	50,0%
	HomeWIFI	3	27,3%	50,0%
	Internet cafe	1	9,1%	16,7%
Total		11	100,0%	183,3%

a. Dichotomy group tabulated at value 1.

\$VirtualConference Frequencies

		Responses		Percent of Cases
		N	Percent	
Which virtual conferencing do you use? ^a	Zoom	3	30,0%	50,0%
	TEAMS	6	60,0%	100,0%
	Google Meet	1	10,0%	16,7%
Total		10	100,0%	166,7%

a. Dichotomy group tabulated at value 1.

\$DeviceAccessed Frequencies

		Responses		Percent of Cases
		N	Percent	
Which device do you have access to? ^a	Cellphone	6	60,0%	100,0%
	Laptop	4	40,0%	66,7%
Total		10	100,0%	166,7%

a. Dichotomy group tabulated at value 1.

\$DeviceOwned Frequencies

		Responses		Percent of Cases
		N	Percent	
Which device do you own? ^a	Cellphone	6	54,5%	100,0%
	Laptop	5	45,5%	83,3%
Total		11	100,0%	183,3%

a. Dichotomy group tabulated at value 1.

\$ICTuse Frequencies

		Responses		Percent of Cases
		N	Percent	
Knowledge of the ICT Policy & Tools ^a	South African ICT in Education Policy	3	11,1%	50,0%
	Microsoft Word to create Content	4	14,8%	66,7%
	Microsoft Word for lesson prep and assessment	3	11,1%	50,0%
	Microsoft PowerPoint to create Content	4	14,8%	66,7%
	Microsoft PowerPoint to present lessons	3	11,1%	50,0%
	Microsoft Excel to record, calculate and evaluate assessment	3	11,1%	50,0%
	Any online tool to teach or assess learners	2	7,4%	33,3%
	MS Word for lesson prep and assessment	4	14,8%	66,7%
	Any online tool to teach or assess learners	1	3,7%	16,7%
Total		27	100,0%	450,0%

a. Dichotomy group tabulated at value 1.

APPENDIX B: Interview responses

INTERVIEW 1

1

INTERVIEW WITH Ismail

Interviewer:

Okay, so this is an interview with Mr Ismail. Okay. Um, for the project titled, promoting South African Primary School Teachers Innovation in Curriculum Delivery through ICT Teacher Professional Development. This is a follow up interview, uh, based on the training that was offered in 2022 to the teachers of Eastgate Primary School.

Uh, I am Interviewer Maeane. So, sir, we have five main questions. So because this is semi-structured, um, if, for example, after a particular question, we feel that we need to delve more into it, and it leads to another question, that's the direction that we are going to take. But in essence, uh, the main questions that we need to answer are these five questions.

And thereafter, if there's anything that you'd like to add, um, you are more than welcome to do.

Okay. So firstly, um, **(1) please tell me about your experience with technology before we started the training. What was your level of, uh, experience there?**

Ismail:

So, I, I'd say I'm, I'm pretty much, um, well versed. Um, I'm well equipped in terms of, uh, using, uh, technological material, mainly because I graduated from an institution that prioritised, uh, integrating education with, uh, you know, obviously technology and its advancement and obviously equipping us with, uh, the ability to implement it in the education space as well. So, uh, we did basically focus on, uh, incorporating technology in our teaching and in whichever, um, space we go into, uh, whichever space we dive into, we've got to have that, um, experience, and we've got to have that ability of using that technology in that space.

Interviewer:

Mm-hmm. Okay. Uh, so had you actually used that knowledge of technology for teaching purposes before the training?

Ismail:

Uh, yes, I have. Um, to an extent I would say that I have mainly because we've always gotta accommodate the diversity that we've got present in the learning space. Mm-hmm. In terms of the, you know, the demographics and, and you know, obviously the socioeconomic statuses of. Some learners might also, we need to ensure that learners are familiar with, you know, obviously these tools, technological tools. So some learners might be familiar with it, um, and have some sort of an idea, whereas a majority of them are not so, uh, well versed with it or even familiar with it to an extent.

So it, it's, it's quite difficult, but to an extent I have, okay, so what I have done is I've basically tried to gauge, uh, to what had these learners engaged with technology. And obviously the extent to which they've engaged and the mediums, uh, which they are familiar with. I've tried to go to the extent of accommodating that medium.

So I'll give you an example. Like, uh, a WhatsApp platform. So that's, it's, it's a common communications platform, so all of our learners are familiar with that, even though they don't have immediate access to it, but it is to their availability, uh, obviously restricted because their parents control the usage.

Because they've had access to that. I've used that platform. And for me that obviously that is a technological platform and it does, um, yeah, it is basically a direction that we

Commented [1]: "well versed"
"well equipped"

ICT Familiarity (Prior extensive ICT experience)

DIGITAL COMPETENCE

Commented [2]: "I graduated from an institution that prioritised, uh, integrating education with, uh, you know, obviously technology."

ICT Familiarity (Formal ICT education from university educational background included a focus on integrating technology into education.)

DIGITAL COMPETENCE

Commented [3]: "incorporating technology in our teaching"

ICT Familiarity (educational background included a focus on integrating technology into education.)

DIGITAL COMPETENCE

Commented [4]: "I have... mainly because we've always gotta accommodate the diversity that we've got present in the learning space."

ICT Proficiency (Application of ICT skills in diverse teaching environments)

DIGITAL COMPETENCE

Commented [5]: "I've basically tried to gauge, uh, to what extent these learners engaged with technology."

ICT Proficiency (ability to adapt the technology in the teaching)

DIGITAL COMPETENCE

ICT INNOVATION

Commented [6]: DIGITAL AWARENESS

2

INTERVIEW WITH Ismail

are moving towards, you know, technological advancement and I have incorporated it. Yes. To an extent. Yeah.

Interviewer:

All right. (2) And what are the challenges that you experienced with the technology during the training?

Ismail:

Uh, the challenges that I experienced with the technology I, I. During that period, I wouldn't say I experienced, um, challenges. I think basically, well, the one sort of like limitation to an extent would be that, you know, the learners had restricted usage of the WhatsApp platform because they had to use it through their parents.

Yeah. So that was, um, just the one challenge that I did have. Uh, so it wasn't necessarily a, a limitation or a challenge as such. It was just like a restriction. I could have certain hours that I could obviously engage with, with the learners, and then it had to be monitored, which is justifiably so. But yeah.

But that was basically the main challenge that I experienced. And, um, yeah, also another challenge that has surfaced, you know, obviously heading towards the project was that of loadshedding. That's, uh, a governmental problem. And unfortunately that that affects all of us. Yeah. So that does, uh, prohibit us. It does restrict. And that was one of my challenges was, was basically the loadshedding, because the, the hours where you can actually engage with these tools, uh, are not so flexible. You've gotta accommodate a loading schedule instead of the schedule accommodating us.

Interviewer:

So, um, is it safe to assume that from your side you had all the devices, you had the necessary technology, but um, it was obviously challenges that were affecting the students. And for example, with the load sheeting, that is an external factor that in the end, um, affected the entire experience during the training, but not so much a problem with your personal access.

Ismail:

Yes, yes, definitely. And, and, uh, I think another prominent issue, which I feel I should mention was that of Covid 19 as well. I think that put us in a complete disarray, um, you know, in, in terms. Our purpose in the classroom, how we approach the classroom in terms of the, the learners and the educators, you know, the perspectives just were all over the place as well. So, um, I think, you know, when we were in the period of Covid, I think every time we, we came to the classroom space, uh, we felt like we were venturing into the unknown.

So, you know, trying to engage with these tools as well. Uh, you know, it felt like we were just venturing into the unknown, and we are engaging with, uh, tools that were like basically new to us. Mm-hmm. And, um, it's like, you know, you had to like relearn a whole lot of things because even when you engage with these platforms, there's limitations as well.

You know, uh, there's, there's also the issue of the learners actually attending. So even if I were to want to engage with them through these platforms initially, I've got to meet with them face to face. So having that contact with them. That was a challenge as well, where I can actually implement, introduce, and implement those platforms.

Commented [7]: "I've used that platform... it is basic a direction that we are moving towards, you know, technological advancement and I have incorporated it

ICT Proficiency (Use of familiar technological platform for teaching)

DIGITAL COMPETENCE

INNOVATION AWARENESS?

Commented [8]: "the learners had restricted usage of the WhatsApp platform"

Resource Constraints (Challenge of restricted technology usage due to parental control)

MOTIVATION

Commented [9]: "loadshedding"

Time Constraints - WORKLOAD
Resource Constraints - MOTIVATION

Commented [10]: "accommodate a loading schedule instead of the schedule accommodating us"

INNOVATION

Commented [11]: Constraints were mostly for the learners

Commented [12]: "venturing into the unknown"

Fear, anxiety - Feeling of uncertainty due to new tool and changed teaching conditions

FEELINGS

Commented [13]: "relearn a whole lot of things"

ICT Proficiency (Need to adapt and learn new ways of teaching with technology due to pandemic)

DIGITAL COMPETENCE

3

INTERVIEW WITH Ismail

So yeah, that also I should have mentioned was a prominent issue, COVID 19. But yeah, indeed, I will reinforce what you said. Uh, it's not a matter of, I, I did not have the resources, the resources were available. However, it just was the challenge of being able to effectively, um, and, and, and, uh, wholeheartedly implementing it in the classroom, the way it should be used, you know, that's, yeah.

Interviewer:

Okay. And we also had the whole concept of the PLCs. (3) **Were you active in the PLCs? And how did that maybe help in alleviating some of those challenges? If it did help at all in alleviating any of the challenges?**

Ismail:

I, I, I think the, the PLCs definitely did help.

Um, I think also what it's done is that it's, it's brought, um, a lot of, uh, concerns to us is that, Um, are we actually at the same level in terms of being, uh, technologically informed, being equipped with the necessary skill set, you know, to be able to effectively engage with these tools and implement them in the classroom.

Um, so I think it also, it, it brought that concern to us that despite, you know, obviously the, the various age gaps and, uh, you know, the various, uh, methodologies we've been subject to in our, you know, our tertiary education. Um, we all need to have. Uh, a uniform approach to the classroom in terms of, uh, you know, technological advancement and usage.

So the PLCs definitely brought that concern to us, but it also helped us address it as well, where we could equip each other with the necessary skills, the necessary knowledge, um, that we can use to ensure that we have a uniform approach to the classroom. So it definitely did help. Um, and, and needless to say, I actually did learn a lot from my, uh, colleagues as well, as much as they have learned from me as well.

So yeah, it definitely did help. Um, and it also, it, it's, it's, uh, it's, it's made it possible for us to actually form these PLCs for other aspects as well.

Interviewer:

So that's great.

Ismail:

I think that's another positive that came up besides the, the equipping of, you know, technological skill sets.

Interviewer:

That's great. Yeah. Oh, we did something right. That's awesome.

And let's talk about the level of support. So, um, I'd like to focus it more on the (4) **training support from the trainers, do you think it was sufficient? Um, what were some of the gaps you identified? Um, did you feel that we supported you?** And please be brutally honest here. Um, obviously for future purposes, if, if we want to continue with this training and future, we need to know where we went wrong and how to fix those areas of concern.

Commented [14]: "the resources were available... challenge of being [implemented]"

Resource Constraints (Availability of resources but challenges in their effective implementation)

MOTIVATION

Commented [15]: "the PLCs definitely did help"

Peer Support (Recognition of the helpfulness of PLC

MOTIVATION

Commented [16]: "are we actually at the same level terms of being, uh, technologically informed"

ICT Proficiency (Concerns over varying technological competencies within the PLC)

DIGITAL COMPETENCE

Commented [17]: "we all need to have. Uh, a uniform approach to the classroom"

Instructional Approach (Desire for a consistent approach to technology in education across member the PLC)

COURSE DELIVERY

Commented [18]: "we could equip each other with the necessary skills"

Collaboration (Mutual learning and skill-sharing within the PLC)

MOTIVATION

Commented [19]: "I actually did learn a lot from my, uh, colleagues"

Collaboration (Personal learning and growth through interactions in the PLC)

MOTIVATION

Commented [20]: "made it possible for us to actually form these PLCs for other aspects"

Peer Support (Expansion of PLC concept to other areas beyond technology)

MOTIVATION

Commented [21]: "another positive that came up besides the, the equipping of, you know, technological skill sets"

Positive Attitude towards Instructional Material (Acknowledgement of other benefits of PLCs beyond technology skills)

ATTITUDE

4

INTERVIEW WITH Ismail

Ismail:

Um, okay. To be brutally honest with you. Yeah. I, I think, uh, first and foremost, I'd like to thank, you know, obviously the, the hosts of this whole workshop. Um, because I think it's necessary that we have such, you know, we have such a workshops, um, because it's very important to, to create awareness around, you know, technological usage.

So with the, the conductors of the workshop, the host of the workshop, I think they were extremely supportive. Uh, mainly because they, they come from a background where they have prior knowledge of the, the education environment as well. So they are aware of, you know, obviously the challenges, uh, in terms of, you know, time constraints, in terms of workload.

So they were very accommodative of that, uh, as well. And they did provide support, be it face-to-face support, be it over the phone support as well. Uh, they were very timeless as well in terms of, their lessons in terms of deliverance as well. They were very clear with it. Uh, and, and also they were very compassionate as well.

Uh, taking into consideration that, you know, not everyone comes from a prior knowledge background in terms of technological usage. So they, they had to like drop down the their knowledge scale, um, to accommodate everyone. Um, and, you know, break down, you know, the terminology. Break down how to actually go about, you know, engaging with the workshop as well and getting what's done, what is required.

So I'd say they were definitely very accommodative. They were very, uh, informative as well. And, um, yeah, very professional in how they carried out everything. And yeah, I definitely learned a lot. And, and I would definitely say that this would benefit, um, other schools. It would benefit other educators and it would hopefully open up, you know, the, the education, Gauteng Department of Education's eyes to the fact that, you know, um, moving towards, you know, a, in a Fourth-IR, um, would have to take a lot of the, of, um, effort from them and they would definitely need to come to the party. And, and we shouldn't necessarily have, you know, these, uh, external, um, workshops that are doing more than the department itself. Yeah. So...

Interviewer:

From your lips to the department's ears...

Ismail:

Yes. Uh, speaking into fruition. Here we go.

Interviewer:

Uh, thank you so much, sir. And (5) what aspects of the training do you think you most benefited from?

Ismail:

Um, I, I'd say the aspects that I most benefited from was the, the facts that, uh, the training opened my eyes to, to the various platforms that we do have that are available to us, uh, that, you know, don't necessarily require, uh, monetary commitment.

Um, you know, there are platforms that are quite free. Yeah. Uh, there are platforms that are quite also informative as well, and platforms that are also available to, to the, the public, uh, you know, at a larger scale as well. So these are platforms that not only educators can, can engage with, but also parents and learners as well.

