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**Teachers' perceptions of Information and Communication Technology in the  
teaching of learners with intellectual disabilities**

**By**

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requirements for the degree



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**UNIVERSITY OF JOHANNESBURG**

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## DEDICATION

**“Intellectual development commences at birth and cease at death” ~ *Albert Einstein***

I dedicate this dissertation to my sons, Liam and Liano Dass.



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## ABSTRACT

The integration of Information Communication Technologies (ICTs) into the inclusive educational context is seen in many schools across South Africa as a response to the global educational technological changes taking place. These efforts include strategic plans aimed at ensuring all schools in South Africa are ICT integrated. However, the effectiveness of these efforts in the inclusive educational context falls short. The challenge presented in terms of ICT integration is extending the benefits of ICTs to learners who are mildly intellectual disabled. While some special needs institutions are supported in terms of the availability of ICT infrastructure and devices, pedagogical integration serves to be problematic. The accommodation of learners who are mildly intellectually disabled to share in 21<sup>st</sup>-century learning experiences is largely ignored. The area of concern is that in terms of the technological knowledge of teachers in the inclusive educational environment, the delivery of lessons that advocates for ICT-integrated learning experiences is limited. The study explored the notion of technological pedagogical and content knowledge (TPACK). The study determined the perceptions of teachers with reference to how the constituents of the TPACK theoretical framework influence each other in an inclusive educational setting. A qualitative approach was followed in order to gain an understanding of the perceptions of special needs teachers regarding the use of ICT in their teaching and learning context. Working from an interpretative paradigm, a qualitative approach underpinned this study to provide an exploratory view of the teachers' perceptions of ICT in their teaching environment. A single-case study was formulated, expressing the manner in which teachers in a special educational school perceive the role of ICT integration. An analysis of the data generated from the study revealed that some teachers still struggle with the pedagogical content knowledge (PCK), and raises the question of how then can their technological knowledge (TK) can be aligned. Pertinent findings that emanated from the study were, teachers conveyed that the learners that they teach continually seek news ways to grasp the particular content. Also, the findings uncovered that many teachers are knowledgeable when it comes to the functionality of devices. However, the integration of ICT for learning purposes is a challenge. The study contributed to an understanding that ICT integration initiatives ought to stress the need for teacher training in inclusive educational settings in attempts to harness an alignment of teaching bodies of knowledge related to the content, pedagogy and technological knowledge.

### Key words

[21st century skills](#), [Case Study](#), [Information Communication Technology \(ICT\)](#), [Learners with special educational needs \(LSEN\)](#); [Technological Pedagogical Content Knowledge \(TPACK\)](#), [Technological knowledge](#), [Qualitative research](#), [Inclusive Education](#)

## **LIST OF ABBREVIATIONS**

- 1. Information Communication Technology (ICT)**
- 2. Intellectual disability (ID)**
- 3. Learners with special educational needs (LSEN)**
- 4. Special Educational Needs (SEN)**
- 5. Mildly Intellectually Disabled (MID)**
- 6. Content Knowledge (CK)**
- 7. Pedagogical Content Knowledge (PCK)**
- 8. Technological Pedagogical Knowledge (TPK)**
- 9. Technological Content Knowledge (TCK)**
- 10. Technological Pedagogical and Content Knowledge (TPACK)**

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## CHAPTER 1 ORIENTATION TO STUDY

**“No research without action, no action without research” – Kurt Lewin.**

This chapter includes an introduction, the background to the study, the motivation, the problem statement and research questions, aims and objectives and the methodology. This chapter also includes the clarification of concepts.

### 1.1 INTRODUCTION

The White Paper on E-Education expressed the intention that by 2013, every learner and every teacher in South Africa should be ICT capable (The Basic Department of Education, 2004). Although there have been many initiatives by the Department of Basic Education (DBE) to ensure that the aim is realised, this has not yet been fulfilled. It is crucial that teachers should be able to use ICT appropriately in the classroom. The policy document on Teacher Development in terms of ICT stipulates that teachers will require the knowledge, skills, values and attitudes, as well as the necessary support, to integrate ICT into teaching and learning (The Basic Department of Education, 2007). Developing teachers who are able to harness the full capabilities of ICT usage within the classroom for teaching and learning has, so far, fallen short of achieving its intention.

The integration of ICT into various teacher roles has been inconsistent. This is due to a lack of integration of teaching and learning technologies (Özdemir, 2017). The problem is compounded when one considers inclusive schools with learners with Mild Intellectual disabilities. There are many possibilities for ICT to be integrated into schools which provide special education for learners who are mildly intellectually disabled (Peter & Sutherland, 2004). This acknowledges the need for ICT integration to be extended to educational environments who serve learners who are mildly intellectually disabled.

## 1.2 BACKGROUND TO THE STUDY

21<sup>st</sup>-century teaching and learning experiences are shaped by Information and Communication Technologies (ICTs). Research regarding the use of technology in education is more focused on mainstream learners than SEN learners (Isteni, 2010). This advances the idea that, through the use of ICTs, a fundamental component for learning can be attained by developing a curriculum that is flexible. This appeals for modification of content and methodologies to reflect a more technologically integrated educational offering.

The White paper on e-education (DBE, 2004) proposed using ICTs to extend and enrich educational experiences across the curriculum. This suggests that learners experiencing learning barriers should be exposed to the learning potential of ICTs. Research does not explore the capabilities and opportunities that ICTs could afford learners with intellectual disabilities (Isteni, 2010). Coupled with ICTs not affording attention to learners with special educational needs is the inadequate ICT integration that stems from teachers. There is limited research on how people with disabilities experience the benefits of the virtual world (Stendal, 2012). Additionally, this highlights that the integration of ICTs into teaching and learning environments could possibly be further extended to schools that provide educational offerings for learners who are mildly intellectually disabled (MID).

The American Psychiatric Association (2013) defines an intellectual disability (ID) as involving impairments of general mental abilities that impact the adaptive functioning in three areas, namely the conceptual, social, and practical domains. Learners with intellectual disabilities experience difficulty in learning new concepts and skills. It is proposed that the integration of ICT into the classroom has the ability to provide teaching and learning offerings that evoke thought in all learning institutions. Naturally, this integration lends itself to learner with special educational needs (SEN) schools. In relation to inclusive education the Basic Department of Education (2001) White paper 6 recommends that educational institutions integrate technologies across the South African curriculum in order to respond to learners with MID. The manner in which the South African curriculum responds to learners with intellectual disabilities is to create the conditions for a more flexible curriculum to be implemented (The Basic Department of Education, 2001). This highlights that it should happen through developing a

curriculum that is adequately flexible insofar as it maintains the educational goals alongside serving as context independent. This means that the capabilities of ICT integration present the conditions in which learning can be made flexible through the use of various technologies.

In their study Paul and Rosa (2016) explore the idea that both teachers and learners perceived that e-learning allows learners to take ownership of their own learning. This serves to illustrate the aspect that in attaining a curriculum that is flexible, a shift from a more teacher-centred learning experience to a more learner-centred experience might serve to create educational experiences that do not only provide unique offerings but allow learners to be granted a sense of autonomy when it comes to their learning. Technologies build on new ways of learning that can enhance and strengthen the old epistemologies of learning (Koehler & Mishra, 2009). In doing so, it will provide learners who are MID to find methods that will best shape their understanding of the content or skills, explored in a particular subject.

In addition to this, the use of technology for learning in spaces where it can cultivate and build on the strengths of learners who are MID can be regarded as a benefit emanating from the careful integration of ICTs. “Information and communication technology (ICT) supported education helps individuals with special educational needs to concentrate their attention to the task that needs to be performed” (Yeni & Gecu-Parmaksiz, 2016, p.117)

### **1.3 MOTIVATION AND RATIONALE OF STUDY**

The fundamentals of learning can be reinforced through the use of ICT integration by ensuring that learners are equipped with a variety of ways of learning brought about by means of being exposed to learning technologies (Ozudogru & Ozudogru, 2019). This means that where discrepancies exist technology, can attempt to compensate for those. Integrating ICT into special needs schools is of course the task of teachers, using it as a platform to expand on learning.

Furthermore, it is through the creation of educational experiences that learners deem to be authentic that ICT integration into special education schools can be maintained. One of the benefits associated with the use of ICTs in an inclusive setting is that learners are exposed to higher-order thinking skills (Yeni & Gecu-Parmaksiz, 2016).

This proposes an idea that learning can be made flexible, in the sense that the method of learning is modified. However, for the integration of ICTs into special educational spaces to be meaningful it must not be separated from the content or skills which are being explored in the classroom. By exposing learners who are ID to ICT creates conditions for equality to take place (Chadwick, Wesson & Fullwood, 2013). Building on the strengths of learners who are MID through the use of ICTs will allow for learning to be more meaningful as it grants learners with the opportunity to better understand the content or skill being explored as it will require learning to be shaped by the learners themselves.

Learners who are MID very often rely on the use of their senses more than cognitive processes to learn (Majoko & Phasha 2018). This means that more hands on or visual experiences are a vital part of the lesson, to ensure the learners can deduce information and make meanings and connections from that information. "Using a variety of teaching methods with the assistance of technology could help MID learners by illustrating the abstract concepts through a realistic visual displayed" (Peng & Mohd Daud, 2016, p.24). This illustrates the potential of integrating ICTs into special education schools. ICT provides alternative ways of learning or grasping the content. It allows learners who are MID to be motivated that, should challenges exist in terms of understanding a certain concept, there are other ICT-integrated methods in which they can go about learning something.

In essence, the integration of ICTs allows learners who are MID to create an environment in which ICTs could illustrate that there is more than one way to understand the context of the lesson. Multiple views or perspectives using ICTs could also influence their academic performance of learners (Sarsar & Simsek (2019). This will ensure that learners use a variety of ways to understand a topic shared in the lesson.

Learners who are MID are exposed to ICT-integrated ways of learning which can be flexible. All new approaches to learning must focus on the learner and adapt to his or her limitations (Pareja-Lora, Rodríguez-Arancón, & Calle-Martínez, 2016). ICTs in special needs schools should be intended to allow learners who are MID to acknowledge their weaknesses or limitations, but at the same time use their strengths to make learning more meaningful through the use of ICTs. This relates to the aspect

of teaching using technology in a meaningful way by teachers to complement their teaching methodologies. Assistive technology, as means of ensuring that provision can be made for MID learners. recommends that considerations must be made of the possibility of using assistive technology to bridge the gap between misconceptions experienced by learners who are MID (Hodgson, 2018).