Commented [22]: "they were extremely supportive"

Structural Support (Acknowledgement of the support nature of the trainers)

MOTIVATION

Commented [23]: "they come from a background where they have prior knowledge of the, the education environment"

Instructional Approach (Recognition of trainers' knowledge and understanding of the educational environment)

COURSE DELIVERY

Commented [24]: "they were aware of ...the challenges"

Structural support - Guidance/ Facilitation

Commented [25]: "they were very accommodative"

Instructional Approach (Appreciation for trainers' flexibility and accommodation of different levels of technological proficiency)

Commented [26]: "they were very timeless as well in terms of their lessons"

Instructional Approach & Time Allocation (Recognition of trainers' efficient time management in lesson delivery)

Commented [27]: " they were very compassionate"

Appreciation of trainers' empathy and understanding towards participants' challenges

Commented [28]: "they had to like drop down the their knowledge scale, um, to accommodate everyone"

Instructional Approach (Recognition of trainers' ability to adjust their teaching level to accommodate varying

Commented [29]: "this would benefit, um, other schools"

Positive Attitude towards Instructional Material (Belief in the potential benefits of the training for other

Commented [30]: "we shouldn't necessarily have, you know, these, uh, external, um, workshops that are doing more than the department itself"

Positive attitude towards instructional approach and

Commented [31]: "opened my eyes to the various platforms"
"don't require monetary commitments"

ICT Familiarity (Recognition of the value of freely

Commented [32]: "platforms that not only educators can, can engage with, but also parents and learners well."

ICT familiarity (Appreciation of the broad usability of

5

INTERVIEW WITH Ismail

So that's one thing that I'm highly appreciative of, was that we were informed of the various platforms that we can use and also the various platforms that are so subject and content, and especially Eastgate Primary School related, uh, you know, the, the platforms touched on a lot of, if not, I wouldn't say all, but most of the topics that we're currently engaging with in the classroom.

And, you know, when we came across that we were quite surprised that, you know, we are not aware of these platforms and now it's been brought to our attention and even told us day. We are still engaging with those. Whether it's educational and personal as well. So it benefits definitely.

Interviewer:

Thank you so much, sir.

And is there anything else that you'd like to add on to this?

Ismail:

Um, I, I'd definitely say that, uh, this workshop was quite beneficial and we learned a lot and I, I think it's, it's very important to have workshops like, uh, these to, to accommodate, you know, um, educators that are fresh from, uh, you know, university.

So that we, we have a uniform approach and that from the onset, they are aware of, you know, what the, the end goal is. Yeah. To ensure that, you know, from the moment they step into the classroom, they've got to have that Fourth-IR approach. They've got to have that, uh, technological advancement approach as well.

So that's, that's the one thing I'd like to say. So if this could be a continuous program and workshop that's implemented maybe on a regular basis, maybe not every year, but maybe every second year where new newly appointed educators are trained, and that would be beneficial.

Interviewer:

Yeah, I like that. I agree.

Thank you so much, sir. I will.

Commented [33]: "informed of various platforms"

Instructional Material (Valuing the training for informing them about relevant platforms"

COURSE DELIVERY

Commented [34]: "important to have workshops like uh, these "

Positive attitude towards Instructional Material (Recognizing the importance and benefits of the workshop especially for newly graduated educators)

ATTITUDE

Commented [35]: "if this could be a continuous program"

Structural Support (Suggestion for continuous implementation of the training program)

CONTINUOUS SUPPORT

INTERVIEW 2

1

INTERVIEW WITH LAILA

Interviewer:

All right. Good afternoon. I am here with Mrs. Right? [Laila: Yes, yes.] Um, for our interview for the research project called Promoting South African Primary School Teachers Innovation in Curriculum Delivery through ICT Teacher Professional Development. I am Interviewer Maeane. This is part of the data collection for the training that we did in 2022 for the ICT teacher training professional development.

Okay. So, Mrs., there are five questions that I want us to discuss. Okay. But because this is also semi-structured in a way, whatever comes up during this interview, during these questions, we will just go with it and touch on that. But in the end, these are the main five that I wanted us to answer, so with you as well in your responses.

If there's something that you would like to add as we go through these questions, please feel free to.

So our first question, um, if you would **(1) please tell me about your experience with technology before we started the training.**

Laila:

Okay. Actually, I'll start from, uh, Wits when I started doing my undergrad. I, I didn't know I, what is the computer? I couldn't type, I used use one finger, but at some point I learned. I learned. Then, yeah, I was not that perfect, but I could type my assessments. Just the, the simple things.. Just typing and or not beyond that. Just typing and saving and all that. Yeah.

Interviewer:

So was your, um, knowledge of, or your experience with technology at that level? Uh, just before we started with the training as well.

Laila:

It was much better compared to like few years ago. Cause before then, remember I said I was used to type with like using one hand I couldn't. I didn't know how to save, but now I could. I was faster. And I was able to save and be able to do the pictures cropping and all that.

It was not, Bad. Yeah. Yeah. It was that compared to before. Before, yeah.

Interviewer:

And had you used it for teaching purposes?

Laila:

Only teaching purposes, only. Yes.

Interviewer:

Teaching the kids or just for your own admin?

Laila:

On my own admin. My own admin. Because yeah, actually I'm scared of using it cause I'm not good at it. So, and the other thing, the main things that we don't have, the resources, we don't have.

Commented [1]: "I didn't know..."
"I couldn't type"
"I used one finger..."

Not familiar with computer use

ICT familiarity
DIGITAL COMPETENCE

Commented [2]: "I could type my assessments"

Basic computer functions

ICT familiarity
DIGITAL COMPETENCE

Commented [3]: "Just typing...not beyond that"

Basic computer functions

ICT familiarity
DIGITAL COMPETENCE

Commented [4]: "I was faster"
"I was able to save"
"able to do the pictures cropping"

Basic computer functions had improved at the start of the training

ICT familiarity
DIGITAL COMPETENCE

Commented [5]: "my own admin:"

Basic functions were mostly for admin purposes

ICT familiarity
DIGITAL COMPETENCE

Commented [6]: "I'm scared"

Afraid of using the ICT tool for teaching
FEELINGS

"I'm not good at it"

ICT familiarity
DIGITAL COMPETENCE

Commented [7]: "we don't have the resources"

Resource constraints
MOTIVATION

2

INTERVIEW WITH LAILA

Interviewer:

But I saw when you were doing the training. Maybe it was because of your enthusiasm, but you seemed to be coping very well.

Laila:

I was fine. It was very interesting. I could see that even if I don't have this, I can improvise like the WhatsApp groups. Yeah. I can send things to the learners quickly, get the responses and all that I like, but I didn't know that I could do those things.

I didn't know that I could have the group [Interviewer: Really?] And then, yeah, it didn't click. I knew about it, but I didn't click that. I can use it in the classroom environment. Like we use it in our, where we stay when we have meetings and all that, but I didn't know that I can bring it into the classroom. I thought maybe classroom is only overhead projects, download something, videos and all that could, you know, that it is very like broad, I can use it. Like in those simple Yeah. For like WhatsApp.

Interviewer:

So your innovation was sparked. I like that.

Laila:

Yeah. Yeah. It was Jim. It was very interesting.

Interviewer:

And (2) **what were the challenges you experienced with the technology during the training?**

Laila:

Yo, it was a lot. Cause as most of the things I didn't know, as I said, Technology, like I understanding was very limited. So it was difficult for me to find some of the things, especially creating the portfolio. Yes, interactive worksheet. Some of the things, like most of the things, not some, most of them, but I do know about them. Like you go and beyond what we see on the screen and you know about that and what else.

Yeah. And then what the TEAMS that we were using, it was difficult. Wifi, sometimes not working and we are left behind. You try to catch up and then, yeah, that was the problem. And the other thing that learning something new, was very like difficult for me learning something new and it's too much at the same time.

So it was difficult for me to balance, but it was very interesting.

Interviewer:

Yeah, and you kept coming to the sessions so clearly there was something interesting.

Laila:

Mm-hmm. It was interesting. Shame, um.

Interviewer:

You know, we had the PLC groups, right? [Laila: Yes. Yes.] Um, (3) **how did those [PLC groups] help with alleviating some of these challenges that you experienced?**

Commented [8]: "Very interesting."

"I can improvise."

ATTITUDE

"WhatsApp groups."

"Send things to learners quickly."

"I didn't know I could do those things."

ICT familiarity

DIGITAL COMPETENCE

Commented [9]: "I can use it in the classroom environment."

She didn't realise that WhatsApp can be used for teaching in the classroom

"Overhead projectors."

"Download something, videos."

"Broad, I can use it."

"Simple."

She realises that ICT is broad

ICT familiarity

DIGITAL COMPETENCE

(sounds enthusiastic)

ATTITUDE

Commented [10]: "Yo, it was a lot"

Sounds overwhelmed

FEELINGS

Commented [11]: "Technology...understanding was very limited"

"difficult to find some things"

"creating the portfolio"

"interactive worksheets"

ICT familiarity

DIGITAL COMPETENCE

Commented [12]: "TEAMS that we were using, it was difficult"

"Wifi, sometimes not working"

"left behind"

"trying to catch-up"

The Instructional Material was not so effective

COURSE DELIVERY

Commented [13]: "it's too much"

"it was difficult for me to balance"

Participant found it difficult to grasp the content; due Instructional Approach

COURSE DELIVERY

MOTIVATION (kept going because of the new skill?)

INTERVIEW WITH LAILA

Laila:

Um, we had to sit after school and go back to what we did in class. Yeah. It really helped that one. Yeah. Going back to what we did. Learning from others that no, we did this. But normally in class I used to take down my own notes, use the computer, also take down. Then when after that we have our PLCs, then we sit and we go back and say, "ma'am said this, that," yeah, it was like revision, it's that.

Commented [14]: "Going back to what we did"
"Learning from others"

Collaboration & Support

MOTIVATION

Interviewer:

Did, did, did you find that those groups actually helped a lot? Um, especially after the training. Do, do, do you think that maybe you could have coped without these groups?

Commented [15]: "revision"

Support

MOTIVATION

Laila:

Uh, maybe. Yeah. Cause for me, I can do beyond. Yeah. Copy again, revise on my own. Even if in groups, we did that in groups, but I'll also, when I get a home set and try to understand All right, indeed.

Commented [16]: "I can do beyond"

Does not always need external motivation. They are able to motivate themselves.

MOTIVATION

Interviewer:

The PLCs that you were in, was it per subject? Did, did you have the same subject in common or...

Commented [17]: "when I get home"

Shows enthusiasm

ATTITUDE

Laila:

No1

Interviewer:

Phase in common... ?

Laila:

Phase in common, yes.

Interviewer:

Phase in common?

Laila:

Yes.

Interviewer:

Okay. Alright. Okay. And, um, **(4) what do you think about the level of support that you got during the training**, particularly from the, Uh, trainers. Please be brutally honest, nothing will be used against you.

So if you feel like you are not supported, please do open up. Uh, I want your honest opinion. Um, what you think about the level of support provided during the training session.

4

INTERVIEW WITH LAILA

Laila:

The level was fine. I feel that at some point it was too fast. The information was a lot at this small period, uh, short period of time.

Yeah. And especially Doctor's part. She was like, "let's move, let's move, let's move" there. It was very fast. It was very fast and then at some point it's new, you're trying to catch up, there's a computer, try to listen to what she's saying, looking at your computer... but your part, at some point you were taking it one step at a time.

Are you here now? Are you there now? But it was not bad, but the level of support was okay. It was at some point. Yeah.

Interviewer:

How do you think it could have been better?

Laila:

Maybe because of time. Maybe just learning one concept or one particular thing at the time, and then you wait for the Yeah, it's time. Everyone to, we like everyone to be in the same like page. Wait for everyone. Now we are there. Like when you are teaching know like with like, we are starting from like, from like I am grade four or my foundation phase. You take me step by step. Like with the grade fours, I'm teaching grade fours.. You take them, step by step, now you write the date, are you done?

Now let's go to this step. Are you done? Like unlike just, done date... they like, moving fast. You move with them. Yes, yes.

Interviewer:

And I like the emphasis on time. [Laila: Yeah, absolutely.] So for example, there was trying to balance time after school because you had just finished your teaching duties. Mm-hmm. And you are probably tired.

So, yeah. And. Um, from the training perspective, maybe we are trying not to use up too much time. [Laila: Mm-hmm.] Um, so that you don't leave too late. [Laila: Yes. Okay.] So in, in that regard, um, with the time, do you think maybe we could have slotted it in at a different day, like maybe during the weekend or during holidays, or how do you think we could have worked around the time issue?

Laila:

I, uh, ish, I don't know, maybe twice per week. Cause now weekends, we're tired during the week. We were here at school and then weekend. You just want to relax and then do the work. We also can take all work home. Maybe you should have maybe came maybe twice per week or maybe thrice. I don't know. Maybe it was gonna work.

Interviewer:

You think holidays would've been an option?

Laila:

Commented [18]: "too fast"
"information was a lot"
"small period... short period of time"

Time Allocation (was not enough)
Instructional Approach (information overload)

COURSE DELIVERY

Commented [19]: Information overload?
Overwhelming

Commented [20]: "you're trying to catch up"
"try to listen to what she's saying"

Felt overwhelmed by the amount of information

Instructional Approach

COURSE DELIVERY

Commented [21]: "learning one concept... at a time"
"everyone to be in the same page"
"wait for everyone"

Instructional Approach (should not be too fast)
Guidance/ Facilitation (more appropriate pacing)

COURSE DELIVERY

Commented [22]: "take me step by step"

Guidance & Instructional Approach

COURSE DELIVERY

Commented [23]: "maybe twice a week"

Time Allocation (required more contact time)

COURSE DELIVERY

Commented [24]: "we're tired during the week"
"you just want to relax"

Time constraints (due to other professional/ work responsibilities)

WORKLOAD

Commented [25]: "twice per week or maybe thrice"

Time Allocation (required more time)

COURSE DELIVERY

5

INTERVIEW WITH LAILA

Maybe holidays... Yes. Maybe holidays. Once per week maybe. Yeah. Then we have maybe a whole day in the holidays. Yeah.

Interviewer:

And (5) **what aspects of the training do you think you benefited from the most?**

Laila:

The one of the interactive worksheet, that ones like, it's very interesting. **[Interviewer: You liked it neh?]**

Yeah, I like that one. Yes. I couldn't do, I didn't know that I could I can do that interactive worksheet, creating those groups, sending work to the learners. You get the responses then and there, and the kids were very excited. They like the inside, which was the one for me.

Interviewer:

And do you still use some of these things even after the.

Laila:

I used them before we closed schools last year, but now I'm thinking to use them cause ma'am just now said we need to create the, the WhatsApp groups, each and every class must have a WhatsApp group. So we gonna be using that. Yeah, sending the worksheets. Even ma'am X is doing it, I started and some of the teachers are doing it. Sending the work. Yes.

Interviewer:

Innovation.

Laila:

Yeah. We, we gonna definitely gonna be doing that.

Interviewer:

I like that.

Laila:

We are moving towards that. Yeah.

Interviewer:

Thank you so much Laila. Is there anything else that you would like to add? [Laila: To add on?] Um, anything?

Laila:

Anything. No, everything was fine. That it was very interesting for me. It was very exciting.

Although Was it with your interaction? Yeah, although it was, the information was like new, you know, you learn something new sometimes. I find it's difficult to balance the work and the that information, but the practical part of it, doing it now practical for me was the, it was the best. It was. Yeah.

Interesting. I really like that one. Yes.

Commented [26]: "interactive worksheet"
"very interesting"

Instructional Material (found it interesting and relevant)

COURSE DELIVERY

Commented [27]: "I didn't know I ca do that"
"creating those groups"
"sending work to the learners"
"getting responses then and there"

ICT familiarity (using the tools in their active teaching)

DIGITAL COMPETENCE

Commented [28]: "difficult to balance work and [new information]"

-the need to prioritize their tasks and responsibilities effectively

WORKLOAD

6

INTERVIEW WITH LAILA

Interviewer:

Thank you so much.

Laila:

Practical work. Practical. It was. It was, yes. Yes.

Interviewer:

Would you do it again if given the chance? The chance, and if you have the time.

Laila:

Time, yes. I would definitely, yes. Especially the practical part. Doing it like, yeah, practice. [Interviewer: Practice, until you get it right...] Yes, yes.

Interviewer:

No, Mrs. , thank you so much. I think that's it.

INTERVIEW 3

1

INTERVIEW WITH Priya

Interviewer:
Good afternoon. Um, this is a recording of the interview with, Mrs Priya. from Eastgate Primary School for the research project under the title promoting South African Primary School Teachers Innovation in Curriculum Delivery through ICT Teacher Professional Development. This is a follow interview up based on the training that was provided in 2022 to the teachers of Eastgate Primary School, my name is, uh, Interviewer .. Okay, ma'am.

Priya:
So you, you are not, you are not recording me now.

Interviewer:
We are recording each other now. Please don't be afraid. It's just you and.

Priya:
But this recording you cannot delete it.

Interviewer:
I can't delete it, but I'm not going to share it with anyone. Yes. So remember the consent form that you signed at the beginning of the research?

Priya:
Mm-hmm.

Interviewer:
It shows that everything that we do, it's private and confidential. [Priya: Okay.] So this recording, I'm only going to use it to compile my research. [Priya: Ohhh] and no one will have access to it. So if you hear your voice somewhere, you have the right to sue me because it shouldn't be shared with anyone and it will not be shared with anyone.

Priya:
Okay...

Interviewer:
Okay, ma'am. So even in the responses in my research, your name will be confidential, so I will never write that "Mrs. Priya said..." yes. It'll always just be maybe teacher X or teacher B, or teacher Y, but you will never be revealed as the respondent. [Priya: Okay.] All right.
So ma'am, (1) please tell me about your experience with technology before you started the training.

Priya:
Ok uh, based on technology was very tricky. Uh, but it's very beneficial for teachers and user friendly to the kids. Yeah. So, but since you came then I started to have that interest. Yeah. Regarding. Yeah. So I've learned, though some other items were tricky. Yeah. But it was very enjoyment to me.

Commented [1]: "very tricky"

Found it to be uncomfortable

FEELINGS

Commented [2]: "have that interest"

Starting having a positive outlook towards it

ATTITUDE

2

INTERVIEW WITH Priya**Interviewer:**

And did you ever use teaching? Uh uh, in technology or ICT for teaching before this? Before this training started?

Priya:

Um, I once did at WITS, but it was, you know, that, uh, we were working on groups. Yeah. Using the, the slides, whatever. Yeah. But it's long time.

Interviewer:

How many years ago? [Priya: 2009.] Oh my goodness.

Priya:

I was furthering my studies. [Interviewer: Yeah.] Yeah.

Interviewer:

That's a long time.

Priya:

Yeah, that's a long term. Then you came. So, uh, you know, it, it is good if schools, they do offer us this thing of overhead projectors, or whatever. Yeah. So, so after you have learned that side coming, then you find that you are teaching, then you don't have those kind of resources, you know, even this one is not working. Then you start getting forgetful. So, yeah. But you came and bring that 'oompf' back to us that we, we can try this to the kids. And most of, most of the kids, they do learn more with, uh, these, uh, the visual things than it's, it's part of enrichment to them and they don't forget, especially what they see images. Yeah. It keeps them, yeah.

Interviewer:

And do you think this is something that you will definitely be using continuously after this?

Priya:

If I could find, uh, the, the school or the class that they do offer, the, the resources, it's gonna be very, uh, user friendly for me. Cause, you know, I'm, I'm teaching the LSEN [Learner Special Education Need School's] kids, so... [Interviewer: Oh yes.] So most of them, the, this thing of chalkboard... So, uh, they're slow learners. So if I'm using this kind of, uh, the resources for them, it's gonna be, uh, a very interesting lessons. Yeah. Always, you know?

Interviewer:

Yeah. Okay. So you mentioned resources, and I'm thinking that maybe the resources are part of some of the challenges that you came across. [Priya: M-hmm.] So, which comes to the next question that, (2) please tell me more about some of these challenges that you experienced with the technology during training.

Commented [3]: "I once did at WITS"

She is familiar with ICT tools in education - But not proficient in it.

DIGITAL COMPETENCE

Commented [4]: "overhead projectors"

Familiar with ICT tools

DIGITAL COMPETENCE

Commented [5]: Insufficient ICT resources that have affected ICT proficiency, because become out-of-practice and become forgetful of the skill.

DIGITAL COMPETENCE

Commented [6]: "you came and bring that oompf back to us"

Positive outlook towards the training's potential

ATTITUDE

Commented [7]: "If I could find...the school or the class that...offer the [ICT] resources"

Resources affect skill

DIGITAL COMPETENCE

Commented [8]: Realises the link between resource and the interest to apply the tool's potential

Resource constraints

MOTIVATION

3

INTERVIEW WITH Priya**Priya:**

Okay. Okay. The challenges that we, we, I encountered with you always when we come here. You know, we are teachers, sometimes, you know, okay, we were kids to you though we are teachers.

And you were working according to a schedule. So sometimes you are... Cause this is what you know. And this is what you're excelling in. So, you expect us to be like you and whereas we are still crawling. So my concern is that in the near future, when you come, continue with that breakdown... It should not be more hours... breakdown, maybe one and a half hours. Not two, four. So this thing, it needs like one hour. Ok, 30 minutes teaching, 30 minutes discussing. Then it's, it makes us... that, it build. And the more the lesson is interesting, the more that, uh, we want, uh, we won't forget. Yeah. So it'll be part of our enrichment.

Interviewer:

I, I want us to, to just go, go, go back a bit on, on what you said, and I want you to put it plain and simple for me.
What was the challenge?

Priya:

Timeframe? [Interviewer: Okay.] And, and, and you must know that regarding the time. Teachers, we are all teachers, we are like learners. We've got, uh, different IQ though we are teachers, but you must know that others, they learn through repetition. Yesss.

Interviewer:

Yes, get you. I get you. Yes. Yeah.

Priya:

Yeah. The group work was very interesting. Mm. Cause we interact each other. Yeah. And the way you have been walking around us, it was that you were, you, you, you were making the environment, uh, uh, pleasing. [Interviewer: Oh, thank you.] But time frame. Timeframe, teachers we are at work, two o'clock, they done. You are coming. You are tired. We are, we are tired. You are coming. We have to attend... I've been working with the learners with the different abilities in this class.

Interviewer:

Hey, and it must feel, it must have been very challenging for you in particular?

Priya:

Very challenging. Cause you know, those kids, it depends on the day. If they, they say that today, "I'm not going to learn". It's not them that say that. It's what they, isn't it their on medication, some? So you'll find that, really... You'll find a day that I almost did only Maths and I, I should not rush them. So it's like I, I'm now adopted to their style, although I'm not like them...

Interviewer:

But you have come to their level.

Commented [9]: "you expected us to be like you"
"we were still crawling"

She feels that the pace of the delivery was rushed

COURSE DELIVERY

Commented [10]: "breakdown"

Simplify the content through a Breakdown of the train sessions

COURSE DELIVERY

Commented [11]: "Timeframe"
"we are like learners"
Different IQ"

Requires a breakdown of the content & sessions to better grasp the skill

COURSE DELIVERY

Commented [12]: "walking around us"
"pleasing"

Support

MOTIVATION

Commented [13]: "Timeframe"
"we are at work"
"You are tired. We are tired"

Exhaustion

WORKLOAD

Commented [14]: "We have to attend"

Frustration due to exhaustion

WORKLOAD

Commented [15]: "I'm now adopted to their style"
"although I'm not like them"

Breakdown of the content and sessions for better understanding

COURSE DELIVERY

4

INTERVIEW WITH Priya

Priya:

Yeah...To their levels. So in future, break down your, your items, break down them, so that everyone, they must have that, "Okay, let's go. Let's go."

Commented [16]: "breakdown your items"

Emphasis - sounds overwhelmed

COURSE DELIVERY

Interviewer:

Yeah. So in, in terms of the time, because I like that you mentioned the time constraint. Um, in terms of that, in future, do you think maybe to accommodate everyone, uh, the schedule and, you know, your, your level of exhaustion, should we maybe look at weekends or maybe holidays?

Priya:

Mh-hmm, weekend...

Interviewer:

When, because... Just tell me what you think would, would be another suitable alternative.

Priya:

I think, I think holidays... so if it's holidays, one week coming, then the rest of the week will give us time. **[Interviewer: Okay.]** Then you'll see them coming. Yeah.

Commented [17]: "holidays"
"time"

To alleviate the workload commitments mid-term

WORKLOAD

Interviewer:

You believe that the teachers will come,

Priya:

I'm telling you... Akere (isn't it) they've been attending the workshop over the holiday.

Commented [18]: "they've been attending the workshop over the holiday"

Union-based PD training

WORKLOAD
MOTIVATION

But those people [Union & GDE trainers], they do think for us that these people, they've got their families, they have to do this and this and this. That's why the first week teachers are coming, all of them. First week they're coming. All of them.

Interviewer:

Then after that they enjoy their holiday...

Priya:

Yes. And even though that they're there, don't pressurise them, you know, in the morning, yes, they should be the one for the talking... Get to know them. Yeah. So involvement, you involve them with what you're going to, uh, talk about. Then, and to update them for tomorrow. Update them tomorrow so that they can prepare themselves, not by means of pressuring them. No, no. Akere [isn't it] those people they know that, they are adult. They've got challenges from home now. So you work on their pace. Yeah. But it should not be a long time.

Commented [19]: "pressurise"

Don't overwhelm with information during training

COURSE DELIVERY

Commented [20]: "update"
"prepare themselves"
"not by means of pressuring them"

Ways to mitigate being participants being overwhelm

COURSE DELIVERY

Interviewer:

Yeah. I like that.

5

INTERVIEW WITH Priya**Priya:**

It shouldn't be a long time, long time meaning teacher starts nine o'clock until two o'clock.
No.

Commented [21]: "It shouldn't be a long time"

Pace

COURSE DELIVERY

Interviewer:

Yeah, that's too much.

Priya:

That's too much. [Interviewer: That's too much]. Nine o'clock, half past 10 break. Yeah, then coming... Then 11, 12, lunch. Yeah. Then half one [1:30pm] done. Everyone goes. Yes.

Interviewer:

Okay. So ma'am, you also mentioned the groups that they helped you a lot, **(3) those PLCs. How did they help to alleviate some of those challenges?**

Priya:

Uh, they were very, Mm. Where you are struggling, they'll come and help you. Looking on what they did.

Commented [22]: "struggling"
"they'll come and help you"

Collaboration & Support

MOTIVATION

Interviewer:

Were you very active in those groups?

Priya:

I was active. You still remember? I, I once, uh, usually I used to stay at school with Mr. M.

Interviewer:

Oh, yes. And I saw Mr. X was around sometimes.

Priya:

Yes, then Mr. X left. So he was very, very helpful. Very helpful.

Commented [23]: "helpful"

Supportive

MOTIVATION

Interviewer:

Okay. Do you think, um, that maybe you couldn't have coped very well without the groups?

Priya:

Yeah, to be honest, uh, what I'm saying that, uh, some of the teachers that done this from high school level, Yes. So starting with this course, tertiary, it's gonna take you time. Yeah. So Bantu Education, it kills us.

But anyway, we, we, we crawl over those, the, the youngsters. That we should not be left behind. Yeah.

Interviewer:

And what do you think about the level of support that we provided you? Now I want you to be brutally honest here. Uh, do you think that we did support you? Do you think that

6

INTERVIEW WITH Priya

the support was not enough? (4) What do you think about just the overall level of support from the trainers of the project?

Priya:

To be honest, you were very helpful. But not knowing, uh, the, the, the intellectual capacity. Cognitive level of the teachers. Mm-hmm. How to the struggles. Very, very, you are very, very supportive. Cause you came with that knowledge. Isn't this what you know? Yeah. So when you come, cause you are knowledgeable with this.

Maybe you were expected us to be like you, but you were going to each and everyone, whether the person is to me. You have done a great job.

Interviewer:

Oh, thank you.

Priya:

If you could come again repeating the same thing, then you'll see I'm telling you. [Interviewer: Yeah, I thank you, ma'am.] And repeating the same thing. Yes. You're gonna see.

Cause it's like, you know, you know, you know, teaching a child, for, for most of the teachers it was a baseline. Yeah. Yeah. You were an expert, for teachers it was a baseline. Especially the ones that did, uh, Bantu education. Yeah. But the youngsters, nineties, for them, it was just, it was easy. Yeah, wrapping over.

Interviewer:

So you think that there's definitely a need for us to come back.

Priya:

Please. Please. You should not leave us on the island. Come serious. Come again. Yes. Then you'll see that how, how people are not participating. Especially, it could be the same thing now. Yeah. Same of what you taught us. Really!

Interviewer:

But like round two or round two.

Priya:

Yeah, round two, but breaking down things. Yeah. Breaking, breaking.

Interviewer:

And, and I like that you are highlighting and you are emphasising what you would like to see as a change.

Priya:

Mm-hmm. We need to round two. Yes. You know, you'll see transformation. Yes. You'll see transformation. That's why you'll find that I, I don't know, most teachers you end up, they were not coming. You know, you know, you know, coming is not, they didn't want, they are, they're throwing the towel down. Mm-hmm. Because you don't know that... That's why I've said that when you start our thinking capacity differs. Yeah. You could

Commented [24]: "helpful"
"not knowing...intellectual capacity"
"cognitive level"

Need to understand the participant's ICT proficiency

COURSE DELIVERY

Commented [25]: "going to each and everyone"

Facilitation

COURSE DELIVERY

Commented [26]: "come again"

Looks forward to another opportunity of the training

ATTITUDE

Commented [27]: "baseline"

Level of proficiency

DIGITAL COMPETENCE

Commented [28]: "island"
"come again"

A need for more guidance

CONTINUED SUPPORT

Commented [29]: "transformation"

Optimistic about impact of future training

ATTITUDE

CONTINUED SUPPORT

Commented [30]: Instructional Approach

COURSE DELIVERY

7

INTERVIEW WITH Priya

see that the person is a teacher. Yes. Teacher by learning whatever, but thinking capacity, technology-wise, that teacher's not there.