In order for assistive technology and other ICTs to be effectively integrated into the SEN classroom or context, the technological knowledge of teachers becomes a fundamental component. ICT integration of the modern teacher includes technological knowledge in conjunction with teaching methods/pedagogies and knowledge relating to the subject content (Koehler & Mishra 2009).

Therefore, it is the technological aspect of the TPACK (technological, pedagogical and content Knowledge) model that this study is based on (Koehler & Mishra, 2009). “It is imperative that both teachers build confidence towards the use of technology through proper facilitation using the required electronic equipment, training, and time resources” (Paul & Rosa, 2016, p.39). This reinforces the idea that only by teachers interacting with the content, pedagogy and technology, effective ICT integration can be brought about. It also goes to add that teachers are to be facilitators of teaching by means of the use of ICTs.

The study was conducted at a SEN school in the South of Johannesburg, academic subjects such as English, Afrikaans, and Mathematics are offered along with skills-sets like hairdressing, cosmetology, catering, engineering, brick laying, metalwork and woodwork. The effective integration of ICTs in SEN schools’ rests on the ability for teachers to achieve the desired learning outcomes and objectives using technology.

The United Nations Educational Scientific and Cultural Organisation in their *ICTs in Education for People with Special Needs’ training manual* (2006) propose that SEN teachers use ICT. Learners with ID could benefit from integration of ICTs in their education which aligns with 21st century learning where ICT is embedded in all classrooms (DBE, 2014).

Effectiveness of technology usage in the classroom is based on using the available ICTs in a manner that evokes thought and enhances the achievement of learning goals for teachers and learners who are MID. Although the school is equipped with

smartboards, projectors and a dedicated computer lab, many teachers do not make use of these technologies. Previous studies conducted by the Illinois Institute of Technology in the United States show the importance of maximising the benefits of ICT for people with ID (Li-Tsang & Lee, 2006). This study focused on people living with ID and the benefits associated with ICT related to their daily activities. “There are gaps in the research about the opportunities ICT provides to people with intellectual disabilities” (Stendal, 2012, p.9). This implies that to date there has been limited research, regarding the role that ICT plays in SEN schools. Thus, the theoretical gap for which this study addresses through capturing the perceptions of teachers who teach MID learners, initial teacher training programmes can be modified to include the ways in which ICT could be extended to SEN schools. Researchers have not yet treated the impact of ICT in inclusive education in much detail (Li-Tsang & Lee, 2006).

#### **1.4 STATEMENT OF PROBLEM**

From the discussion above, the following research problem becomes evident. Despite having the necessary technologies, fitting together pedagogical and content knowledge with the technological component to their teaching experiences is an area of concern in many SEN schools. “The number of researches with a focus on people with intellectual disabilities remains low in comparison with other, mostly physical, disabilities” (Dekelver, et al., 2015, p.824). In a similar manner, Gutiérrez and Zaragoza, (2011) concur that research in the area of ICT for people with Intellectual disabilities is limited. ICT integration rests solely on teachers being able to align pedagogies, content and technological knowledge. Intellectual disabilities and accessing technology have been hardly studied (Gutiérrez & Zaragoza, 2011). Some special needs teachers still struggle to align pedagogical and content aspects to technological knowledge.

The knowledge pertaining to the technical skills associated with technology cannot sufficiently ensure that ICTs are effectively integrated in SEN schools. Careful thought around the interactions of pedagogy and content with technology is lacking. It is also not known how teachers at a SEN school actually perceive the role of ICTs in the teaching of MID learners. Chadwick, Wesson and Fullwood, (2013) agree that studies involving intellectually disabled learners and ICT in terms of internet usage is limited. For teachers in the inclusive educational environment, an alignment of the content,



pedagogical and technological knowledge becomes problematic. Responding to the learning needs of learners who are mildly intellectually disabled in a manner that integrates ICTs into the classroom by aligning content and pedagogical knowledge becomes the responsibility of teachers in the inclusive educational environment. TPACK is a comprehensive heuristic allowing teachers to align subject content and didactic skills with ICT and this framework has been used minimally in SEN schools.

### **1.5 AIM OF THE STUDY**

The study aims to explore and describe the perceptions of teachers regarding ICT in the teaching of learners with intellectual disabilities.

### **1.6 RESEARCH QUESTION**

In the context of ICT integration in a SEN school from the teacher perspective, the following research question guides the study:

**How do teachers perceive ICT in the teaching of learners with intellectual disabilities?**

Thus, contributing to an understanding of the influence of ICTs within the special educational environment.

### **1.7 THE RESEARCH DESIGN AND METHODOLOGY**

Working from an interpretative paradigm a qualitative approach will underpin this study to provide an exploratory view of the problem of teachers integrating ICT in teaching ID learners. An interpretive paradigm subjectively interprets human interests and behaviours (Creswell & Poth, 2018). A qualitative approach examines a phenomenon that impacts the lived reality of individuals (Denzin & Lincoln, 2017) and it produces a descriptive, explanatory product (Birks & Mills, 2014).

The qualitative method of inquiry provides an expanded view of the problem. Qualitative data is aimed at examining a phenomenon that impacts on the lived reality of individuals or a group of people and that it produces a much higher quality outcome (Birks & Mills, 2014). Data collection took place by means of semi-structured individual and focus group interviews with a purposefully selected sample of teachers, and



observation until data saturation<sup>1</sup> was achieved. The focus group interviews provided shared insight into the experiences of SEN teachers using ICT.

The individual interviews with teachers provided insight into the perceptions of the teachers regarding the use of ICTs in special needs schools, with special focus on the teacher's technological knowledge. The TPACK framework provided a comprehensive strategy for teachers to align their content and/or skill-set to the use of technology and served as an analytical lens in this study. The interview questions were open-ended, structured in a manner that sought to capture the perceived technological knowledge of the teachers in understanding why they hold certain perceptions. The participants for this study, comprised of six purposefully selected SEN academic teachers. To this, four skills-set teachers were purposively sampled.

The research design selected for this study was a single case study. Case studies are best suited for exploring the reasons as to why a particular phenomenon is taking place (Birks & Mills, 2014). The research methodology utilised was a single -design case study which acquired situated knowledge related to the perceptions of teachers regarding ICT integration in a single SEN school. A case study is most suitable for this study as it provided an in-depth understanding of the problem in a real-life context which presents immense implications on the phenomenon being explored in this study.

While conducting the interviews, I bracketed my personal biases to enhance the reliability of the participants' responses. As conceptualised by Richards (2009) I reflected on my own role, preconceptions and personal interpretations, I made observations during school visits using a TPACK-framed observation schedule and recorded these observations in written field notes. I then analysed these field notes and interview transcripts by means of generated notes using Atlas.ti. software that is used to analyse qualitative data (Scientific Software development, Atlas.ti, 2017).

Qualitative data analysis requires the researcher to actively interpret raw data in order to uncover deep underlying meanings. Babbie and Mouton (2016) recommend that an inductive approach was used in pursuit of explanatory concepts that emerge from the data. Data analysis is an iterative process which starts with organising and cleaning the data sets (Flick, 2005). Interview audio recordings were transcribed verbatim. The

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<sup>1</sup> Data saturation- refers to the point of no new information or themes are observed in data sets.

data sets were uploaded to the Atlas.ti software (Scientific Software development, Atlas.ti, 2017). Meaningful units of content in the raw data were coded into categories (Saldana, 2009). Patterns that emerged were amalgamated into abstract themes that were drawn from data sets as recommended by Maguire and Delahunt (2017).

Thereafter the transcripts of the interviews were captured into data by means of Saldana coding. By means of coding the data gathered a researcher has the ability to establish key themes relating to the study (Saldana, 2009). The coded data was uploaded to the Atlas.ti software which allows for the data to be analysed through a number of components such as “patterns and topics” (Muhr, 2017, p.16). Atlas.ti provided me with an opportunity to conduct a thematic analysis of the data. A thematic analysis entails that the researcher establishes the commonalities, relationships, theoretical concepts or topics of the data generated, as a case in point how teachers perceive their technological skills weakness (Flick, 2014). Additional details pertaining to data analysis will be explored in more detail in chapter 3 of this report.

To ensure trustworthiness, various methods were used to maintain credibility, transferability, dependability, and confirmability (Guba & Lincoln, 1994). I engaged with the study site for a prolonged period over six months, doing observations and recording data. A written audit trail was of the daily activities undertaken during the study to enhance dependability (Birks & Mills, 2014). I kept a researcher journal to record personal reflections which allowed me to make sense of the data. The journal aided my personal reflectivity, allowing me to consider my biases and subjective interpretations (Richards, 2009) in an attempt to maintain neutrality and draw sound conclusions. Since the raw data was obtained from interviews with the 10 teachers and substantial classroom observations, triangulation was conducted in order to arrive at the most valid themes describing this problem. Two colleagues acted as objective peer reviewers by scrutinising the raw data and the thematic analysis independently. Once the themes were developed, they were then taken back to the participants in order to match my interpretation with the teachers’ own experiences. The teachers’ comments on the themes formed part of the member checking process (Rolfe, 2006). I then wrote rich, thick descriptions (Merriam, 1998) of the themes in order to provide a detailed account of ICTs in SEN schools. These detailed descriptions contributed to the transferability of the results to another context.

Ethical clearance from the Faculty of Education ethics Committee and permission from the Department of Education and the school principal have been obtained. Participants were fully informed of their involvement in the research and written consent was signed. An atmosphere that ensures confidentiality was created when interviews were being conducted.

## **1.8 ORGANISATION OF THE REMAINDER OF THE STUDY**

The research report will comprise of five chapters. The preceding sections focused on introducing the study. Chapter 2 will conceptualise the research focus by providing a literature review of aspects such as TPACK and the role of ICT in education, with particular emphasis placed on special needs education as far as the study is concerned. Chapter 3 uncovers the research design and methods relating to the case of perception of teachers in a SEN school regarding ICTs, which will encapsulate the research instruments used. Thereafter, chapter 4 presents the findings related to the study by means of an arrangement of the data gathered relating to the role of ICT in a SEN context. Lastly, chapter 5 provides an overview of a revisit of the research questions while presenting recommendations for further research and concluding remarks.

## **1.9 CLARIFICATION OF CONCEPTS**

**Assistive technology** can be described as: “A piece of equipment or product system either acquired commercially, off the shelf, modified or customised and used to increase, maintain or improve functionality capability for individuals with disabilities” (Peng & Mohd Daud, 2016, p.29).

**Information Communication Technology (ICT)** “ICTs represent the union of information technology and communication technology. ICTs are a combination of hardware, software and means of communication that brings people together and that enable the processing, management and exchange of data, information and knowledge in order to expand the range of human capabilities” (The Department of Basic Education, 2004, p.42).