So they end up throwing things down, towel down. So if you can come again, go down to their level. Though you are an expert, go down to that level. That's why these kids that I'm teaching are much, my level is higher than them, yes.

In the class, you know, a content can be break up into three aspect:

- Water, definition of water.
- Water, right? the importance of.
- Water, true or false?
- Water, pictures of the water.

Can you see how many? Which means I'm accommodating everyone.

Interviewer:

But you are talking about the same one thing.

Priya:

Like you, when you go there, there are people that the technology's not just a simple thing to them. Yeah. But you must know that there are people who still need to be hold by the hand. Cause, they, they learn how to use chalk and a pen all the time.

Interviewer:

Yeah, no, I get you ma'am. Um, the last question here, **(5) what aspects of the training do you think you benefited most from?**

Priya:

I like Canva.

Interviewer:

One of my favourites as well.

Priya:

Canva and the Interactive Worksheets. To the kids, yeah, it was, it was good. Mm-hmm. So I wish that we do have this kind of, the resources that it's gonna minimise our time, minimise our work. But you know, where our schools are not those prominent schools. Yeah. If it's like other schools that whereby when you teach us, then tomorrow I have to do the practical thing. It won't flip over.

Interviewer:

Hmm. No. Thank you very much ma'am.

Priya:

I wish that you can come again. **[Interviewer: I would like that as well.]** Over the holidays too. Yeah. Yeah. Over the holidays, come and you, you are a friendly person.

Interviewer:

Oh, Thank you.

Commented [31]: "Canva"
"Interactive Worksheets"

Instructional Material

COURSE DELIVERY

Commented [32]: "minimise our time"
"minimise our work"

Sees the pedagogic potential of these Instructional Material

COURSE DELIVERY

Commented [33]: "I wish that you can come again"

A need for more guidance

CONTINUED SUPPORT

Commented [34]: "over holidays"

A need for more time

Time Constraints

WORKLOAD

8

INTERVIEW WITH Priya**Priya:**

You were, no, you were though. You've got those kind of the, your own ego, whatever. But number one, your voice, you were taught, your voice were, was just... a normal. Yes.

Interviewer:

Thank you.

Priya:

And it was, it was good to be with you. Thank you. And knowing you and getting more things up from you.

Interviewer:

And I would love to come back...

Priya:

And, and that's my prayer. **[Interviewer: I, I hope that...yeah]** Holidays, one week just tell us, don't, not two weeks. One week,

Interviewer:

and one week will be more than enough to cover that content on.

Priya:

We don't mind about the, the food, our, like food, whatever. We can come with our lunch the way you do come to school. Yeah. But a week you come with the same aspect, but you can top up somewhere, somewhere. Akere [isn't it] it can be the same aspect, but you can just put the butter and what, what... the way, you know.

Interviewer:

Yes. Yes. No, thank you ma'am. And is there anything else that you would like to add onto what we have spoken about?

Priya:

I'm done.

Interviewer:

I like how you say you are done. No ma'am. Thank you so much.

Commented [35]: "holidays"
"one week"

Requiring more time for engagements.
Time allocation

COURSE DELIVERY

INTERVIEW 4

1

INTERVIEW WITH SARAH

Interviewer:

This is an interview for my research project called 'Promoting South African Primary School Teachers Innovation and Curriculum through ICT Teacher Professional Development'. I am Interviewer Maeane and I am interviewing Mrs. Sarah from the Eastgate Primary School, and she was part of the training that we did together in 2022, to help with the innovation of ICT amongst primary school teachers.

All right, Ms. Sarah, there are five questions that I'm going to ask you.

Sarah:

Okay.

Interviewer:

So these are just probing questions, so that means if you want to add onto this, Uh, that is absolutely fine. If maybe I ask one question but something else arises, we can go that route. But in the end, these are the main five questions that I would like us to just touch on. Okay.

So the first one, **(1) please tell me about your experience with technology before you started with our training.**

Sarah:

Before we started. Uh, you know, I was a bit, um, nervous. Cause I didn't know what to expect. You know, with technology, as you grow older and the things I do, new things come into being, you don't feel comfortable at first, but as time went on, I started to enjoy it.

Interviewer:

All right. So before the training, you didn't have much experience or any experience?

Sarah:

Not much on like, on the things that we were doing. Like, uh, sending, um, eh work to, to the children where they would, um, they would, uh, respond using the computer itself. No.

Interviewer:

You've never done that?

Sarah:

We had never done that before, but we had sent, uh, homework to children, but it was on paper.

Interviewer:

But you did very well with it hey, because you, you were one of the first teachers actually who started actively sending out the work using the ICT.

Sarah:

Exactly. It's because of the support that I get at home.

Interviewer:

Who was supporting you?

Commented [1]: "nervous"

Afraid of the unknown

FEELINGS

Commented [2]: "don't feel comfortable"

- Uncomfortable

FEELINGS

Commented [3]: "Not much..."

Unexperienced ICT use

ICT EXPERIENCE

Commented [4]: "We had never"
"it was on paper"Inexperienced ICT use
Accustomed to traditional teaching

ICT EXPERIENCE

Commented [5]: "support"

Motivation?

2

INTERVIEW WITH SARAH

Sarah:

My husband. Because my husband had done, uh, the computer training in the US, so he has an interest in everything. So when we started, He was like, you go for it. You go for it.

Commented [6]: "computer training"

Experienced support

MOTIVATION

Interviewer:

That's great. What does your husband do for a living, if you don't mind me asking?

Sarah:

He teaches Math.

Commented [7]: "teaches Math"

Source/profession of support

MOTIVATION

Interviewer:

Oh, so he's also a teacher?

Sarah:

He's a teacher.

Interviewer:

Oh, wow. Okay.

Sarah:

Yeah. But before that, um, he was a cartographer.

Commented [8]: "cartographer"

Experienced support

MOTIVATION

Interviewer:

Okay.

Sarah:

Working in the central statistical office.

Commented [9]: "central statistical office"

Experienced support

MOTIVATION

Interviewer:

Nice.

Sarah:

So you would draw the maps for EA areas. And you know, it, it, it needs a lot of computer work. So that's how he had done Computer and Statistics.

Interviewer:

That's amazing.

Sarah:

So it, it was a big help.

Interviewer:

That is great. That's great.

And (2) what were some of the challenges you experienced with that technology during the training?

3

INTERVIEW WITH SARAH

Sarah:

Uh, each time we had an assessment, we had to do it, if there was work that we, class work that I also had to, to do. Uh...

Commented [10]: Clashes between training and work related commitments

WORKLOAD

Interviewer:

Which assessments? Let's just clarify which assessments are...

Sarah:

Like, if we had, uh, to send out work for the children, something that we needed to do and I had to do my work in class with the, the, the, the curriculum in the classroom. So that's why I wouldn't get enough time.

Commented [11]: Priorities

WORKLOAD

Interviewer:

So it's the workload?

Commented [12]: "time"

Not enough time

WORKLOAD

Sarah:

Yes, it is.

Interviewer:

Having to participate in the ICT training and what we required from you and your own teaching load.

Sarah:

Yes.

Interviewer:

Okay. But you managed to ...

Sarah:

And at home. I don't have a helper. So, at home I would be the cook. Whatever needed to be done at home. So it was, um, but I enjoyed it.

Commented [13]: "I don't have a helper"
"Whatever needed to be done at home"

Priorities
Time

WORKLOAD

Interviewer:

And you did very well. Can I just keep saying you did very, very well. Okay. So we also had the concept of PLCs, right? You remember that?

Sarah:

Yes.

Interviewer:

So tell me about (3) how the PLC group alleviated some of the challenges you had.

Sarah:

4

INTERVIEW WITH SARAH

It helped a lot, especially when, during the time that we were with you. The time was short, isn't it? So some things would pass without the proper understanding, the deep understanding of the thing. So when we met, uh, with a group. Some things would come more clearer because we would explain. You know, when you are peers, you, you push until you understand the thing.

Interviewer:

And I think it was better for you to engage with people that you knew very well.

Sarah:

Yes.

Interviewer:

Instead of someone who was...

Sarah:

Yes, and they were helpful. They were helpful.

Interviewer:

Mm-hmm. Okay. Um, So (4) **what do you think about the level of support provided during the training?** So this is level of support from myself as the researcher and the presence of Dr. Ndlovu. Um, and yeah, you can be brutally honest. This will not be used against you in the court of law.

Sarah:

You know, the help was good. Only the time, we needed more time. Like, uh, there were times when the lesson came to end end before we really grasped what we were supposed to do. Like I needed some more time and some more explanation. You know, when you are teaching people who, let's say beginners. Sometimes you say, um, "but it's easy", because you know it, and it's new to me. So the pace at which you'll be moving is, is different from, uh, the pace that I am absorbing the information. And so, it was there when the lesson stopped. Yes. We were tired after working from morning to that time. But still the time was not enough.

Interviewer:

And, and that's an interesting one because I truly agree with that. The time. Now from your perspective, **how could we have worked around the time?** Because it's also trying to have a fair balance between not overloading you with the work. But also trying to ensure that the training is worthwhile.

So how do you think we could have worked around the time? Could it have been. Um, a session on a Saturday or, uh, could, could it have been a training during the holidays for a week? You know, or how do you think we, we could have worked around it?

Sarah:

I think **holidays** could have helped. Mm-hmm. Because, uh, on Saturdays, if teachers, you have that Saturday for whatever week you have at home to do other things, or if you have visited. And so forth. But during the holidays, I think a week could have been better.

Commented [14]: "time"

Assumes/acknowledged that the trainers were aware of the issue of time

Commented [15]: Collaboration Support

MOTIVATION

Commented [16]: "time"

insufficient time

COURSE DELIVERY

Commented [17]: "before we grasped"
"I needed some more time and some more explanation"

insufficient time

COURSE DELIVERY

Commented [18]: "but it's easy"
"it's new to me"

Not sufficiently supported

COURSE DELIVERY

Commented [19]: "pace"

Difference in pace and participation/engagement

COURSE DELIVERY

Commented [20]: "We were tired"

Exhaustion

WORKLOAD

Commented [21]: "holidays could have helped"

A way to mitigate the limited time during training

WORKLOAD

5

INTERVIEW WITH SARAH

Interviewer:

And do you think you and the other colleagues would have attended those sessions during the holidays?

Sarah:

I would have attended. Mm-hmm. Because, um, you know, there's a time when n uh, NAPTOSA usually calls teachers for training.

Interviewer:

Mm. Yes. Yes.

Sarah:

During the holiday, June, **[Interviewer: Is it during holiday?]** In winter. **[Interviewer: Wow!]** In winter. And it's cold, but you'll see the halls will be full of them.

Interviewer:

And is it compulsory training or is it voluntary?

Sarah:

It's voluntary. **[Interviewer: Okay.]** But you would see the, those lectures was packed with teachers during the whole meeting. **[Interviewer: Okay.]** So I would've attended.

Interviewer:

Okay. **(5) What aspects of the training do you think you benefited the most from?**

Sarah:

Uh, when PowerPoint, because I wasn't so comfortable with PowerPoint, I enjoyed that.

Interviewer:

And do you still use it now?

Sarah:

At home, I usually go through the, the lessons that we did. And the work that I did. Mm-hmm. And so I'm fascinated, you know, I'm so interested that sometimes when I look at it and I say, ah, I did this.

And I also said to my and to my children, I have all the children who are married and they have young children as well who are in school right now. So I would send them the lessons.

[Interviewer: That's nice.] Can you let my grandchildren listen to this? So I enjoyed power, I enjoyed it. And when we, the interactive, which I also enjoyed that.

You know, in life when you grow old, but you still want to earn some money. Yes, I can use that. I can use that.

Commented [22]: "NAPTOSA"

Union-based training that usually provides CPTD poi as a reward for attending PD training.

MOTIVATION

Commented [23]: MS PowerPoint

Commented [24]: "enjoyed"

Positive perception towards the training aspect

ATTITUDE

Commented [25]: "fascinated"
"interested"

interested and proud of their accomplishments

ATTITUDE

Commented [26]: "I would send them the lessons"

interested and proud of their accomplishments

ATTITUDE

Commented [27]: "earn some money"

Intrinsic drive and desire to keep learning

MOTIVATION

6

INTERVIEW WITH SARAH

Interviewer:

And I hope you use it. [Sarah:Yeah.] I, I, I, I really hope you do. Um, okay, so another question that's not on this list, um, in terms of, we spoke about support from the trainers. Okay. What about support from the school?

Not necessarily saying the school is in the principal or whoever, but just, um, you know, for example, you, you get training on how to use a computer. [Sarah: Mm-hmm.] And then the training passes, but because there's no resources in the school, uh, it's kind of like you no longer go back to it. Do you feel that you are in a similar situation?

Where because of the resources, there's maybe discouraging. And how do you think that can be worked around? And also the thinking about when we did our training, uh, you had to bring your own device. How has that impacted just what you feel about the training in general and how you experienced it as well?

Sarah:

I think the unavailability of computers, it affected, uh, a lot, especially when my husband was using his computer. I wouldn't have, the first, you know, the first sessions. That we had. I didn't have a computer and so I was um, like discouraged. Yeah, a little bit. I am hopeful because our principal is working towards that.

It's only that the school doesn't have enough money. Mm-hmm. But if we had money, I am sure. I'm quite sure that she [principal] could have done something. Yeah. Because at the moment she's also trying to, to develop the school. Yeah. In terms of, um, smart boards, buying smart board.

Interviewer:

Yeah. All right. Now, Sarah, thank you so much.

Is there anything that you would like to add that we haven't touched on?

Sarah:

Hmm. I think on the part of parents? Like parents with the class that I had, most of them were so interested in the. In the, um, interactive worksheets and they became so much active each time I, I sent, uh, homework. They would respond on the group.

Interviewer:

That's nice.

Sarah:

So it was so encouraging.

Interviewer:

So there actually is an interest. We just have to. Keep [Sarah: exactly.] working on it and motivating...

Sarah:

Commented [28]: "unavailability of computers"

Resources

MOTIVATION

Commented [29]: "I didn't have a computer"

"discouraged"

"I am hopeful"

Resilience in the face of challenges

MOTIVATION

Commented [30]: Financially constrains

MOTIVATION

Commented [31]: "parents ... they would respond on the group"

MOTIVATION

Commented [32]: "encouraging"

MOTIVATION

INTERVIEW 5

1

INTERVIEW WITH Sipho**Interviewer:**

Okay, this is an interview with, uh, Sipho from Eastgate Primary School under the research project, uh, promoting South African Primary School Teachers Innovation in Curriculum delivery through ICT Teacher Professional Development. This is a follow up interview after the training that was provided to the teachers of Eastgate Primary in 2022, and I am Interviewer Maeane.

Okay. All right. So, uh, Sipho, there are five questions, main questions that I want us to touch on, but if I feel that the, it's necessary to have a follow up question, I will just add that. But otherwise, these are the five main questions.