**Intellectual disability** “Intellectual disability (intellectual developmental disorder) is characterized by deficits in general mental abilities, such as reasoning, problem

solving, planning, abstract thinking, judgment, academic learning, and learning from experience” (American Psychiatric Association, 2013, p.31).

**Learners with special educational needs (LSEN)** “A learner has special educational needs if they have a learning difficulty or disability which requires special educational provision” (The Basic Department of Education, 2014, p.2).

**Mild Intellectually Disabled (MID)** “Can be defined as neurodevelopmental disorders that begins in childhood and are characterized by intellectual difficulties as well as difficulties in conceptual, social, and practical areas of living” (American Psychiatric Association, 2013, p.31).

**Pedagogical Content Knowledge (PCK)** “Those elements needed by teachers to effectively evoke thought through their practice. A combination of subject/learning area content and ways of teaching or presenting the content” (Shulman, 1986, p.9).

**Technological Pedagogical Knowledge (TPK)** “An understanding of how teaching strategies can change when particular technologies are used in particular ways” (Chai, Koh, Wong, & Hong, 2015, p.544).

**Technological Content Knowledge (TCK)** “An understanding of the manner in which technology and content influence and constrain one another” (Koehler & Mishra, 2009, p.65).

**Technological Pedagogical and Content Knowledge (TPACK)** “An understanding that emerges from interactions among content, pedagogy and technology knowledge” (Koehler & Mishra, 2009, p.66).

## CHAPTER 2 LITERATURE REVIEW

**In theory, there is no difference between theory and practice. But, in practice, there is. —Jan L.A. van de Snepscheut.**

### 2.1 INTRODUCTION

This chapter contains a traditionally styled literature review, which is focused on developing a critical approach expanding from literature that relates to the study. The chapter comprises of a discussion of the notion of pedagogical content knowledge (PCK). In addition, the theoretical framework upon which the study is founded, namely the TPACK model, will be conceptualised. The chapter also explores special needs education and ICT integration by emphasising assistive and instructional technologies.

### 2.2 THEORETICAL FRAMEWORK: A BRIEF OVERVIEW

The theoretical framework that guides this study will be technological content and pedagogical knowledge (TPACK) model. “The TPACK framework builds on Shulman’s (1987, 1986) descriptions of PCK to describe how teachers’ understanding of educational technologies and PCK interact with one another to produce effective teaching with technology” (Koehler & Mishra, 2009, p.62). This points out that the TPACK model is based on an extended framework of Shulman’s notion of PCK content knowledge. Teachers should be able to actively participate in the integration of ICT by carefully using technologies in a manner that evokes thought (Akturk & Ozturk, 2019). Teachers should know how to effectively use technologies (DBE, 2004). This conveys that the TPACK involves a variety of bodies of knowledge that, when joined together to formulate TPACK.

### 2.3 MILD INTELLECTUAL DISABILITIES

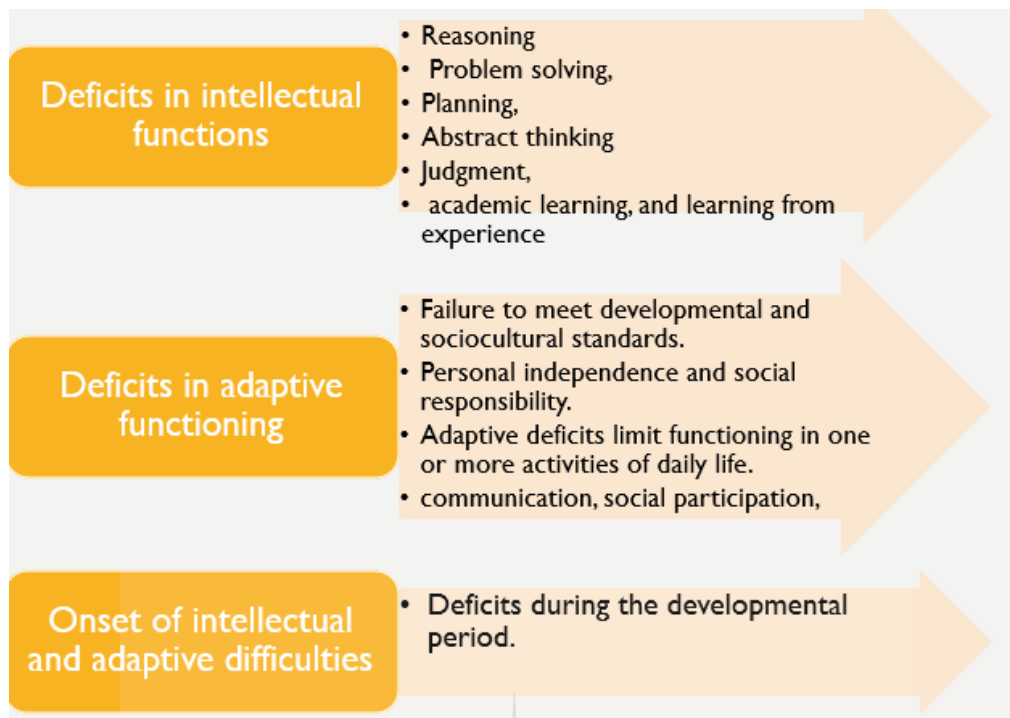
The American Psychiatric Association defines a mental disorder as “A mental disorder is a major disturbance in an individual’s thinking, feelings, or behaviour that reflects a problem in mental function. Mental disorders cause distress or disability in social, work, or family activities.” (APA, 2013, p.31). The American Psychiatric Association in

the chapter *Intellectual Disabilities* defines an Intellectual Disability (ID) as involving impairments of general mental abilities that impact the adaptive functioning in three areas, namely the conceptual, social and practical domain (APA, 2013). The DSM-5 (2013) categorises these intellectual disabilities into four (4) levels of severity, namely, mild, moderate, severe and profound (APA, 2013). Learners who are ID experience challenges in terms intellectual, social, practical and unique needs.

Learners with intellectual disabilities, experience difficulty in learning new concepts and skills. Learners with special educational needs are hindered by learning capabilities in a mainstream educational environment as mainstream schools are not responsive to the learning needs associated with the intellectual disability being experienced by a particular learner (Majoko & Phasha, 2018). This demonstrates a need for an educational setting that caters for learners who are MID, responding to their individual learning needs. Thus, adapting learning materials and the pace of learning experiences to accommodate the cognitive, social and emotional domains of learners who are MID is crucial and lends itself to using ICTs in the classroom. Adaptability is associated with using ICTs to create unique learning experiences (Dekelver, et al., 2015). Cognitive or conceptual relates to academic learning, judgements, reasoning and problem solving. The cognitive domain challenges can be associated to intellectual deficits. The practical domain is day to day challenges and can be associated with adaptive functioning deficits. The social domain challenges, which relates to communication and social activities can be associated with deficits in adaptive functioning.

### 2.3.1 Characteristics of Mild Intellectual Disabilities

Learners who experience mild intellectual disabilities display many of the following characteristics. Learners encounter problems in information retention and performing basic mathematical functions (Karabulut & Özmen, 2018). This provides a reflection that learners with MID experience challenges in problem solving and general learning. For, ICT the use of technological knowledge by teachers to respond to the challenges experienced by learners who are MID should be the focus of a SEN school.



**Figure 1 Intellectual disability characteristics**

Figure 4 above outlines the characteristics associated with intellectual disabilities (American Psychiatric Association 2013, p.33).

Intellectual disabled learners experience challenges associated with the cognitive, social and practical domains of functioning. Thus, learning needs are focused on functioning intellectual abilities, social interactions and independently completing daily activities. Learners with intellectual disabilities experience challenges in processing, perceiving and applying new information in a manner that can solve problems (Mostafa, 2016). One aspect that is uncovered is that learners with MID process information in terms of their ability to apply their perceptual skills relating to the content or task at hand. Doughty and William (2013) also explore deficits in the planning of motor tasks for learning who are intellectually disabled. “Students with IDs are characterized by delay in reaching motor milestones and impairment of sensorimotor function, which affects sensory, neuro-musculoskeletal, and motor systems” (Hogan, Rogers, & Msali, 2000, p.54). This means that learners with MID work at their own pace and could reflect minimal understanding of concepts if they are not adequately scaffolded in terms of the content. Learners with ID experience certain limitations to cognitive and metacognitive strategies (Karabulut & Özmen, 2018). These are deficits in the ability of learners with MID to think in relation to executive functioning and higher



order thinking skills. It also points out, the need for teachers to be informed of the learning challenges and needs which are shown by MID learners.

### 2.3.2 Background to inclusive education in South Africa

In 2001, when South Africa's current inclusive education policy was published, the government estimated that there are approximately 280 000 children with intellectual disabilities (Hodgson, 2018). "The DBE acknowledged that the inclusive education system was still heavily reliant on special schools and that a staggering 597 953 children with disabilities were 'either out of school or in school without having been identified for additional support'" (Hodgson, 2018, p.461). This reveals the need for inclusive educational environments to be an area of concern with reference to governmental initiatives in education. There are many MID learners currently in mainstream schools. A barrier created for ID learners emanates from the environment (Stendal, 2012). This implies that an environment that is not conducive to learning for learners who are ID, could further hinder their development. Hence ICT can also be used to cater for MID learners who are not currently admitted into SEN schools.

The fundamental aspect of any inclusive educational environment is to help learners with intellectual disabilities to learn (Mostafa Taha, 2016). This raises the concern, that in light of the recent changes in technology, how can ICTs be best utilised in special education schools so as to ensure that teaching takes place. An aim of the South African education system is ensuring that education is granted to all, regardless of their abilities and disabilities. The ideal inclusive educational setting should be able to accommodate for these learners' intellectual disabilities. For special education practitioners, the area of concern becomes, the ability for learning needs of learners with IDs to be responded to. This will ensure that learners who are MID are catered for in terms of the education system in South Africa. It is of importance for education to attain an accessible curricula and modes and means of teaching that responds to the needs of learners who are MID (Hodgson, 2018). Inclusion as an education system makes provision for learners who are intellectually disabled through support (Yildiz, 2015). ICT can be used as the means to ensure educational technologies provide that support system in the classroom.



In South Africa, the implementation of the White Paper on inclusive education policy (2001), require that teachers create the conditions whereby personal learning environments are created for learners who are MID. Support measures must be more individualised to accommodate for learners who are MID (Hodgson, 2018). Providing an education system that caters for all, while ensuring that the individual needs of learners with ID are responded to. The real benefit for learners with ID is to engage in ICT related activities without the limitations posed by their learning disability (Stendal, 2012). This presents an important task for teachers to use ICTs in special educational contexts to ensure that more personalised learning experiences are provided to learners with MID. ICT in education has the ability to make learning more flexible (UNESO, 2013). This can be brought about through the careful application of pedagogy to the content being explored.

## **2.4 THE CONCEPT OF PEDAGOGICAL CONTENT KNOWLEDGE**

The teaching profession comprises various elements which teachers need to possess pertaining to skills and expertise of the profession. Shulman's (1986) notion of pedagogical content knowledge identifies those elements needed by teachers in order to effectively evoke thought through their practice. The first teacher characteristic identified by Shulman (1986) is content knowledge.

### **2.4.1 Content knowledge**

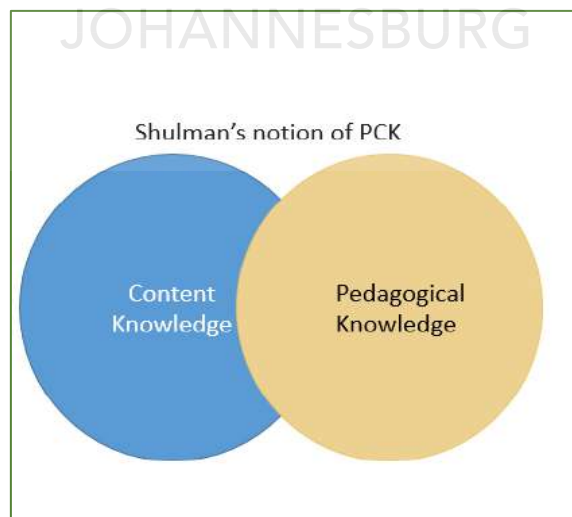
The first element that teachers should be knowledgeable about is content knowledge (CK). CK related to the subject matter that is to be taught by a teacher (Koehler & Mishra, 2009). This relates to teachers understanding information relating to the subject or learning area discipline offering and is the body of knowledge that teaching is founded upon. The absence of CK results in learners not being effectively taught as the teacher is unsure of the knowledge base related to the subject they teach.

This body of knowledge would include knowledge of concepts, theories, ideas, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge (Shuman, 1986). Teachers are to be firstly knowledgeable about the content matter embedded in their subject(s) (Ozudogru & Ozudogru, 2019). Thus, at the heart of the profession of teaching is content knowledge; without it, a teacher cannot deliver meaningful lessons. In addition to

content knowledge, there are other bodies of knowledge that teachers are required to be informed about. The second is pedagogical knowledge (PK). In a SEN school, this type of knowledge would be related to the academic content and the content of skill-set subjects offered by teachers.

#### 2.4.2 Pedagogical knowledge

Possessing an understanding of the subject matter is not the only determining factor to ensure meaningful lessons and effective learning in the classroom. Another aspect relating to characteristics that teachers are to embody is pedagogical knowledge. Pedagogical knowledge (PK) is teachers' deep knowledge about the processes and practices or methods of teaching and learning. They encompass, among other things, overall educational purposes, values, and aims. This form of knowledge is related to contextual and methodological aspects of education (Koehler & Mishra, 2009). Teachers are to be informed of how to structure the content knowledge so as to allow effective teaching and learning to take place. This relates to teachers being aware of the teaching methods that they can align to the content knowledge. As a case in point, consider an English teacher preparing a lesson on *Romeo and Juliet*. They will have to consider the manner in which the drama will be explored in the classroom. When the bodies of knowledge, content knowledge and pedagogical knowledge are used in conjunction with each other, they form pedagogical content knowledge.



**Figure 2: Shulman's notion of pedagogical content knowledge**

As shown in figure 1, PCK can be best described as the point at which pedagogical knowledge and content knowledge intersect and the content is shaped by the manner

of delivering it. PCK is understood as the act of transferring knowledge by using the appropriate methods (Koehler & Mishra, 2009). This elucidates that content and pedagogy are concepts relating to teaching that, although comprising separate variables of teaching, they do influence the other. In other words, for teachers, content knowledge governs pedagogical knowledge and this occurs conversely.

PCK is of special interest as it identifies the specific elements of bodies of knowledge needed to teach (Koehler & Mishra, 2006). CK and PK should be treated as reciprocal bodies of knowledge and suggest that one aspect cannot exist without the other. Pedagogical and content knowledge can be regarded as integrated activities of teaching, learning, curriculum, assessment and reporting (Koehler & Mishra, 2009). The idea that teachers need to possess both bodies of knowledge. In relation to the teaching of learners who are MID, this becomes particularly important. Teachers are to innovatively consider teaching methods that respond to the educational needs of learners who are MID.

It follows that Koehler and Mishra (2006) demonstrate an understanding of Shulman's notion of PCK as one combined body of knowledge, and that it was formulated in a time when technological influences within the educational frontier were limited. They proposed another constituent as being an important component of the characteristics associated with a 21<sup>st</sup> century teacher— technological knowledge.

## **2.5 TECHNOLOGICAL PEDAGOGICAL AND CONTENT KNOWLEDGE FRAMEWORK**

### **2.5.1 Technological knowledge**

The study is based on this underlying concept of technological knowledge (TK). In determining how special needs teachers perceive ICT integration, technological knowledge becomes a central component. Technological knowledge refers to a knowledge base related to the use of technological devices (hardware), software and applications. The delivery of ICT is hampered by capacity related issues (DBE, 2004). This goes beyond being computer literate but rather knowing when to select the appropriate use of technology. Technological knowledge is a measure of competence shown by an individual's ability to manipulate knowledge using the available technologies (Voogt, Fisser, Pareja Roblin, Tondeur, & Van Braak, 2012). This points

out that technological knowledge can be deemed as the use of technology that allows humans to achieve a specific goal.

TK is the understanding that a range of technological tools exist for a particular task, the ability to choose a tool based on its fitness, and strategies for using the tool's affordances<sup>2</sup> (Koehler & Mishra, 2006). This points out the importance of technological knowledge as the basis of ICT competency. Every teacher must have technological knowledge and support in order to employ ICTs into their teaching (DBE, 2004). In the educational context, teachers' technological knowledge relates to how well their TK is utilised so as to capitalise on its benefits for the outcomes of learning.

points out that TK has no defining attribute due to the fact that it is constantly changing (Koehler & Mishra 2009). They imply that technology is constantly changing and, as a result, providing a fixed definition of technological knowledge would render some forms of technology obsolete. Technological knowledge is constantly changing as consequence of advancements (Pareja-Lora, Rodríguez-Arancón, & Calle-Martínez, 2016). Therefore, acquiring TK in its entirety enables a person to accomplish a variety of different tasks using information technology which is continually changing. One of the aims of the white paper on e-education is to build teachers confidence in the use of ICT (DBE, 2004). In education, teachers will most likely utilise technological knowledge to accomplish specific learning objectives or administrative tasks. When technological knowledge is combined with content knowledge, technological content knowledge is formed.

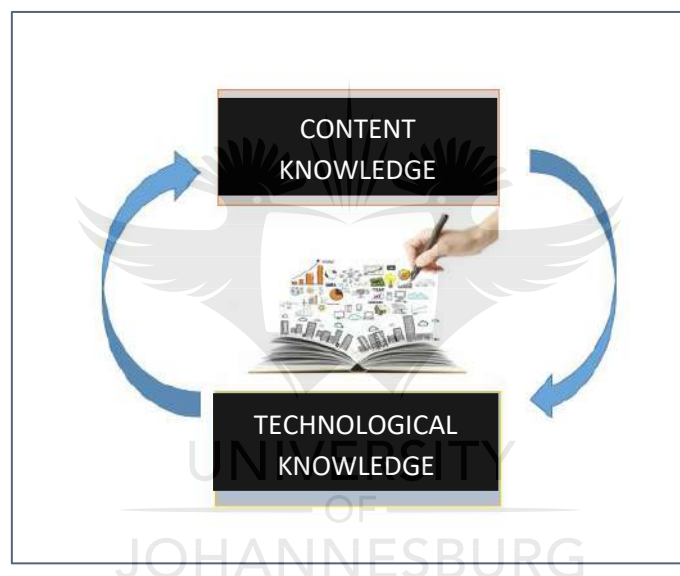
In a SEN school, this body of knowledge is relied on for assistive technologies because it focuses on knowledge related to the operating of devices. The instructional knowledge associated with technological knowledge is associated to the designing of effective lessons using ICTs. Thus, reaching a point of consensus between technology and content.

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<sup>2</sup> Affordances-. An affordance is a relation between an object or an environment and an organism that, through a collection of stimuli, affords the opportunity for that organism to perform an action.

## 2.5.2 Technological Content Knowledge

Technological content knowledge (TCK) relates to the manner in which the content to be delivered determines the choice of technology to be applied. Access to ICTs and the know-how is a two-fold advantage of technology (Dekelver, et al., 2015). TCK can be best understood as the ways in which the content influences the choice of technology (Koehler & Mishra, 2009). TCK is the use of appropriate ICTs in relation to the content being taught (Ozudogru & Ozudogru, 2019). The use of technology transforms pedagogical models (UNESCO, 2013). This explores the idea that depending on the content, teachers should make informed decisions about which technology will be best suited for the content.



**Figure 3: Technological Content Knowledge**

In consonance with figure 2, the two bodies of knowledge, content and technological knowledge, influence each other. In a similar case, consider a selection of content that requires a PowerPoint presentation and one that requires classroom discussion to be conducted. Technology and content must be integrated for effective learning experiences to take place (Ozudogru & Ozudogru, 2019). This emphasises that when selecting the type of technology to use in the classroom, certain considerations need to be made in terms of the content. It further suggests that content knowledge informs technological knowledge.

### 2.5.3 Technological Pedagogical Knowledge

Technological pedagogical knowledge (TPK) accounts for the effective use of ICTs to compliment selected teaching strategies. TPK is an understanding of how the choice of technology influences teaching methods (Chai, Koh, Wong, & Hong, 2015). This uncovers that in addition to teachers having the knowledge pertaining to how to use the technology available to them to present content. “PCK and TPACK reasonably highlight the importance of considering how content, pedagogy, and digital technology overlap in teaching practice” (Berry & Donnelly, 2019, p.42). TPK proposes that the usage of technology becomes a variable that teachers should align to their teaching strategies. This illustrates that the choice of technology is dependent on the desired teaching methods employed. In a SEN school, teachers should select the choice of ICTs in accordance with the learning needs of learners who are MID.