Okay. The first one being, um, if you could **(1) please tell me about your experience with technology before we started the training.**

Sipho:

Uh, I think I was not used when, uh, in this interest of using technology. All I know was to use, uh, the job and the board and textbook. But, uh, after training I've gain lots of experience and information that I've, in fact, I've used with the teachers, the parents and learners. For example, if I needed to speak to a teacher, have to write in the group, uh, or send the communication book around, send a learner around or walk around if there's no learner, uh, if I need any information from them.

But now it's easy. After this training, I know how to create something like a Google form. I can just create one, send it to a teacher, then I know they will just go to a Google form, answer the question, then I would get the back end of the Google form. So it's easy, even if I'm at home, I need, or the principal need information from me, I'll just do something like this.

So even for learners who are doing revision, if I'm not here at school, cause there was a time that I was not around, I was at home for some reason. But I was able to work through using that information, the technology team through say parents' emails and parents' the phone. So I think after the training, I've become a better teacher than I was. I thought I'm a complete teacher. I know everything when it comes to teaching using different methods. But now after, uh, I learned that as a teacher we are learning everyday. So I'm always, uh, in the thing of learning, I've learnt a lot and I've grown from past post this one, uh, pre to this one, this training and afterwards. So I think I've gain lots of knowledge and I'm using it and it's working nice and perfect with me.

Interviewer:

I must say. Sir, I thought that you had used it a lot before.

Sipho:

No, it was my first time.

Interviewer:

... because of your enthusiasm. You were doing so great. I remember the first PowerPoint you created, it was well-thought of, excellent. It seemed like you had done it before.

Commented [1]: "I was not used"Unfamiliar with using ICT for teaching
(ICT Familiarity)

DIGITAL COMPETENCE

Commented [2]: "using the job and the board and textbook"Reliance on traditional methods
(Positive Attitude towards Instructional material)
ATTITUDE

"I've gain lots of experience and information."

ICT proficiency
DIGITAL COMPETENCE**Commented [3]:** "I know how to create something like a Google form."Instructional Approach (has succeeded in teaching the participants a new skill)
Practical Application

COURSE DELIVERY

Commented [4]: "So even for learners who are doing revision, if I'm not here at school."

There's better ICT Familiarity as a result of a good Instructional Approach

DIGITAL COMPETENCE
COURSE DELIVERY**Commented [5]:** "I've become a better teacher than I was.""I thought I'm a complete teacher. I know everything when it comes to teaching using different methods."
"I'm always, uh, in the thing of learning."

There is a better ICT Familiarity due to the successful Instructional Approach

DIGITAL COMPETENCE
COURSE DELIVERY

2

INTERVIEW WITH **Sipho****Sipho:**

It was my first time. First time just that I was willing to learn. With things like this one going to Four-IR, I think we have to go into a system of using technology, so I was willing to learn. I wanted to learn not only for me, for my learners also, so that they're not left behind when they see me standing, they see me with a textbook and show so they can know. Even when they are at home, I can still conduct lessons nicely, understand, uh, make them understand, make them ask question, and then create something for them to do. At the same time, answer it, take notes, then... So, I would send it and they would have to write it down. They can just use their phone to answer through it and then send it back to me, like take them five or 10 minutes. So I think I've learned so much from this journey.

Interviewer:

No, thank you so much. And then our second question, **(2) what were the challenges you experienced with the technology during the training?**

Sipho:

I, I think, uh, I can say maybe not having, uh, internet or wifi, sometimes laptop with people can, and also it's time. I think this training needs to have time. You need to concentrate. You need. Sit down and then like practically do it. With our teaching term and admin term, there's no time. So I'll have to put more work after, sit down here, because I don't have any wifi at home or no access to the internet. So I have to sit around, stay around the school. If I have to be connected, go late and I'm going with kids, kids to be waiting for me until late.

So I think that was only issue like, uh, internet and also getting maybe if the laptop is broken, no access of when I take it home, so I have to sit here at school when after hours and then, uh, do maybe some assignments that we have to do.

Interviewer:

... but I appreciate that you did all of that. [Sipho: Yeah.] Because that means that you were really interested in the training and the effort is really appreciated.

And please tell me about the PLCs. Remember when we had the **(3) PLC groupings, do you feel that they were helpful and if they were, how did they alleviate some of the challenges that you had if they did help in any way?**

Sipho:

I think they did, because you know, as learners, some we'll hear but don't understand every time. But, when we sit together, we are sharing ideas even though we are creating your own powerpoint. I would do it, design is this way. When you sit down, the other teacher will come with his view and then we share then work around. Sometimes I won't be at school, but uh, then I remember the first, I don't know, I think the first training I wasn't around, but when I came in, I could easily ask, uh, members in my place to assist me. We'll sit after school.

They will explain to me a few step, show me what to do. So I think they were helpful, because some we cannot, some we learn different ways. Some I need to do it practically. I need more time to understand it. Some I can just listen to you once and then to, so I think cuz it did work was, uh, the teachers have different views, some have different knowledge, some have views this thing before. So, sharing of ideas, I think it was important.

Interviewer:**Commented [6]:** "first time"

ICT Familiarity (First experience with technology in teaching)

DIGITAL COMPETENCE

Commented [7]: "willing to learn"Prioritizing learner needs in technology adoption (learner support)
ATTITUDE**Commented [8]:** "not only for me, for my learners also"

Prioritizing learner needs in technology adoption (Learner Support)

Commented [9]: "Even when they are at home, I can still conduct lessons nicely"**Commented [10]:** "learned so much from this journey"

Overall positive learning experience

Commented [11]: "not having, uh, internet or wifi,"
Resource Constraints (lack of adequate resources)**Commented [12]:** Not enough time**Commented [13]:** "there's no time"
Time Constraints**Commented [14]:** "I don't have any wifi at home or no access to the internet,"
"have to sit around, stay around the school,"**Commented [15]:** "I have to sit here at school when after hours"**Commented [16]:** "when we sit together, we are sharing ideas"**Commented [17]:** "the other teacher will come with his view and then we share then work around"**Commented [18]:** "members in my place to assist me"

Peer Support (Ability to seek help and learn from others)

Commented [19]: "They will explain to me a few steps show me what to do"**Commented [20]:** "Some I need to do it practically. I need more time to understand it. Some I can just listen to you once"**Commented [21]:** "the teachers have different views some have different knowledge"**Commented [22]:** "sharing of ideas, I think it was important"

3

INTERVIEW WITH Siphiso

No thank you sir. And what do you think about the level of support provided during the training, particularly from the trainers? **(4) Do you think the support was sufficient?** Uh, what were the gaps that you identified? What could we have done things, how could we have done things different? So with this one, please be brutally honest, nothing will be used against you in any way. Uh, we just need to know how we can improve for future purposes.

Siphiso:

I'll speak for, for me, I can't complain about anything. If now I can be able to train other teachers who are not there main, whatever trainers were doing, it was enough for me to understand and know exactly what I need to know.

But I think beginning of the training, we have some challenges with the challenges with this homework. There was something you have to do at home. I think challenges were there. Now sometimes we don't get, like, we literally don't get time. We have to try, but since now we have other things have to do tomorrow, I'm sitting there doing, so... we don't get enough time. So if you are given more work to do at home, you will think that maybe we are lazy to it. And we wanna do it, but the time was like, uh, something else. But after, I think. Uh, other educators had raised it, and then made some different arrangements whereby we do it during the training. I think it was much better.

I think the trainers were very good. If in this eight week, even more than this... after this time, I can be able to explain something. I can't be able to teach someone this. I will do it. Uh, knowing that before the training, I knew nothing about it. I think. Very, very good.

Interviewer:

Ah, thank you.

Siphiso:

... in my point of view, yes.

Interviewer:

I'm glad we did something right. Um, and then finally, **(5) what aspects of the training do you think you benefited most from?**

Siphiso:

I, I think, uh, the one for creating a Google form. I think as far, uh, this one helped me a lot, even as now as I've said. Now I don't have to sit down, type something, print it out, send it to teachers.

I can easily do it and then the teacher can easily go to it, uh, especially when they're here, school, get the information at the back end, whatever I wanna do. Even in the office when you're visiting something with the principal, we need the information even from the parents. It's easy to just create something for them. You ask... So I think when it comes to the part creating of, uh, interactive worksheets, paper learners can just go like online, something like online class. They don't have to just look at the pdf, have to sit down and write it. Take a picture, send it back. They can just do it now, get their answers and then send me answers, which I would see as I think Interactive worksheets and, uh, creating Google Form.

I did benefit a lot and I'm using this now.

Interviewer:

Commented [23]: "whatever trainers were doing, it was enough for me to understand and know exactly what I need to know"

Guidance/Facilitation (Positive perception of the trainer's instructional methods)

COURSE DELIVERY

Commented [24]: "challenges with this homework"

Time Constraints (Difficulty with home-based assignments due to lack of time)

WORKLOAD

Commented [25]: "we don't get enough time"

Time Constraints (Struggle with balancing training homework and other responsibilities)

WORKLOAD

Commented [26]: "other educators had raised it, and then made some different arrangements whereby we do it during the training"

Structural Support (Effective response from the trainers to teachers' feedback about workload and timing)

MOTIVATION

Commented [27]: "the trainers were very good"

Guidance/Facilitation (High level of satisfaction with the quality of instruction from the trainers)

COURSE DELIVERY

Commented [28]: "I can be able to explain something I can't be able to teach someone this" "knowing that before the training, I knew nothing about it"

ICT Proficiency (Increased competence and confidence in using the technology post-training)

DIGITAL COMPETENCE

Commented [29]: "the one for creating a Google form"

ICT Proficiency (High value placed on learning how to create Google forms)

DIGITAL COMPETENCE

Commented [30]: "Now I don't have to sit down, type something, print it out, send it to teachers."

Instructional Material (Appreciation for the efficiency and convenience brought by using Google forms)

COURSE DELIVERY

Commented [31]: "They don't have to just look at the pdf" "They can just do it now, get their answers"

Learner Support (material can be used effectively to benefit learners)

4

INTERVIEW WITH Sipho

I'm glad. I'm glad. Yeah. No, thank you so much, sir. All right. Um, is there anything that you would like to add to this?

Sipho:

No, I think that's all.

Interviewer:

No, sir. I thank you. That's it. All right. Thank you sir. Thank you so much. Uh,

INTERVIEW 6

1

INTERVIEW WITH Thabo

Interviewer:

All right, so this is an interview with Thabo. [Thabo: Yes, ma'am.] Um, who is one of the teachers at Eastgate Primary School who took part in my research project that is titled, promoting South African Primary School Teachers Innovation in Curriculum Delivery through ICT Teacher Professional Development. So this is a re um, a follow up after the training that he participated in last year, 2022, um, for the teachers of Eastgate Primary School, and my name is Interviewer Maeane.

All right. So sir, there are five main questions that I would like us to go through. Uh, but if, for example, you want to add something during these questions or I feel like I could add a follow up question to one of these questions, Then we will do that. However, there are five main questions that we need to essentially touch on for this interview.

The first one being, um, **(1) if you could please tell me about your experience with technology before we started with the ICT training.**

Thabo:

Um, my experience with technology before I started with the, with the ICT training, um, if I may have to, uh, rate myself. I would say, um, I'm advanced in terms of, uh, developing material, teaching material, uh, for ICT. I've done a lot of, uh, ICT courses for educators in the past. Actually developed a lot of, uh, ICT courses in terms of teacher training, uh, whereby I actually part my knowledge and expertise with teachers, like normally when I attend workshops. You know, um, on the weekends and then on, uh, the week after, then I come to school and then actually part my experiences with other educators and which has been actually, you know, like a good, uh, a good tool in terms of, you know, like how to actually, you know, frame other, you know, aspects in terms of, uh, developing the material itself, like your worksheets and things like that.

And, uh, there are other many programs on, uh, GDE like Thutong Portal, uh, which teachers, which also, um, um, I mean shared with the teachers at school in terms of that ICT. So I'll say my experience with ICT, uh, has been exciting in terms of how I actually use ICT, but I don't actually use it to the, to the extent of like what, where I'm like, basically when I say I don't actually, um, engage too much of the ICT, my teaching, but what I do is just basically, And, uh, use it to enable me to, to develop content like, like, like I said mm-hmm worksheets, um, you know, like, uh, basically, um, like lately during Covid was now the using the platform like, uh, ICT thing in terms of, uh, communicating with parents whether actually said worksheets and parents were, and then it actually worked. But until I actually decided, um, I went closing it and that was end of uh, um, 2020. Yes. When I actually, you know, uh, just, uh, cancelled the, the, the, the platform.

Interviewer:

Was it on WhatsApp? Which platform? Was it?

Thabo:

The WhatsApp. Yes, the WhatsApp. I actually used WhatsApp. We were actually, you know, that, that the, the Minister of Education actually, um, suggested that, that, uh, teachers, you know, use the time during after Covid, it was like around June I started, I started with it at around June. And then when we came after the holidays for June, then that's when the minister, uh, suggested that, uh, you know, teachers must actually, you know, ensure that they do the catch-up work with the learners. Mm-hmm. So my little proactive way of doing things, from sections to set up that WhatsApp, I'll even use the

Commented [1]: "advanced"

ICT Proficiency (in developing ICT teaching material)

DIGITAL COMPETENCY

Commented [2]: "done a lot of ICT course for educators"

ICT Familiarity (has previous experience with ICT training)

DIGITAL COMPETENCY

Commented [3]: "GDE like Thutong Portal"

ICT Familiarity (prior exposure, Familiarity with ICT programs like Thutong Portal)

DIGITAL COMPETENCY

Commented [4]: "worksheets"

ICT Proficiency & Familiarity (has used it to develop basic worksheets)

DIGITAL COMPETENCY

Commented [5]: "communicating with parents"

ICT Proficiency (the extent to which ICT has been implemented even during covid)

DIGITAL COMPETENCY

2

INTERVIEW WITH **Thabo**

WhatsApp thing, to be able to communicate with parents to send worksheets, and things like that, which worked.

Interviewer:

It worked for you.

Thabo:

Yes, yes.

Interviewer:

That's great. So I'm glad that you came across that before we even came along. So that shows your own innovation, it shows on another level. [Thabo: Yeah. No, I was just...] It was on another level. All right.

And **(2) during our training, what were some of the challenges you experienced, if there were any challenges at all?**

Thabo:

Um, I found that the, the course was too **slow**, and then also like **tedious**. Um, I actually expected it to be lasting for, I think two months according to the brief. When, when, when were introduced to the topic. So only like when it extended after far beyond June, the mid-year, then I thought, ah, this is too long. But I do, I learned a lot to be, quite frankly, I learned and developed also, you know, like, uh, an understanding of actually how one actually align, if one can align, you know, ICT with teaching. You know, teaching and learning. So my. Um, challenges was just like the, the extended way beyond... [Interviewer: was too long...] Way beyond expected. Yeah.

Interviewer:

And do you have an idea of why perhaps it was extended beyond what was initially agreed upon?