### 2.5.4 The TPACK framework

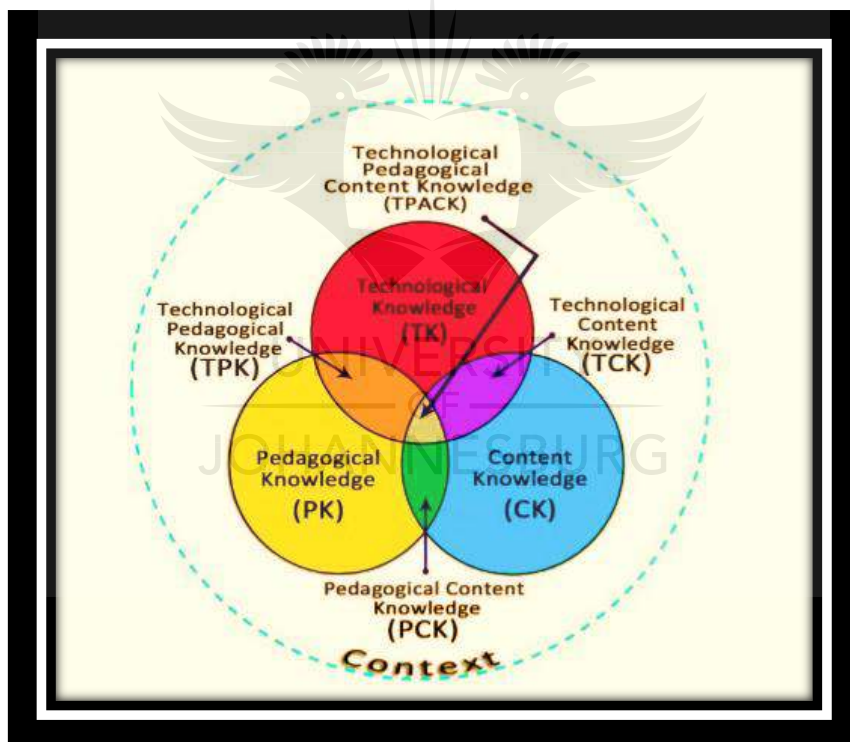
All efforts aimed at ensuring that ICT is effectively integrated into education rests solely upon the micro-level response from teachers in the form of a development of the theoretical framework of TPACK. This relates to the extent to which content, pedagogical and technological knowledge influences each other (Koehler & Mishra, 2009). This perspective treats the various bodies of knowledge as independent elements that interact with each other to formulate TPACK. In the case of this study, an understanding of how each variable influences each other is of concern. Teachers who are well-equipped with TPACK view technology as more than just the means to deliver lessons (Ozudogru & Ozudogru, 2019). An aim related to the phase three (3) of the White Paper on e-education is for teachers integrate ICT into the delivery of lessons (DBE, 2004). Particular focus of the technological aspect will be highlighted in this study so as to provide reasoning of the role that TK plays within the TPACK framework.

The constituents of the TPACK framework can be viewed as the comprehensive characteristics governing 21<sup>st</sup>-century teachers. Teachers are to exploit the various dimensions of this TPACK elements to create meaningful learning experiences (Chai, Koh, Wong, & Hong, 2015). Doing so reflects an understanding that each variable of



the TPACK model plays a pivotal role in presenting lessons in a way that ensures purposeful learning is brought about.

At the centre of the TPACK framework lies bodies of knowledge that, when coupled with learner characteristics enhance the educational environment. “The TPACK framework functions as a ‘conceptual lens’ through which one views educational technology by drawing attention to specific aspects of the phenomena, highlighting relevant issues, and ignoring irrelevant ones” (Koehler & Mishra, 2012, p.17). In addition to this, TPACK stresses how technology can help redress some of the challenges experienced by learners in terms of epistemologies relating to their potential knowledge (Koehler & Mishra, 2009). Epistemological groupings that inform educational activities are to be referred to when selecting the best-suited technological knowledge in relation to the content and pedagogy.



**Figure 4: The TPACK Framework Model**

Figure 3 represents the TPACK framework as the point at which the bodies of knowledge related to CK, PK and TK meet. In order to effectively integrate ICTs into the classroom, teachers must consider how technology shapes content and pedagogy (Polly, Mims, Sheperd, & Inan, 2009). From this relationship teachers can carefully

approach lessons using the different knowledge bases embedded in the TPACK framework.

An understanding of the relationships between the components that make up the TPACK framework is a determining factor in effective teaching. Technological knowledge alone does not create the conditions for the effective integration of ICT to take place (Peng & Mohd Daud, 2016). Teachers must reshape their approach to the curriculum for the integration of ICTs to be effective (DBE, 2004). This means that failing to have clear insights into how ICT may best be used so as to cultivate meaningful learning experiences through interacting with the components could be a challenge to the TPACK framework and ICT integration. The success of ICT relies on teachers effectively using technology (Peng & Mohd Daud, 2016). This refutes the understanding of technological knowledge within education as teachers having technological skills. The TPACK framework provides an outline on how teachers can integrate ICTs in an effective manner (Sarsar & Şimşek, 2019) This proposes that knowing how to effectively align one component with the other determines the success of the TPACK framework. teachers' technological pedagogical knowledge rather than technological knowledge is associated with the effective integration of ICTs (Polly, et al., 2009).

Önal and Alemdağ (2018) concur that teachers who rely on learning by design<sup>3</sup> further develop their technological skills. They support the idea that learning by design considers the technology available and use it to support the content to be covered.

Teachers who understand the role of technology for learning, adjust their teaching styles appropriately (Istani, 2010). This relates to the modification of teaching methods, to make provision for the integration of technological knowledge. The role of the teacher becomes redefined (DBE, 2004). Koh, Chai, Wong, and Hong (2015) share their view with regards to design thinking; demonstrating that design thinking can be utilised as a means to exploit TPACK. Lesson designs are based on the interactions of technology and the content. For learners who are MID, teachers could

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<sup>3</sup> Learning design is the practice of planning, sequencing and managing learning activities, usually using ICT-based tools to support both design and delivery - Rob Koper.



consider the content in relation to the technology. For effective ICT integration to take place, new models of pedagogy must be implemented (UNESCO, 2013).

The TPACK framework views CK, PK and TK as interrelated components that, when used together, can provide favourable teaching and learning conditions. The effectiveness of technology integration depends on how best technology could be included to attain the desired teacher and learner objectives (Peng & Mohd Daud, 2016). This is in the same way Mishra and Koehler (2006) explore the idea of methodical comprehension between CK, PK and TK and suggest how integration is based on how those components continually influence each other. Teachers with technology requires continued modification and adaptations of ICT for learning activities (Koehler & Mishra, 2009). The successful integration of technology requires an understanding of CK, PK and technology encompassed with the TPACK framework (Paul-Obillos & Rosa, 2016).

Taking the learner aspect into account informs the TPACK model as it establishes a basis for content, pedagogical and technological knowledge to be carefully arranged. Learning by design associated with the TPACK framework considers the nature of the learners seated in the classroom. Adjustments to the design of ICT tools to facilitate learning needs ensures flexibility (Chadwick, Wesson & Fullwood, 2013).

The successful implementation of the TPACK framework does not only rely on the teacher characteristics or their level of TPACK, but acknowledges the contributions of learner attributes to the TPACK model. Learners play a pivotal role in the teaching process (Alemdağ & Önal, 2018). Learner attributes can be viewed as their level of understanding of the content, technological skills, or even their diverse learning needs and styles. Through the use of assistive technologies, learners with MID become actively involved in their learning and development (Dekelver, et al., 2015). For teachers in SEN schools, this becomes important as the choice of technology and teaching strategies relies on the characteristics of learners who are MID.

## 2.6 ICT AND INCLUSIVE EDUCATION

### 2.6.1 Intellectual disabilities and Teacher technological knowledge

Technology positively equips teachers to provide educational offerings to learners in unique and creative ways. Technology has the ability to create meaningful learning experiences for learners who are ID (Isteni, 2010). This presents the idea that the educational content and pedagogy are shaped by learner characteristics, and technology enables teachers to accommodate for the special learning needs of 21<sup>st</sup>-century learners. Chapter 7 in the DBE (2004) Whiter Paper on e-education acknowledges the responsibility to make ICT accessible to all.

Through ICT teachers can respond to the individual needs of learners (UNESCO, 2013). Inclusive education persists the idea of equal opportunities afforded to learners with special educational needs. One of the national strategic aims of the Department of Basic Education (2001) emphasises the idea of developing educational environments that ensure that the curriculum becomes flexible and accessible to all learners. Effective ICT integration is combination of teaching strategies (pedagogy) and technology (DBE 2004).

Inclusive education establishes ideals of attaining a flexible curriculum for all learners. Technology as a great equaliser in reaching out to learners who experience learning barriers (Eligi & Mwantimwa, 2017). Inclusive education can be best understood as a reflection of the understanding that all learners can learn (Gronlund, Lim, & Larsson, 2010). “Technology is a tool for fostering equality as technology provides assistive, adaptive and rehabilitative devices for people with disabilities through proper selecting, locating and using of these tools” (Eligi & Mwantimwa, 2017, p.88). There are various technological advancements that enhance learning for learners with special educational needs. For example, SEN schools many trade or skills subjects are offered. ICT provides an opportunity for learners who are MID to experience a sense of inclusion (Stendal, 2012). Technology can provide tutorials in the form of videos shown to learners and interactive smartboards which allow learners to engage with a particular concept related to the skills subject. Specifically, designed platforms are need for learners with IDs to acquire the necessary skills (Li-Tsang et al., 2007). The

development of national policies aimed at addressing special needs education should use ICT in a manner that advocates for the accommodation of unique learning needs.

Effective ICT integration in inclusive education requires technology being included into the classroom that responds to learning needs of learners. For instance, custom designed or modified virtual reality allows learners with ID to improve in their independent living skills (Stendal, 2012). Thus, acknowledging that the efforts of technological knowledge considers that all learners learn differently. The learning differences and needs of learners who are MID can be responded to through the use of ICTs.

#### 2.6.2 Divergent learning and special needs education

Acknowledging that special educational needs learners embody unique ways of processing information becomes the task of not only special needs teachers but the programme offerings provide enclosed in national curricula. Technology allows for subject matter to be accessible by learners in a variety of ways (Koehler & Mishra, 2006). Through ICT, individualised learning experiences can be created (DBE, 2004). This relates to content can be arranged in various ways, to capitalise on the unique learning needs displayed by learners. New technology has the ability to allow the learners greater flexibility in their learning (Peter & Sutherland, 2004).

Learners with special educational needs perceive information in a variety of ways. Efforts aimed at the integration of ICT should be directed to make provisions for these diverse abilities. E-learning focuses on the capabilities, experiences and interests of an individual learner (Istani, 2010). This associates the integration of ICTs with building on the strengths of learners. ICT can help learners with MID to eliminate the stereotypes associated with their disability especially if they are online (Chadwick, Wesson & Fullwood, 2013).

The modification of teaching methods, content and the technology present a comprehensive lesson that incorporates a variety of ways of understanding the subject matter. Both teachers and learners perceived that e-learning helps students gain autonomy of learning and provide activities for diversification (Obillos & Rosa, 2016).

Vocational subject offerings find the use of ICT to be effective in creating authentic lessons for learners (Sarsar & Şimşek, 2019). The manner in which ICTs could be included in the inclusive educational environment should not be limited to trade subject offerings. Effective ICT integration in SEN schools requires teachers to consider creating multiple ways in which the content can be taught through the use of technologies (Cetin & Erdogan, 2018). Educational technology and information communication technology play vital role in creating an adaptable learning environment, especially when delivering content to learners who present with special educational needs (Isteni, 2010). In particular, learners who are mildly intellectually disabled could experience learning that adapts to their intellectual and adaptive functioning levels. For instance, the flexibility of online media allows for ID learners to feel included in the learning environment (Stendal, 2012). This means that learners who are ID are able to fit the information shared online to their schema and potential development.

### 2.6.3 Practical examples of how ICT can impact learning for learners who are ID.

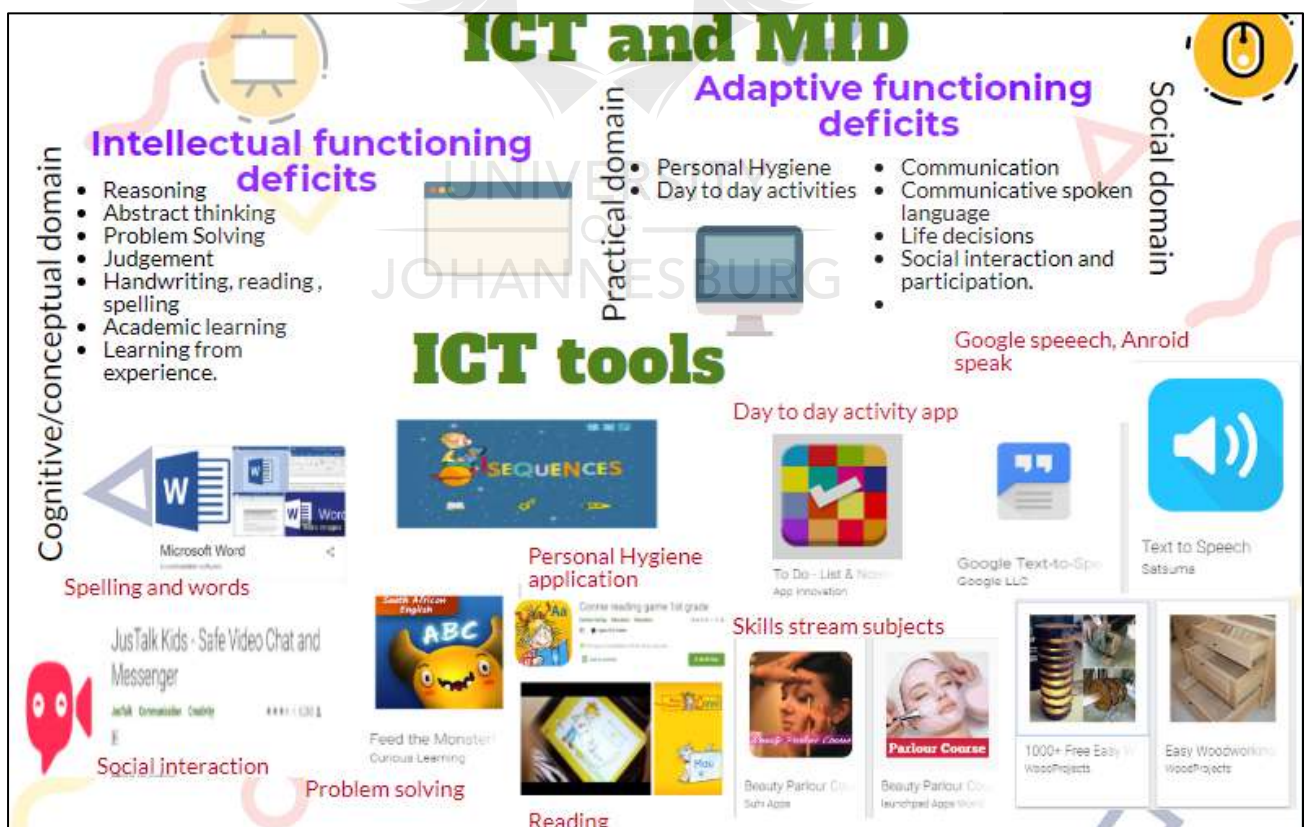


Figure 5: ICT and MID

Figure 5 shows examples in which SEN school could integrate ICTs for learners who are MID. In terms of the identified intellectual and adaptive functioning deficits, one aspect relating to ICT could be utilised to improve learning for learners who are MID.

Learners with intellectual disabilities have no difficulty in performing basic actions on a mobile device (Gutiérrez & Zaragoza, 2011). This means that initiative should be aimed at the designing of mobile online platforms that allows learners who are MID to master basic skills. This will allow ICT integration to take place in the inclusive educational environment. Additionally, mobile learning can be seen as the solution or substitute to computer-based learning (UNESCO, 2013).

These applications and software can be used in class with the help of teachers or at home by learners who are MID. The use if ICTs accommodate for the various deficits related to the conceptual, practical and social domains. Very often learners with MID cannot grasp concrete concepts. Complex content amplifies the barriers experienced by learners who are MID (Li-Tsang et al., 2007). As such concrete examples are needed. ICT provides for concrete and complex concepts to be gradually integrated into learning. For example, [iSequence](#) an application that allows learners to keep track of their personal hygiene. Other function catered by the applications include, memory functions and language development through interactive games. Complex concepts can be done in class by teachers, an example would be the science application of [growing the trees](#). In essence technology can be used in the SEN school to perform the executive functions such as planning and monitoring needed by learners who are MID. Additionally, these applications can keep track of the learner's progress and provide them with continuous feedback, readily available. [Text to speech](#) and [speech to text](#) applications allow learners who are MID to have personalised speech therapist. As such they do not have to wait for therapy in order to enhance their speech or spoken word. Online poster makers such as [padlet](#) could present the possibility for learners who are MID to develop their skills relating to organising, sorting ,arranging and manipulating content and colours. Making use of these applications learners who are MID in South Africa could be provided with learning experiences to improve their intellectual and adaptive functions.

Expanding on the idea of ICT integrating social functions, social networking allows for learners with intellectual to interact online for social or educational purposes. Learners



with IDs can benefit from online socialisation, thus accommodating for the social domain (Chadwick, Wesson & Fullwood, 2013). Learners with IDs are more likely to interact online than face to face (Stendal, 2012). This implies that when learners with intellectual disabilities interact on social platforms emphasis is on their capabilities rather than their disabilities. Teachers can create online social experiences where the strengths related to learners who are intellectually disabled can be used for learning.

## **2.7 THE TEACHER AS THE DRIVER OF ICT INTEGRATION IN THE INCLUSIVE EDUCATIONAL ENVIRONMENT**

The successful integration of ICTs becomes dependent on the ability of teachers to integrate these technologies into their everyday lives and classrooms. There is no standardised technological solution that applies to every teacher on how best to integrate ICTs (Koehler & Mishra, 2009). Teachers should consider the other elements relating to the TPACK model in applying their technological knowledge as they are dependent variables. Ignoring the pedagogical aspect of teachers does not provide effective ICT integration (Akturk & Saka Ozturk, 2019). ICT allows for learning to be extended beyond the traditional means of instruction delivery. (DBE, 2004). The use of ICTs is based on the modification of the content and teaching strategies and the application of the appropriate technologies.

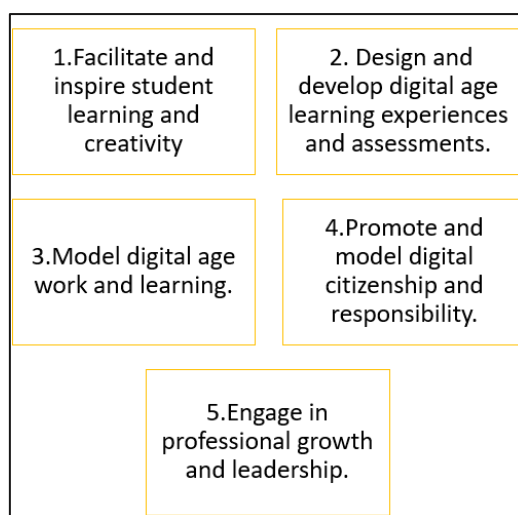
Educational innovation in the sphere of the classroom can only be created by teachers (Peng & Mohd Daud, 2016). This proposes that teachers are the drivers of not only change but also technological integration at the micro-level, if teachers are to respond to the needs of the 21<sup>st</sup>-century learner through the use of their technological knowledge. Teacher competence as one of the norms and standards set out by the white paper on e-education (2004) stress the need for teachers to be competent in terms of applying ICTs in the classroom.

Learners who are MID can be influenced by pedagogical practices that derive from technological knowledge. Many teachers focus on developing their technical skills when it comes to technological knowledge. However, integrating their technological skills into lessons is often ignored. Teachers should not only focus solely on the technical aspect but the instructional benefits associated with ICT integration (Durdu & Dag, 2017). The functionality associated with some technologies affect the way

teachers may choose to integrate them into the classroom (Pareja-Lora, et al., 2016). Experienced teachers are more engrossed in the integration of ICTs than novice teachers (Paul-Obillos & Rosa, 2016). They propose that the experienced teacher has more confidence in showcasing the given ICT related skills because they are knowledgeable with regards to content and pedagogical knowledge. This elucidates a contradiction to the belief that novice teachers are more competent with regards to ICT integration. Contained in the TPACK framework is a demonstration that pedagogy influences the technological usage of teachers. Depending on the manner in which teachers want to go about teaching the lesson, certain technology is selected. Teachers who opt for constructivist-oriented instruction are more actively involved in the integration of ICT (Chai, Koh, Wong, & Hong, 2015). Therefore, learning for learners who are MID will be focused on the construction of concepts using ICTs.