Thabo:

The, the reason, the reason, the reason was mostly, mainly was, uh, is clearly now, no, every, every, every term, um, cause in the, in the beginning, before the beginning of the term, um, teachers receive what you call it, uh, what's this, uh, the School Management Plan. Yes. And then through the School Management Plan that guides educators on what is that is most important in terms of doing like, in terms of MSTs, attending those workshops.

You know, so hence now maybe as an educator has planned something and then the, hence now they actually get those, those, um, uh, inter, I mean, um, uh, they're actually asked to actually participate in those, uh, workshops, so which means now an educator will have to now move from what they initially planned to what they now, you know, have to do. Like in terms of attending those workshops, the MSTs, you know, like, um, extra curricular activities also after school. Yeah. Yeah. I, I saw that also, you know, maybe initially we started as many and then also I'm sure you saw that, uh, that the class... [Interviewer: the numbers started dropping.] They dropped after. After sometime. Yeah. So that could, that was one of the reasons. So my side, I really enjoyed the course. And I learned a lot.

Commented [6]: "use the WhatsApp thing, to be able to communicate with parents to send worksheets"

ICT Proficiency (Successful use of WhatsApp for sending worksheets to parents)

DIGITAL COMPETENCE

Commented [7]: "course was too slow, and then also like tedious"

Course Pace and Time Allocation (Course duration and pace issues)

COURSE DELIVERY

Commented [8]: "extended way beyond expected"

Course Pace (Unexpected extension of the course)

COURSE DELIVERY

Commented [9]: "ah"

Negative outlook (course already being perceived as being 'tedious')

ATTITUDE

Commented [10]: "I learned and developed"

"how one actually align, if one can align, you know, it with teaching"

Instructional Approach/Material (course content was applicable)

COURSE DELIVERY

Commented [11]: "School Management Plan"

"an educator will have to now move from what they initially planned"

"extra curricular activities also after school"

Time Constraints

Professional Priorities (professional commitments always take first priority. Plans change according to SMP)

WORKLOAD

3

INTERVIEW WITH Thabo**Interviewer:**

...and you were present from the beginning to the end, from the last, can I just then ask, um, **why did you stick to the end?**

Thabo:

Um, um, I was just curious. I'm, I'm, I'm, I was just curious to know what it is you are bringing forth, to us educators.

So I was hoping to get more, but obviously there are things that I, I learned in terms of, uh, Google forms. I, I never knew about the Google forms, the Canva that you introduced us to, something which is also exciting that I like to use also in the long run in terms of presentations, I actually learned.

Interviewer:

That's awesome. I'm glad that we could, you know help. [Thabo: Yeah.]

And then we had the concept of the **(3) PLC groups. Um, how did that help to alleviate some of these challenges? Did the PLC groups help at all?**

Thabo:

Yes. Um, Yes, the a PLC group actually, uh, when it was initiated, it was a bit confused by doing a long run. After few weeks and few days of discussions through teacher, teacher discussions, uh, and then became clear of what is there was required.

So even myself was actually, but confused in the beginning. But, um, when, when I met with other educators, It is. Um, that's when, uh, it became clear to say, okay, this is now what is required of us. And then, yeah.

Interviewer:

All right. Um, were you active? You were very active, I'm assuming, because

Thabo:

Yeah. I was active.

Interviewer:

I know some teachers mentioned that you were one of the people who assisted. [Thabo: Yeah.] Alright. Um, **(4) what do you think about the level of support provided during the training? So, particularly from the trainers. Um, do you think that they were supportive? Were they sufficiently supported, supportive?** Um, what are some of the gaps that you identified? And please be brutally honest here.

Because obviously if we are going to do this again in future, we need to know how to improve. [Thabo: Sure.] On, on our side. So none of this will be used against you in the court of law. So, yeah. So what do you think about the level of support provided during the training?

Thabo:

Uh, the level of support that was provided.

Commented [12]: "I was just curious"

Self development & professional growth (Curiosity as motivation to stick with the course)

MOTIVATION

Commented [13]: "I learned in terms of, uh, Google forms...the Canva"

Instructional Material (Acquired new knowledge about Google forms and Canva)

COURSE DELIVERY

Commented [14]: "confused [in the beginning]" "teacher discussions"

Collaboration (teacher discussions made it easier to understand the requirements of the training)

MOTIVATION

4

INTERVIEW WITH Thabo

Actually, I like the idea of, um, uh, trainers actually bringing their own resources into the school. So basically, Was also like key in terms of bringing their laptops and actually showing us from, you know, from scratch. Mm-hmm. How to actually open different programs and how to actually access, you know, certain forms, Google forms, things like that.

So that, for me was supportive, uh, in a sense that they were already ready when you came to class. Um, and also the, the communication. Okay. But it wasn't really, uh, too, didn't actually, um, meet my expectations in terms of now communication on a, on a weekly basis. Okay. Uh, yes. Every now and then, um, ma'am will actually send, you know, like, uh, a WhatsApp or, um, a, a communication through Microsoft. Was it uh Microsoft Teams?

Interviewer:

It was TEAMS...

Thabo:

To say that this is what you need to do and so forth and so forth. I, I, I, I, I think maybe, uh, maybe if, if possible, if, if, if before, before ma'am leaves the, maybe say the development ma'am develops a program today, initiates everything, uh, develops everything, say on a Monday before leaving. It'll be better to actually, uh, explain to say, you know what, this is what I expect next week from you. Not just to leave and then next week and then send via WhatsApp. Say, please follow up on this and this and this. **[Interviewer: Oh, yes.]** And, and it becomes almost distant, like, uh, you know, distant learning. Which we sometimes becomes almost like isolated. You come, you feel isolated.

Interviewer:

I like that comparison.

Thabo:

Yeah. You feel, you feel far just place in the corner there. And so, um, that consistency was gonna be fine. You know, like if, if like before leaving to say, you know what, this is what expect these do this and this and this, explain, and then make sure that everyone understand and then done after that, then yeah.

Interviewer:

Yeah. All right. The, the consistency, the consistency in communication...

Thabo:

Communication, yes.

Interviewer:

But aside from that, do you think that there was support provided?

Thabo:

Yes. Yes.

Commented [15]: "trainers actually bringing their own resources"

Instructional Material (The respondent appreciated th trainers brought their own resources, helping them to learn from scratch.)

COURSE DELIVERY

Commented [16]: "they were already ready"

Instructional Approach (a sense of preparedness and professionalism)

COURSE DELIVERY

Commented [17]: "communication... didn't actually, um, meet my expectations"

Structural Support
Guidance/Facilitation (The respondent found the communication during the training did not meet his expectations, suggesting a need for improvement.)

COURSE DELIVERY

Commented [18]: Instructional Approach (to share t related information in advance)

COURSE DELIVERY

Commented [19]: "you feel isolated"

The respondent felt isolated during the training, suggesting a need for more interaction or support.

FEELINGS

INTERVIEW WITH Thabo

Interviewer:

Um, and, (5) What aspects of the training did you personally benefit from the most?

Thabo:

Um, the interactive worksheets, I think that is got, uh, is like, uh, basically it's got potentially actually going terms of now how we remediate, uh, and mediate, you know, our content when, when it comes to teaching and learning.
That is the, the one, the interactive worksheet. The Canva also, uh, uh, was the PowerPoint presentation when you actually develop material from slides and Canva. It also does, you know, like, uh, work for me, it worked for me. Um, when, when I developed some, some, some activities, they, and then parent learners actually, um, answered some questions.
Actually I could see that there was like, basically, You know, like, it was not like unilateral, but it was like, you know, like cycling the, like that, that's, I say I, I, I developed material after that, learners already learned in class learners, uh, sent, uh, the email to the parents, parents responded, help their kids to respond, and then that was like a cyclic kind of thing.

Interviewer:

That's nice.

Thabo:

Which for me, has got potential again in terms of developing using ICT.

Interviewer:

... and it seems like the interactive worksheet is a favourite, [Thabo: Yeahh.] I like it!

Thabo:

I think because we started with it, and it was so exciting cause then learners were like, you know, you give them questions and a set of questions and then they chose questions like in terms of, you know, like your, um, like general knowledge kind of questions.
You know, like now they, it's also exciting, but maybe if, if, if, if maybe, if possible... If one can develop that. Maybe you can look at other Bloom's Taxonomical approaches. You know, like you not just being also, or just looking at one part of it, like maybe the general knowledge, maybe the component of explaining and discussions, you know, can be slot in there.
And then, um, and then other things like maybe say, remember in the Bloom's taxonomy it looks at um, uh, being able to, to, to respond, like basically reading and reading, reading to be able to read and, uh, comprehension. And then it has got another part, which is extreme six, uh, fifth and sixth, which is now to do and create.
Yeah. So now that part I, if, if that part can be considered in the scope of, of, of developing that, uh, interactive worksheet, I think that could be more, even more exciting.

Interviewer:

Commented [20]: "it's got potentially actually going terms of now how we remediate,"

Positive attitude towards Instructional Material

ATTITUDE

Commented [21]: "interactive worksheets... Canva.. PowerPoint presentation"

Instructional Material (The respondent found the use interactive worksheets, Canva, and PowerPoint presentations to be most beneficial.)

COURSE DELIVERY

Commented [22]: "cyclic kind of thing"

Instructional Approach/Material (The respondent appreciated the cyclic nature of the learning process where learning materials developed by the teachers were used by the learners and their parents, establishing a feedback loop.)

COURSE DELIVERY

Commented [23]: Positive attitude towards Instructional Material

ATTITUDE

Commented [24]: "Bloom's taxonomy... to do and create"

ICT Proficiency (The respondent highlights the need include higher-order thinking skills such as 'creating' the interactive worksheets, in line with Bloom's taxonomy.)

DIGITAL COMPETENCY

6

INTERVIEW WITH **Thabo**

And I think that's where the teachers come in because at the end, the teacher, you are the master of it all, and you can manipulate whatever resource... **[Thabo: Yes.]** to suit whatever you want to achieve. **[Thabo: Absolutely.]** And I'm so glad that, so you are, you seem very hands on. Like...

Thabo:

I didn't give my best shot...if I have to give my best shot... (laughing)

Commented [25]: Why?**Interviewer:**

You are very, very hands on.

Thabo:

Yeah, no, I know. I know. Thank you so much.

Interviewer:

No, thank you so much sir. Is there anything else that you would like to add, um, um, that we haven't touched on that you feel that it's imperative for me to maybe know...?

Thabo:

Um, adding on would be just maybe say, um, maybe have, have some sort of like, um, uh, not necessarily a program. Yes, a program obviously, but some sort of like, uh, like, uh, some point is to say, okay, this week, up to this week will be dealing with this and then being from this week to this week, we'll be dealing with this set, that sort of thing. Because I was actually surprised, uh, initially when we were introduced to the program, uh, ma'am actually explained to say, um, uh, Dr. Ndlovu and you would, uh, um, uh, taking teachers through this ICT program course. And then after June, July, August, somewhere there, and then suddenly we were presented with the consent form, so I was not surprised to say, oh, I didn't know ma'am was actually doing the studies and, but it's fine. I buy, I bought in with it...

Commented [26]: "some sort of like, uh, some point to say, okay, this week, up to this week will be dealing with this"

Instructional Approach
Course Pace (The respondent suggests having a clear program or roadmap indicating what topics will be covered each week.)

COURSE DELIVERY

Interviewer:

... you surprised you, sorry.

Thabo:

Yes... then I didn't even, it was not the big thing, but initially if we informed to say, you know, what name is collecting data in terms of this and this and this, that's how we presented, introduced to the, to the course. Yeah. And obviously some teachers may be sceptical to really put in more effort. Some. Some.

Interviewer:

Oh, because it was more of...

Thabo:

it was, yeah, it was basically Now maybe if, if we were informed earlier, before hand in the proceeding part of this exercise, then maybe teachers were gonna put more effort, attendance, maybe. Yeah. Because perhaps was gonna be much better than...

Commented [27]: "if we were informed earlier"

The respondent expresses surprise at the nature of the program being linked to a study and suggests that prior information might have encouraged more effort.

FEELINGS

Course logistics
COURSE DELIVERY

Interviewer:

7

INTERVIEW WITH Thabo

That's true.

Thabo:

Yeah. Maybe because only after that consent form I said, oh man, data then, yeah. Because like...

Interviewer:

We apologize.

Thabo:

That's fine. We understand. We understood. We understood. Yeah. We understood.

Interviewer:

You understood, because you are still here

Thabo:

... as an academic. Yes. I understand these things. Yes. Yes.

Interviewer:

But thank you so much sir.

Thabo:

Thank you so much ma'am.

Interviewer:

Thank you. Um.

APPENDIX C: Participants' CRR

Participant's Assessed Criterion Referenced Rubric

Name of participant:

Sarah

COMPETENCIES	LEVEL OF COMPETENCY		
	Level 1 EXPLORATION	Level 2 INTEGRATION	Level 3 INNOVATION
Technology Ability to select and use a variety of technological tools for relevant, responsible and efficient purposes, understanding the principles that govern them, how to combine them and licences that restrict their use.	Recognizes / <i>is aware of</i> a wide range of technological tools and some ways / <i>the potential of</i> integrating them in educational practice.	Uses various technological tools in education, according to his/her role, curriculum area, level and context in which he/she works. <i>e.g., computer for admin, cell phone for communication and knowledge with colleagues/parents/students</i>	<i>Uses his/her knowledge of</i> a wide variety of technologies for the <i>design of innovative learning environments</i> and to find solutions for problems identified in the context. <i>e.g., designing and sharing interactive remedial worksheets (or anything similar) with students/parents via the variety of technological tools</i>
Communicative Ability to communicate, contact and engage in educational discussions synchronously and asynchronously, with Professional Learning Communities (PLC).	Uses various channels and languages associated with ICT to communicate with the educational community (<i>PLC groups</i>).	<i>Develops collaborative work</i> strategies in the school drawing on his/her experience participating in ICT based networks and communities	<i>Participates in communities and publishes (or has completed)</i> his/her learning tasks on <i>Google Sites (e-portfolio)</i> , using languages enabled by ICT.
Pedagogical Ability to use ICT to support teaching and learning processes, recognizing the possibilities and limitations of the incorporation of these technologies in students' development process and in his/her own professional development.	Identifies / <i>is aware of</i> new strategies and methods mediated by ICT, as a tool for his/her professional work.	<i>Suggests possible learning strategies</i> using ICT to foster students' learning. <i>e.g., ability to suggest strategies that might or might not be possible to implement within their context such Kahoots game that requires all students to have a cell phone device in class.</i>	Leads significant experiences for themselves and others that involve differentiated learning environments according to the students' needs and interests. <i>e.g., incorporation of interactive worksheets and PPT presentations; using platforms such as WhatsApp to share remediation activities.</i>
Management Ability to use ICT for effective planning, organization, administration and evaluation of educational processes, both in terms of teaching practices and Institutional development.	Organizes activities of his/her professional work with the use of ICT.	Incorporates ICT to improve the management, academic, administrative and community related processes of his/her institution.	Suggests and leads actions to improve integrated processes of school management.

Participant's Assessed Criterion Referenced Rubric

Name of participant:

Laila

COMPETENCIES	LEVEL OF COMPETENCY		
	Level 1 EXPLORATION	Level 2 INTEGRATION	Level 3 INNOVATION
Technology Ability to select and use a variety of technological tools for relevant, responsible and efficient purposes, understanding the principles that govern them, how to combine them and licences that restrict their use.	Recognizes / <i>is aware of</i> a wide range of technological tools and some ways / <i>the potential</i> of integrating them in educational practice.	Uses various technological tools in education, according to his/her role, curriculum area, level and context in which he/she works. <i>e.g., computer for admin, cell phone for communication and knowledge with colleagues/parents/students</i>	<i>Uses his/her knowledge</i> of a wide variety of technologies for the <i>design of innovative learning environments</i> and to find solutions for problems identified in the context. <i>e.g., designing and sharing interactive remedial worksheets (or anything similar) with students/parents via the variety of technological tools</i>
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Participant's Assessed Criterion Referenced Rubric

Name of participant:

Sipho

COMPETENCIES	LEVEL OF COMPETENCY		
	Level 1 EXPLORATION	Level 2 INTEGRATION	Level 3 INNOVATION
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Participant's Assessed Criterion Referenced Rubric

Name of participant:

Ismail

COMPETENCIES	LEVEL OF COMPETENCY		
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Participant's Assessed Criterion Referenced Rubric

Name of participant:

Thabo

COMPETENCIES	LEVEL OF COMPETENCY		
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Participant's Assessed Criterion Referenced Rubric

Name of participant:

Priya

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CRR Frequencies:**Technology-Use**

	Frequency	Percent	Valid Percent	Cumulative Percent
Exploration	1	16,7	16,7	16,7
Innovation	5	83,3	83,3	100,0
Total	6	100,0	100,0	

Communication and Collaboration

	Frequency	Percent	Valid Percent	Cumulative Percent
Exploration	1	16,7	16,7	16,7
Integration	2	33,3	33,3	50,0
Innovation	3	50,0	50,0	100,0
Total	6	100,0	100,0	

Management-Use

	Frequency	Percent	Valid Percent	Cumulative Percent
Exploration	4	66,7	66,7	66,7
Integration	1	16,7	16,7	83,3
Innovation	1	16,7	16,7	100,0
Total	6	100,0	100,0	

Pedagogical Practice

	Frequency	Percent	Valid Percent	Cumulative Percent
Integration	4	66,7	66,7	66,7
Innovation	2	33,3	33,3	100,0
Total	6	100,0	100,0	

APPENDIX D: Post-training Survey

Timestamp	6. What aspect of the overall training did you find most engaging?	7. What aspect of the overall training did you find most relevant?	8. What aspect of the overall training did you find irrelevant?	9. How would you suggest the overall training can improve for a better experience next time?
29/05/2023 14:55:53	The diversity and informative nature of ICT tools in simplifying and advancing conveying content knowledge in and outside of classroom spaces. The use of the power point during lesson presentation was most engaging.	Informing educators of all available ICT resources and how relative these tools are to the classroom spaces and education.	None	To ensure an analysis of a school is done to determine the availability of ICT resources .
29/05/2023 16:06:14	The use of the power point during lesson presentation was most engaging.	The use of the interactive worksheet was most relevant.	None	If the training could be done during the holidays I think it will be most effective because teachers will not be overwhelmed with work .
23/06/2023 13:42:10	Creating online learning materials such as worksheets for the learners.	The use of ICT in the classroom environment...	Some theories	Clarification of concepts or notes...the pacing ...it was too fast ...taking us one step at a time....not doing a lot of information at once(to enhance the understanding).. Be given more tasks to complete
27/06/2023 17:03:58	Interactive worksheets	Power point presentation making	None	
29/06/2023 12:50:20	Using Canva to create interactive worksheets/ activities on powerpoint for learners.	Using ICT to reach audience (learners) and in enabling them to be 4IR compliant.	N/A	Informing the participants (teachers) on time i.e. especially in the preceding parts of the exercise in an attempt to improve the logistics of data collection, evaluation and verification whilst learners are still adept with the prevailing Pedagogical Content Knowledge of the ATP or lesson plan.

APPENDIX E: Field Notes

Date:	29/08/2022
Location:	Kensington, Johannesburg, Gauteng (South Africa)
Observer:	Matjema Maeane
Participants:	30 teachers
Observation notes	
	The training takes place in a primary school classroom. It looks like a language classroom. The classroom caters for 30+ students.
	This was an introduction lesson. We were just getting to know the teachers and trying to understand what they understand about the use of ICTs in education. The following points were discussed: - Technology - what does this mean in our modern day - Innovation - what does this mean for teachers and with respect to technology - ICTs - what are they and how are they used in the classroom - Policies with regards to ICTs in education
	Participants appear unsure and nervous at first, but are eager to learn. They share their thoughts about why they use or do not use ICTs. These are some of the points they mentioned: * Most say they do not use ICTs in their teaching because they do not have the relevant devices or resources. But they may use a laptop to prep their work. * Others are concerned about safety; they walk to work or use public transport and are afraid of carrying their devices like a laptop in public.
Researcher reflections	
	Teachers' exposure to ICTs seems to have been most prevalent during COVID when many were forced to deliver their content electronically. However most admit that: * they only moved to sending work electronically out of obligation * they did not understand what they were doing: they felt lost and uncertain * while they believed they were doing "online" learning - they were not aware that there were such policies such as the White Paper on e-Education that informed e-learning Teachers say that they were given training on how to use virtual platforms such as MS Teams, and the Moodle LMS system. However: * training was not enough * the training had too much information to grasp all at once * so the training was not very effective.
Emergent themes	
	- Training: The training provided they received from the department was not very effective. There was too much information in a once off session. - Resources: Some teachers and learners are not able to fully explore these digital tools because they are unable to get access to the relevant tools (e.g. laptop, wifi, MS office)

Date:	29/08/2022
Location:	Kensington, Johannesburg, Gauteng (South Africa)
Observer:	Matjema Maeane
Participants:	13 teachers
Observation notes	
	The training takes place in a primary school classroom. It looks like a language classroom. The classroom caters for 30+ students.
	In this session they were introduced to creating interactive Powerpoints for learners. How to make a PPT that provides learners with immediate feedback
	Participants appear unsure and nervous at first, but are eager to learn. They keep asking for assistance and are not afraid to request that the instructor repeat instructions.
Researcher reflections	
	Teachers seemed more comfortable with me being there. It seemed to make them feel at ease with sharing their feedback.
Emergent themes	
	- Learning Smart: this concept was introduced to encourage the teachers to think of new and creative ways of teaching their students beyond the barriers of the physical classroom. - Demotivation as a result of negative parent feedback. - Resources: Some teachers and learners are not able to fully explore these digital tools because they are unable to get access to the relevant tools (e.g. laptop, wifi, MS office)

Date:	05/09/2022			
Location:	Kensington, Johannesburg, Gauteng (South Africa)			
Observer:	Matjema Maeane			
Participants:	11 teachers			
Observation notes				
	The training takes place in a primary school classroom. It looks like a language classroom. The classroom caters for 30+ students.			
	In this session, teachers are introduced to the concept of "Automated Assessments": We look at Google Forms as a source of the automated assessments			
	One teacher, Sarah, has been very active in driving the Smart Learning concept in her classroom: + She says the parents are buying into the digital material and they appreciate it. + Parents are worried about digital skills and about who will be teaching their kids these skills. + The assumption is that all kids can operate digital. However, the reality is that they are not all able too operate them for educational purposes. Another teacher, Sipho, also stated some improvements: + Parents want more interactive worksheets. + Intends to create more interactive worksheets.			
Researcher reflections				
	The general feedback is good so far. A couple of teachers have been quite active in sharing the material they create in this ICT-TPD training programme.			
Emergent themes				
	- Learning Smart: this concept was introduced to encourage the teachers to think of new and creative ways of teaching their students beyond the barriers of the physical classroom. - Demotivation as a result of negative parent feedback. - Resources: Some teachers and learners are not able to fully explore these digital tools because they are unable to get access to the relevant tools (e.g. laptop, wifi, MS office)			

Date:	12/09/2022
Location:	Kensington, Johannesburg, Gauteng (South Africa)
Observer:	Matjema Maeane
Participants:	10 teachers
Observation notes	
	The training takes place in a primary school classroom. It looks like a language classroom. The classroom caters for 30+ students.
	In this session, teachers are introduced to different websites to get free material for their various subjects and grades: + e-classroom + NaliBali + Western Cape Education Department (WCED)
	Sarah continues to be active in driving the Smart Learning concept in her classroom: + she continues to send digital material to her students using WhatsApp The other teacher, Sipho continues to also share material via WhatsApp, as well. It seems to be the same teachers who often provide feedback on how they have been using the digital material they created during the training sessions.
Researcher reflections	
	The general feedback is good so far. A couple of teachers have been quite active in sharing the material they create in this ICT-TPD training programme.
Emergent themes	
	- Learning Smart: this concept was introduced to encourage the teachers to think of new and creative ways of teaching their students beyond the barriers of the physical classroom. - Demotivation as a result of negative parent feedback. - Resources: Some teachers and learners are not able to fully explore these digital tools because they are unable to get access to the relevant tools (e.g. laptop, wifi, MS office)

Date:	27/09/2022
Location:	Kensington, Johannesburg, Gauteng (South Africa)
Observer:	Matjema Maeane
Participants:	12 teachers
Observation notes	
	The training takes place in a primary school classroom. It looks like a language classroom. The classroom caters for 30+ students.
	More teachers are beginning to explore the digital materials with their students: + 2 teachers sent Google Forms exercises via WhatsApp to their students. + approximately 60+ learners completed the exercise. + Interactive worksheets are also still being shared with the students. This seems to be a favourite for the teachers. They have become very comfortable with it. One teacher mentioned that 20+ students out of 70 students returned their interactive worksheet activity. A couple of teachers mentioned that they were feeling demotivated because of poor parent feedback. This has caused them to refrain from sending any digital materials home to the parents. - a suggestion to this was to use the digital material in class instead, so that students are still exposed to the tools. Although only in the classroom. - students are excited to use the tool, however, cannot do so at home because of lack of resources. Another teacher indicated that she preferred using the digital tools for remedial purposes during school holidays. Sarah and Sipho continue to be the most active with driving the "Smart Learning" in their respective subjects and grades. - they continue to send out interactive worksheets and Google Forms automated assessments.
Researcher reflections	
	The general feedback is good so far. - More teachers are becoming active in sharing the material they create in this ICT-TPD training programme. - Teachers are beginning to see what does and doesn't work for them regarding the type of digital tools they share or present to their students.
Emergent themes	
	- Learning Smart: this concept was introduced to encourage the teachers to think of new and creative ways of teaching their students beyond the barriers of the physical classroom. - Demotivation as a result of negative parent feedback. - Resources: Some teachers and learners are not able to fully explore these digital tools because they are unable to get access to the relevant tools (e.g. laptop, wifi, MS office)

Date:	17/10/2022
Location:	Kensington, Johannesburg, Gauteng (South Africa)
Observer:	Matjema Maeane
Participants:	12 teachers
Observation notes	
	The training takes place in a primary school classroom. It looks like a language classroom. The classroom caters for 30+ students.
Researcher reflections	
	This is the final session we have with the teachers. - there is an evident change in attitude between now and when we first started. Teachers are familiar with the terminologies used in the creation of digital material and ICT use in the classroom. - teachers are eager and want use these tools in the classroom but one of their biggest challenge is resources; they either don't have the relevant tools or the tools they do have are outdated and slow.
Emergent themes	
	- Learning Smart: this concept was introduced to encourage the teachers to think of new and creative ways of teaching their students beyond the barriers of the physical classroom. - Demotivation as a result of negative parent feedback. - Resources: Some teachers and learners are not able to fully explore these digital tools because they are unable to get access to the relevant tools (e.g. laptop, wifi, MS office)

APPENDIX F: Data collection instruments



Teacher Semi-Structured Interviews

Title of project: Promoting South African primary school teachers' innovation in curriculum delivery through ICT teacher professional development

Name of researcher: Matjema Caroline Maeane

These are the probing questions to guide the discussion in the semi-interviews:

1. Tell me about your experience with technology before you started the training.
2. What were the challenges you experienced with technology during the training?
3. Tell me about how the PLC groupings alleviated some of the challenges.
4. What do you think about the level of support provided during the training?
5. What aspects of the training do you think you benefited most from?

A handwritten signature in black ink, appearing to read "Matjema C. Maeane".

(signature)

Matjema, C. Maeane

(name of person researcher/trainer)

.....(date)



Researcher Fieldnotes

Title of project: Promoting South African primary school teachers' innovation in curriculum delivery through ICT teacher professional development

Name of researcher: Matjema Caroline Maeane

This is a guideline on the type of information to be recorded as part of fieldnotes:

1. Teacher engagement in response to training approach.
2. Teachers' engagement in their PLCs.
3. Teachers' request for and response to the support provided.
4. Teacher's application of skills in their teaching
5. Challenges that teachers experience during each training session
6. Solutions that teachers come up with in response to the challenges they face.

A handwritten signature in black ink, appearing to read 'Matjema C. Maeane'.

(signature)

Matjema, C. Maeane

(name of person researcher/trainer)

.....(date)

Rubric for training engagement and E-Portfolio

COMPETENCIES	LEVEL OF COMPETENCY		
	EXPLORATION	INTEGRATION	INNOVATION
Technology Ability to select and use a variety of technological tools for relevant, responsible and efficient purposes, understanding the principles that govern them, how to combine them and licenses that restrict their use.	Recognizes <i>/ is aware of</i> a wide range of technological tools and some ways <i>/ the potential</i> of integrating them in educational practice. ☐	Uses various technological tools in education, according to his/her role, curriculum area, level and context in which he/she works. <i>e.g., computer for admin, cell phone for communication and knowledge with colleagues/parents/students</i> ☐	<i>Uses his/her knowledge</i> of a wide variety of technologies for the <i>design of innovative learning environments</i> and to find solutions for problems identified in the context. <i>e.g., designing and sharing interactive remedial worksheets (or anything similar) with students/parents via the variety of technological tools</i> ☐
Communicative Ability to communicate, contact and engage in educational discussions synchronously and asynchronously, with Professional Learning Communities (PLC).	Uses various channels and languages associated to ICT to communicate with the educational community <i>(PLC groups)</i> . ☐	<i>Develops collaborative work</i> strategies in the school drawing on his/her experience participating in ICT based networks and communities ☐	<i>Participates in communities and publishes (or has completed)</i> his/her learning tasks on <i>Google Sites (e-portfolio)</i> , using languages enabled by ICT. ☐
Pedagogical Ability to use ICT to support teaching and learning processes, recognizing the possibilities	Identifies <i>/ is aware of</i> new strategies and methods mediated by ICT, as a tool ☐	<i>Suggests possible learning strategies</i> using ICT to foster students' learning. ☐	Leads significant experiences for themselves and others that involve differentiated learning ☐
and limitations of the incorporation of these technologies in students' development process and in his/her own professional development.	for his/her professional work. ☐	<i>e.g., ability to suggest strategies that might or might not be possible to implement within their context such Kahoots game that requires all students to have a cell phone device in class.</i> ☐	environments according to the students' needs and interests. <i>e.g., incorporation of interactive worksheets and PPT presentations; using gamification</i> ☐
Management Ability to use ICT for effective planning, organization, administration and evaluation of educational processes, both in terms of teaching practices and institutional development. <i>(If applicable)</i>	Organizes activities of his/her professional work with the use of ICT. ☐	Incorporates ICT to improve the management, academic, administrative and community related processes of his/her institution. ☐	Suggests and leads actions to improve integrated processes of school management. ☐

Detailed Comment:

Teacher Overall-Training Evaluation Form

Title of project: Promoting South African primary school teachers' innovation in curriculum delivery through ICT teacher professional development

Name of researcher: Matjema Caroline Maeane

Please rate your experience of today's training session circling the most appropriate answer that best describes your experience and providing a brief suggestion for improvement at the end of this questionnaire.