#### 2.7.1 Special needs teacher training and ICT integration

Due to the rapid nature of change of educational technologies, educational systems globally respond to these changes by providing teachers with training sessions on how best to develop their technological knowledge domain. “Preparing pre-service teachers for the ICT integration is a complicated task due to the quick changing nature of ICT and different information sources” ( Alemdağ & Önal, 2018, p.89.). Teachers are to continually keep abreast with the changes that take place and develop their technological knowledge simultaneously. For instance, teachers know how to use an electronic projector in terms of their technological knowledge, but with the inception of smartboards, teachers are tasked with the responsibility to not only get to know how to use them in terms of functionality, but to use them in meaningful ways. The International Society for Technology in Education (ISTE) devised standards for teacher competencies (2017). Included in these standards is technological knowledge.



**Figure 6: The International Society for Technology in Education (ISTE) (2017) Standards for teacher competencies**

Figure 6 above illustrates that there are competencies that teachers should have. The TPACK framework can be seen embedded in these standards. For example, the designing of learning experiences that convey the content and pedagogical knowledge of teachers. Standard 2 relates directly to the technological knowledge of teachers. ICT integration and the adaptation of new technologies rests solely on the willingness of teachers (Jwaifell, 2019). This relates to Standard 4, the 21<sup>st</sup> century skillset tenets global citizenship and digital literacy. “Training teachers for the new roles and tasks in society, including the use of ICT in teaching and learning and in developing their own professional competence” (Isteni, 2010, p.28).

In phase 2 of the White Paper on e-education a target is set for ensuring that 50% teachers effectively integrate ICTs into their teaching practices (DBE, 2004). This target had no specified deadline. Furthermore, it is through training that teachers can develop their own technological knowledge and apply it to the classroom so as to develop the digital literacies of all learners. In addition to this, standard 5 proposes that if teachers are to be committed to being life-long learners in order for ICT integration to be successful (DBE, 2004). The changes in educational technologies require teachers to be in a state of continued learning (Peng & Mohd Daud, 2016). This continues that teacher training could be a strategy to respond to the technological changes taking place in the educational frontier. Teacher training will allow the model of delivery to be ICT (DBE, 2004). In relation to inclusive education, teacher training should be aimed at instilling an understanding of tailor-made initiatives for learners



who are MID (Chadwick, Wesson & Fullwood, 2013). Without training, teachers will not be able to effectively integrate ICTs (UNESCO, 2013). This means that emphasis must be placed by the Basic Department of Education in training teachers for ICT integration that extends to the inclusive educational environment. In the same vein, the teacher training initiative, Teacher Education in Sub-Saharan Africa (TESSA) focuses on ways in which teacher training can be enhanced in the area of ICT integration (UNESCO, 2013)

For teachers in SEN schools, this becomes quite challenging as their PK and CK is already shaped and modified by learning needs displayed by learners who are MID. "ICT in teaching and learning remains only partially understood by educationalists and inconsistently practised in school" (Peter & Sutherland, 2004, p.102). The standards above convey an important idea, that teachers should align themselves with those standards. The standard reflects ideals shared by the TPACK framework. This identified with an important element of this study, through technological knowledge and pedagogical considerations, learning can be improved for learners who are MID.

## **2.8 SUMMARY**

This chapter began by exploring the notion of PCK, in formulating the understanding of the theoretical framework. The theoretical insights relating to the TPACK framework and the special educational context were expressed. A discussion on Mild intellectual disabilities and the characteristics of the intellectual and adaptive functioning deficits was advanced into. The three domains relating to MID namely, the cognitive, practical and social were conveyed. Mild intellectual disabilities and how ICT can accommodate for learners who are MID was expressed. Practical ICT related examples were provided by means of ICT related software, tools and applications. Uncovering how ICT could improve learning for learners who are MID. A discussion surrounding learners who are MID with aspects relating to 21<sup>st</sup> century learning was advanced into. This discussion entailed the explanation of diverse learning needs. The role of the teacher as being the driver of ICT integration in an inclusive educational environment was conceptualised. The teacher's technological knowledge as being a fundamental component of ICT integration in SEN schools was explored.

## CHAPTER 3 RESEARCH DESIGN AND METHODOLOGY

**“The common facts of today are products of yesterday’s research” Duncan  
MacDonald**

### 3.1 INTRODUCTION

This chapter presents the research design, which follows a qualitative approach to inquiry by means of a single, descriptive case study. The case and background relating to the research site will be explained. The SEN school, as the site for case and data collection will be explained. The data collection instruments made use of, namely interviews and observation notes will be discussed. Data analysis techniques will be presented by a discussion of the Atlas.ti Software to explain the analysis of the data. The findings and the procedures adhered to in order to establish trustworthiness of the data generated in this study will be explore. Ethical considerations relating to the study will be discussed.

### 3.2 RESEARCH DESIGN

A qualitative approach was followed in order to gain an understanding of the perceptions of special needs teachers regarding the use of ICT in their teaching and learning context. A qualitative study is best suited because it provides an extended understanding of the perceptions of teachers regarding ICT integration.

Working from an interpretative paradigm, a qualitative approach underpinned this study to provide an exploratory view of the problem. An interpretative paradigm subjectively interpreted human interests and behaviours (Creswell & Poth, 2018). “An interpretative paradigm is an umbrella term covering an array of interpretive techniques which seek to describe, decode, translate, and otherwise come to terms with the meaning, not the frequency of certain more or less naturally occurring phenomena in the social world” (Van Maanen, 1979, p. 521). This study explored the phenomena of TPACK as shaped by teachers in an inclusive environment was and their perceptions translated into generated data.

The qualitative research method was the most appropriate for this study as it is consistent with the research focus associated with the study. Qualitative research methods focus on the unique contributions made by participants during a qualitative

study that allows for the data gathered to contain a variety of perspectives and views (Creswell, 2007). Qualitative inquiry, the data gathered may be analysed using a variety of content analysis techniques and can gain multiple perspectives relating to ICT integration in an inclusive setting. Qualitative methods of inquiry, the lived experiences of the participants are gathered (Henning, 2004). The day-to-day exposure of ICT tools and knowledge application thereof are areas of interest for the study, which qualitative research allows to be accomplished. Qualitative methodology allows researchers to study a complex phenomenon in the context in which it is taking place (Baxter & Jack, 2008, p. 544). This conveys the naturalistic aspect of the selected qualitative method so as to allow the data methods to capitalise on a more realistic view of the phenomenon in relation to the study. Qualitative research is advantageous because it captures thick descriptions related to a particular phenomenon (Henning, 2004). This expands the idea that the real phenomenon is explored by means of advancing into qualitative educational research. A qualitative approach to research that encapsulates a single case study focuses on certain components that are embedded within the system or individual component (Stake, 2013). The focus will now turn to a rich and thick description qualitative research approach, namely the case study. A qualitative study is used to establish connections in the responses gathered from in-depth probing (Birks & Mills, 2014). In addition to this, qualitative inquiry stresses the need to find meanings behind why a particular phenomenon is taking place (Gillham, 2000). This illustrates the ability of a qualitative method of inquiry to capture the essence of teachers' perceptions regarding the influence of ICT in the SEN classroom.

### 3.2.1 Limitations of qualitative research

Data generated from a qualitative study cannot be quantified because it comprises of written recordings of data (Faria & Ameida, 2017). Thus, statistical representations cannot be generated from qualitative inquiry. Qualitative methods of inquiry follow a structured and objective procedure (Faria & Ameida, 2017). This means that a phenomenon to be explored from multiple views, at times some information gathered could be unrelated to the study. The researcher is solely responsible for the data generated (Atieno, 2009). This proposes that the research is the source of generated data and can manipulate data in accordance to pre-determined findings. Due to

fieldwork being conducted, participants may modify their setting to adapt it to the focus of research (Atieno, 2009). This implies that one of the possible disadvantages is that the natural setting of data collected could be changed. In terms of this study, this challenge was responded to by conducting cross-checking of information throughout the study.

### 3.2.2 The case study research design

A descriptive case study as a component of qualitative research design was utilised in this study by means of inductive reasoning. The research design was a descriptive case study as this design is appropriate for answering deep questions of 'how' or 'why' a phenomenon occurs (Merriam, 1998; Yin, 2012). Thus, the contribution of the participants in terms of their views and perceptions allowed for an in-depth analysis to be gained. "The descriptive theory must cover the depth and scope of the case under study, selection of cases and the unit of analysis is developed in the same manner as the other types of case studies" (Tellis, 1997, p. 6). The unit investigation was based on grade 10 teachers in a SEN school.

A descriptive case study examines a phenomenon in the real-life context in which it occurs (Baxter & Jack, 2008). The case study focuses on providing an explanation or reasons for a phenomenon occurring. A real-world phenomenon is explored by the case study, which allows an in-depth probing as it occurs (Gillham, 2000). In essence, the case study allowed the teachers' day-to-day technological activities and the influence it has on teaching to be best understood. The integration into teaching through the manipulation of the content and pedagogy to best accommodate the use of technology in the classroom is what the study explored.

The case study is best suited for this study because case studies, are based on gaining situated knowledge related to the case or research problem (Birks & Mills 2014). The case study presents a more holistic view of the study as it has many variations of descriptive meanings associated with it (Merriam, 1998). A case study provides an in-depth description of a person, group or social situation (Birks & Mills, 2014). As such, meanings gathered from the participants can be interpreted using a variety of topics and connections, and insights.

In-depth research designs make considerations for the characteristics of the phenomenon being explored to be revealed in a more extensive way (Henning, 2004).

Case studies are relevant because it investigates a phenomenon in relation to the context (Yin, 2016). This expands the idea that the data gathered provided the means for a more comprehensive and unique contribution to the study of the perceptions that teachers hold when it comes to ICT integration. Case studies are responsible for conceptual validity and are useful for examining the theorised role of the study (Starman, 2013).

Case studies considers multiple variables in order to explore a particular issue (Starman, 2013). By means of a descriptive case study design, the condition where practice informs is developed through attaining an understanding of the contributions made by teachers in a SEN school. In the context of the inclusive educational environment, emphasis was placed on how teachers can employ the use of technology and, through careful pedagogical considerations, ICT may be integrated. Thus, the research design adopted a single case study as means of gathering the perceptions of teachers regarding ICT integration.