1. The overall training approach made me feel engaged	ALWAYS ☐	SOMETIMES ☐	NEVER ☐
2. The overall training instructions were clear and easy to understand	ALWAYS ☐	SOMETIMES ☐	NEVER ☐
3. The overall training demonstrations were clear and easy to follow	ALWAYS ☐	SOMETIMES ☐	NEVER ☐
4. Overall, the training facilitator provided a lot of guidance and support	ALWAYS ☐	SOMETIMES ☐	NEVER ☐
5. I look forward to trying this with my learners	ALWAYS ☐	SOMETIMES ☐	NEVER ☐

6. What aspect of the overall training did you find most engaging?

7. What aspect of the overall training did you find most relevant?

8. What aspect of the overall training did you find irrelevant?



9. How would you suggest the overall training can improve for a better experience next time?

A handwritten signature in black ink, appearing to read "Matjema, C. Maeane".

(signature)

Matjema, C. Maeane

(name of person seeking consent/researcher)

.....(date)

APPENDIX G: Ethics Certificate



Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Maeane

CLEARANCE CERTIFICATE

PROTOCOL NUMBER: H22/09/08

PROJECT TITLE

Promoting South African primary school teachers' innovation in curriculum delivery through ICT teacher professional development

INVESTIGATOR(S)

Mrs M Maeane

SCHOOL/DEPARTMENT

Wits School of Education/

DATE CONSIDERED

16 September 2022

DECISION OF THE COMMITTEE

Approved
Risk Level: Low

EXPIRY DATE

08 November 2025

DATE 10 November 2022

CHAIRPERSON


(Professor J Watermeyer)

cc: Supervisor : Dr N Ndlovu

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University. Unreported changes to the application may invalidate the clearance given by the HREC (Non-Medical)

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to submit an amendment of the protocol to the Committee. **I agree to completion of a regular progress report. For Minimal and Low studies, this is due annually on 31 December. For Medium and High Risk studies, this is due twice annually on 30 June and 31 December.**


Signature

14 / 11 / 2022
Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX H: Course Design



COURSE OUTLINE

Introduction

The COVID 19 pandemic has brought education to a halt as lockdown had to be imposed to alleviate the spread of the virus. This meant that the education sector together with other services considered as non-essential had to shut down. While some schools (especially those from the elite private schools) continued to operate as teachers were quickly trained on how to provide learning through different Learning Management Systems.

Teachers teaching in public schools, especially those with no ICT infrastructure have not been exposed or oriented into teaching with digital technology and as a result, many school children did not learn during lockdown. Schools tried to contact learners and their parents in order to send materials so they could continue learning from home and they received minimal response. Although the ministry of education had an online resource hub prior to Covid that could be used by teachers for sharing and creating teaching materials, this was not utilised by most teachers as they did not have the necessary competencies to participate in this innovation.

This course seeks to equip teachers with the skills necessary to generate teaching and learning materials. It also aims at preparing teachers for the effective use of ICTs in their subject-based teaching.

Course Purpose

This 12-week program acknowledges that there is a need to supply teachers and learners with data so they can access the internet. It is for that reason that this programme includes creation of materials offline to cater for those with limited resources. With the high demand on Open Education Resources (OERs) it is imperative that participating teachers are trained on developing, adapting and using online materials so that they can contribute to the materials not only at school level, but also at a national and international level. The teachers will be expected to provide evidence of their learning experience by producing an e-portfolio at the end of this training programme.

Objectives:

Participants in this programme will be able to,

- Select and effectively use the teaching materials for teaching and learning online
- Access different digital materials
- Create digital content for their subjects
- Learn how to successfully facilitate learning online synchronously and asynchronously.
- Form and participate in Professional Learning Communities that will become a sustainable support structure aimed at consistently advancing teacher ICT knowledge and skills.
- Apply acquired ICT knowledge and skills to enhance and adapting existing subject materials to digital form

Presentation Tool

MS Teams

All participants will be registered on MS Teams where they will access the virtual presentations

Moodle



Moodle will be used to share course content and for submission of assignments. Virtual sessions will be accessed via Teams through Moodle. In addition, participants will create their e-portfolios in Google Sites and showcase them to mark the end of the course.

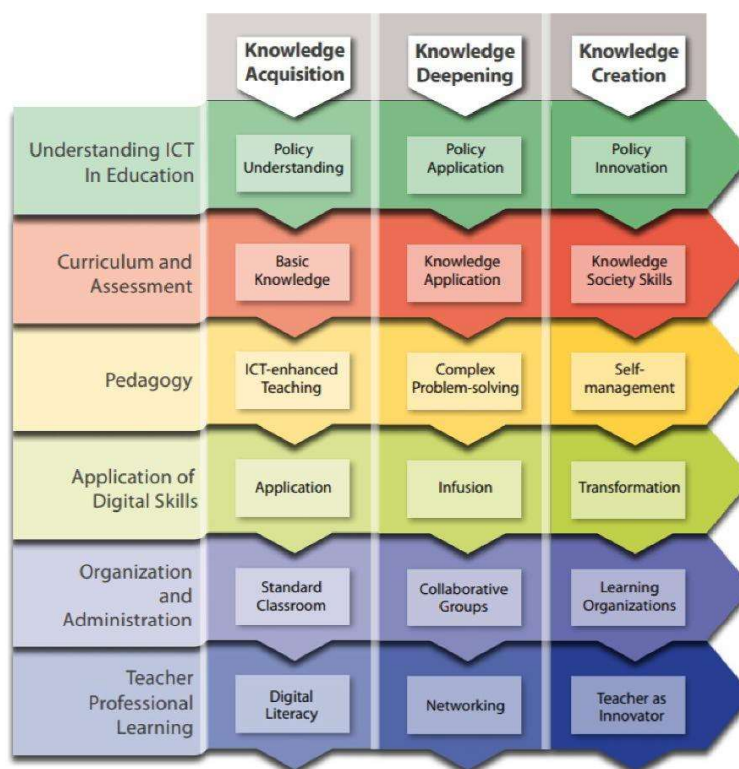
Tuition Fees

Currently, this course is offered free of charge as it is a pilot program.

There are plans to register this as a short course that will be certificated with Wits and accredited by SACE for CPTD points in the near future.

Model used

UNESCO ICT CFT- The ICT CFT assumes a working knowledge of the benefits of ICT in Education and encourages contextualization of the framework for local teacher professional development.



UNESCO ICT CFT Competencies

In order to contextualise the framework, the project anticipates the following levels that should inform the development of teacher competencies:

	Competency Number	Level 1 (Knowledge Acquisition)	Level 2 (Knowledge Deepening)	Level 3 (Knowledge Creation)
Understanding ICT in Education	1	1.1	1.2	1.3



Curriculum and Assessment	2	2.1	2.2	2.3
Pedagogy	3	3.1	3.2	3.3
Acquisition of Digital Skills	4	4.1	4.2	4.3
Organisation and Administration	5	5.1	5.2	5.3
Teacher Professional Learning	6	6.1	6.2	6.3

Participation Requirements

1. Teachers should be qualified and teaching in a South African public school.
2. While teachers can possess any form of computer (smartphone, tablet, desktop or laptop) that can link them to the internet, **they will need a laptop or desktop to create the materials.**
3. An e-portfolio is evidence of a successful completion of the training programme

Attendance and submission of assignments

- Currently, the course is offered once a week on Mondays from 14h30 to 15h30
 - Attendance in all sessions is mandatory for the successful completion of this course
 - If unable to attend, please communicate this to the instructor and make sure you make provisions to access and go through all content covered so you are up to date with the programme.
- Submission of tasks will be on Moodle's Assignment box.
 - Please make all effort to submit on time so you can get feedback before you upload the task on your e-portfolio.
 - By doing so, you will not have to work under pressure to submit your e-portfolio on the last day of the course.
 - This is to make sure you have something to show and refer to as you advance in this exciting journey of sharing materials you have created with other teachers.

Course Content

Wk.	Content	Competency	Technology	Resource	e-Portfolio Task
0	ORIENTATION - Course Overview - Subject - based Support - Start Date? - Navigating - video on Teams and Moodle - Double screen - E-Portfolio (signing up and creating an e-portfolio)		Social learning online	Laptop Smartphone MS Teams Microsoft Education Centre https://education.microsoft.com/en-us/courses	Needs Analysis (Teacher perceptions) Baseline Assessment (Measure content)
25 Apr - 6 May	Module 1 INTRODUCTION TO ICT USE FOR TEACHING 1.1 Introduction to ICT use Teaching approaches with ICTs 1.2 Difference between Face-to-Face, Blended, Online learning and Remote learning Presenters: Dr Ndlovu & Matjema		MS Word - Editing + Graphic Organisers - Designing a worksheet - MS Word – interactive	- White Paper on e-Education https://edu.gcfglobal.org/en/workord2016/ - Teams Classroom - Developer – MS Word - Guidelines for using the Developer Tab https://www.youtube.com/watch?v=qgRvnla_bzY - Twigg, C.A. (2003). Models of Online Learning. EDUCAUSE Review, September/ October.	Task 1 1. Enhancing an existing worksheet 1.1 Interactive Worksheet (for blended learning) 1.2 Create a worksheet for remote learning with a Cover Page (with instructions) <i>Upload Module 1 task on TEAMS course site (8 May 2022 - by 23:59)</i>

9-13 May	1.3 What is technology? - Media Forms - Affordances Presenters: Dr Ndlovu & Matjema		- Using MS Word templates for a subject specific project - E-Portfolio (navigating Google Site)	- Google Sites https://sites.google.com/site/sitesetupguide/home - Google Sites - Word Templates	
16 - 20 May	Module 2 CREATING INTERACTIVE LESSONS WITH PP/ CANVA 2.1 ICT Policy 2.2 Pedagogical Integration of ICTs [Narrative Form] Presenters: Dr Ndlovu & Matjema		- Creating PowerPoint for lesson presentation - Selection of Design - Animated PP - How to present a lesson with PowerPoint	https://edu.gcfglobal.org/en/powerpoint2016/ - PowerPoint - Guidelines on creating a video with - Microsoft Education Centre https://education.microsoft.com/en-us/course/ef434d1a/overview https://education.microsoft.com/en-us/course/b75eca1f/overview	Task 2 2.1 Create an interactive lesson using PowerPoint 2.2 Create a video with PowerPoint Presentation (offline use) <i>Upload Module 2 task</i> <i>Add completed tasks so far on your e-Portfolio and start reflecting. (see the e-Portfolio for more detail)</i>
23 - 27 May	2.2 Pedagogical value of ICTs 2.3 Meeting the needs of diverse learners Presenters: Dr Ndlovu & Matjema		- Creating an interactive PP - Developer - Adding sound - Adding Links - Creating a video with PP	Microsoft Education Centre https://www.youtube.com/watch?v=DdV_TDF7y0g https://education.microsoft.com/en-us/course/e02f490e/overview	
30 May - 3 June	Module 3 AUTOMATED ASSESSMENT 3.1 Types of Assessment		- Identifying online assessment tools - Creating a WebQuest	- WebQuest Template - Kahoot - Google Forms - Microsoft Education Centre https://education.microsoft.com	Task 3 3.1 WebQuest (Offline use) 3.2 Identify an online assessment tool appropriate for your grade and subject

	3.2 Automated Assessment – offline and online Presenters: Dr Ndlovu & Mrs Amanda Calitz			m/en-us/course/7ae3eed2/overview	and create an online assessment tool with feedback. Send the link to the class <i>Upload Module 3 task</i>
6 - 10 June	Module 4 USING AND CREATING MULTIMEDIA CONTENT 4.1 Using prescribed content Presenters: Dr Alton Dewa (Wits)		- Storyboard - Gamification - Creating a Game with Excel	- Scratch - MS Excel Additional resources: - Minecraft https://education.microsoft.com/en-us/course/7dd3d540/overview	Task 4 4.1 Create an educational video where learners learn a concept <i>Upload Module 4 task</i>
13 - 17 June	4.2 Cognitive overload in Multimedia <i>[Adaptive Form]</i> Presenters: Mrs Nonhlanhla Shandu-Omukunyi (UWC)		Digital storytelling	Additional resources: - Screencast Microsoft Education Centre esports https://education.microsoft.com/en-us/course/d40087b3/overview	
20 - 24 June	Module 5 ACCESSING AND CREATING CONTENT ONLINE 5.1 Principles for creating Online learning resources		- Register in the UNESCO OER - Navigate the hub to identify - OneNote	- UNESCO OER Hub - Microsoft Education Centre https://education.microsoft.com/en-us/course/2423b96f/overview	Task 5 5.1 Identify an Open Education Resource from the UNESCO OER Hub you can use for teaching a concept in your grade 5.2 Storyboard for a topic you will create online

	5.1.1 Methodology - principles 5.2 Referencing Presenters: Dr Ndlovu & Mrs Amanda Calitz				5.3 Create a lesson online 5.4 Present your lesson online 5.5 Uploading lesson on the UNESCO ICT Hub
June	5.3 LMS affordances and their use for online learning 5.4 Copyright licenses (for teachers) Presenters: Dr Ndlovu & guest		- Sign up on Schoology - Schoology affordances - OneNote	Lane, L. (2008). Toolbox or Trap?	
10 26 Oct	5.5 Presentation of lessons Presenters: Dr Ndlovu & guest		LMS/s		
11 2 Nov	Module 6 FACILITATING ONLINE (Blended Learning) Presenters: Dr Ndlovu & guest		Facilitating online	- Google Docs - WhatsApp	Task 6 6.1 Submit evidence showing how you facilitated online
12 9 Nov	Module 7 PROFESSIONAL LEARNING COMMUNITIES - Connectivity - How people learn in a community <i>(Q = How will teachers advance in their use of ICTs in your school in the</i>			George Symons Social media Microsoft Education Centre https://education.microsoft.com/en-us/course/1e076ee5/overview	Task 7 Submission of e-portfolio



	<i>absence of the ICT training to ensure that the PLCs work?)</i>				
	Presenters: Dr Ndlovu & guest				
28 September	feedback session				