#### 3.2.2.1 A single case study design

A single case study was made use of, that ascertained one aspect relating to the perceptions of teachers. "Single case studies enable the researcher to answer 'how' and 'why' type questions" (Baxter & Jack, 2008, p.557). The one aspect focused on in the case study was the feedback relating to the theoretical framework, namely the TPACK model. Single case studies can be used a descriptive tool in which theory is tested (Yin, 2016). This concurs with the idea of data generated by means of focusing on a particular aspect relating to the research project. Through the TPACK lens, teacher perceptions relating to the technological knowledge as influencing ICT integration in their school was established. Single case studies are able to interpret the complexity of a particular component (Stake, 1995). The single case study focused primarily on one aspect, teachers' perceptions relating to the integration of ICTS, at one case study site. In addition to this, the theoretical framework, namely the TPACK framework established the explanatory grounds for one component relating to ICT integration to be illustrated in the study. "For explanatory case studies, the construction

and testing of an explanation must be seen as the primary objective” (Yin, 2016, p.107). This conveyed the appropriateness for the selection of a single case study as it allowed for the construction of reasons related to the perceptions that teachers held in the area of ICT.

### 3.2.3 Limitations of case studies

Findings and conclusions are influenced by the researcher (Zainal, 2007). This suggests that a researcher can influence the findings in a manner that favors the scope and intent of research. In this study all findings related and unrelated were recorded. It becomes challenging to determine the cause and effect of a particular phenomenon (Queiros, Faria, & Almeida, 2017). Very little basis for scientific generalisations (Zainal, 2007). In the case of this study it implies that generalisations from data cannot be made as it looks at perceptions from a variety of unstructured standings.

### 3.2.4 The site

RRR School, situated in the south of Johannesburg, is a special needs school that caters for learners with special educational needs. These learners are either mildly intellectually (MID) or severely intellectually disabled (SD). For the purpose of this study, the teaching of grade 10 learners who are MID was focused upon. The school offers a variety of skills sets alongside academic subjects to its learners. These skills include cosmetology, plastic, woodwork, welding, catering, building, panel beating and spray painting, plumbing, sheet metal work, cooking, and early childhood development. The academic offerings cover subjects related to English, Afrikaans, mathematics, economic and social sciences (EMS) and personal and social well-being. The skills teachers are specialists in a specific trade and teachers who specialise in a specific academic subject offering. Thus, RRR school provides for the needs of its learners by focusing holistically on what they require to become active participants in society.

RRR School provides learners who are MID and SD with educational learning experiences that are modified to accommodate the learning needs as reflected by learners. The stream of LSEN is divided into classes, of MID and SD learners. In order to develop the learners’ tactile response skills, learners attend special computer-based classes that allow them to gradually develop their skills associated with motor skills.



The school employs over 60 teachers. With regards to ICT integration, the school has a computer lab that caters for one trade offering, namely computer studies and compu-projectors<sup>4</sup> (interactive projectors that allow a white board to be converted into an interactive smartboard) available. Teachers are encouraged to make use of these devices while extending learning experiences. The highest grade at RRR School is grade 9, thereafter learners are encouraged to enrol themselves into FET (further education and training) colleges and trade centres. This is aimed at the learners receiving a higher form of accreditation relating to the trade completed at the school.

### 3.2.5 The case study

The single descriptive case study is of how grade 10 teachers perceived the role of technology in shaping learning for MID learners. The case study acknowledged the role that technology plays in influencing pedagogy and content simultaneously. The study determined what teachers in the inclusive education environment deemed as necessary to ensure that their pedagogy and content makes considerations for the use of technology. A single case study advocates for one aspect to be explored through the study (Hughes, Reeves, & Puchner, 2017). Teachers' perceptions relating to technology, pedagogy and content and how these aspects continue to influence each other as the driver of ICT. The manner in which technology could impart knowledge or gain participation in the skills- subject was also explored in the study.

The descriptive case study encapsulated the views and perceptions these grade 10 teachers hold regarding the use of ICT in their school. The case study was sought to explore in an ideal inclusive educational environment where technological resources are available, how do teachers perceive the application of technological knowledge as a means to not only evoke thought but also to ensure ICT integration takes place? Additionally, applying 21<sup>st</sup>-century modes of instruction through the use of ICT was an aspect which was determined by the case study.

### 3.2.6 Purposeful case selection

For this study, purposeful sampling was utilised. The selection of participants was deliberate in order to gain insight specifically focused to the study (Flick, 2014). Grade

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<sup>4</sup> Compu-Projector- An interactive projector that allow a white board to be converted into an interactive smartboard



10 teachers from the subject and skill-set stream were included in the study. “Purposeful sampling then becomes imperious that selecting the manner of obtaining data and from whom the data will be acquired be done with sound judgment, especially since no amount of analysis can make up for improperly collected data” (Alkassim , Etikan, & Musa, 2016, p.2). As such, six special needs teachers in terms of the subject offerings were included in this study and four skill-set teachers. Sampling is considered as the process of choosing a few participants to represent an entire group (Ghaljaie, Goli, & Naderifar, 2017). These teachers represented a variety of academic subjects and skill-set streams which are offered at the site. The participants varied from 25 to 48 years of age. Table 1 below expresses the characteristics related to purposeful case selection in terms of the participants of the study.

**Table 1: Characteristics of purposeful sample selection**

Pseudonym	Age	Teaching experience	Subjects taught
Mr V	29	5	English
Mr R	46	19	Panel beating
Mr D	36	12	Computer skills
Mrs A	42	20	English
Mrs R	48	14	Social Sciences
Ms C	48	21	Mathematics
Mrs CH	28	4	Life Skills
Mr J	25	3	Wood working
Ms N	25	3	English
Mr L	33	9	Metal work

### 3.3 ETHICAL CONSIDERATIONS

The approval of the study was granted by the University of Johannesburg Research Ethics committee. ([cf. Appendix A](#)). Permission was granted from the Department of Basic Education to engage with teachers at the school ([cf. Appendix B](#)). Prior to the interviews commencing, participants were informed of the purpose of the interview and the written consent form was obtained. The participants were given consent forms to sign before the commencement of the interview, the consent forms contained information related to ethical factors such as anonymity and confidentiality, voluntary participation, informed consent and further information relating to the study (Starman, 2013). ([cf. Appendix C](#)).

### 3.4 METHODOLOGICAL AND DATA COLLECTION

Data was collected by means of semi-structured, individual interviews, one focus group interview, and observations, until data saturation was achieved. The focus group provided shared insight into the experiences of SEN teachers using ICT (Babbie & Mouton, 2016). For a variety of sources, data collection must be informed by some type of protocol (Yin, 2016). The study made use of semi-structured interviews so as to guide the responses of the participants.

Interviews were the research tool for data collection used in this study. Interviews allow experiences related to a phenomenon to be shared by participants (Seidman, 2006). This was demonstrated in a manner that teachers disclosed their daily experiences of the interactions with ICT integration which resulted in a valuable contribution to the study.

Reflections of the influence of ICT integration within the inclusive educational context were gained by carefully considering the views held by the teachers in the study. Intent discourse arranged in the form of interviews proved to also gain insight into the challenges in terms of ICT integration into an inclusive educational setting. Teachers from both the academic and skill-set offerings were given the opportunity to explore the possibilities of the use of ICT-integrated learning experiences and how they can be best arranged so as to ensure that learners who are MID are provided with meaningful and enriched learning experiences. Noteworthy case studies contain a guided operational framework (Yin, 1999). Thus, the framework relating to TPACK was conveyed to the teachers through considering all aspects relating to the theoretical framework, namely, technology, pedagogy and content. The interactions of the components further allowed for the views on the reality of the inclusive educational environment and ICT integration to be expressed.

Observation notes become an important aspect of data gathering at the preliminary stage (Silverman, 2011). This means that the observation notes are to be gathered from the onset. Observation notes in essence are not fixed but could vary depending on what the researcher sees at a given time (Birks & Mills, 2014). In terms of the study, observation notes were gathered throughout the data collection phase and then included in the analysis so as to decipher meanings and interpretations of the

teachers' perceptions. These observation notes conveyed information pertaining to the resources available at the school and encapsulated the learning environment in so far as ICT integration is concerned.

#### 3.4.1 Observation notes

Data was collected using observation notes, also expressed by means of field notes. The role of the researcher as the complete observer was employed (Birks & Mills, 2014). The researcher gathered information relating to the ICT resources and facilities that were available at the school. Observation also became particularly important when conducting the interviews and conveying the gestures displayed by participants in relation to the question being asked. This reflects the observation aspect of data collection as the means of interpreting the surroundings of the inclusive environment of the teachers and relating it to ICT integration.

#### 3.4.2 Interviews

Interviews were made use of as a means of data collection in this study. "Every word that people use in telling their stories is a microcosm of their consciousness" (Seidman, 2006, p.7). This conveys the idea that individual's consciousness relating to a particular phenomenon, in this case the perceptions of special needs teachers regarding ICT integration, can be best understood by understanding what ICT means to the teachers in its simplest form. Semi-structured interviews create the basis for flexibility to be developed and maintained throughout the interview (Gillham, 2000). Throughout the interviews, participants were guided in their responses and allowed the platform to express their views without deviating from the main purpose of the interview. This served to illustrate that adopting a semi-structured approach to interviewing guided the study.

##### 3.4.2.1 Individual interviews

Teachers were encouraged to volunteer to be participants in the study. An interview schedule was developed to structure the timeframes for interviewing participants who volunteered. Teachers were interviewed during their administrative periods. The questions emanating from the individual interviews that reflected the greatest

importance for study is outlined in table 2 below. The anticipated responses were positioned in determining the essence of this study.

**Table 2: Individual interview guiding questions**

Interview guiding questions	
1. Do you believe that ICT integration is beneficial to special needs education? Explain".	2. Do MID learners find it easy to engage with the content if I use technology in your classroom?
3. Can ICT improve on co-ordination and verbal skills of learners who are mildly intellectually disabled?	4. Do you agree that MID learners can gain more in knowledge and skills using assisted technology? Explain.
5. Do you agree or disagree that videos provide an optical response from learners who are mildly intellectually disabled?	6. Do you think that through the use of technology that higher order thinking skills can be cultivated within learners who are MID?
7. What is your weakness(s) when it comes to using technology in the classroom?	8. Is your school is supported in terms of training sessions on ICT integration?

#### 3.4.2.2 Focus group interviews

For the focus group interview that was conducted, three participants were included in the focus group interview due to their availability. The teachers were posed with three questions as shown in Table 3, that conveyed the intent of the study.

**Table 3: Focus group guiding questions**

Focus group interview guiding questions
1. Express the roles that ICT plays in your school.
2. Can learners who are mildly intellectually disabled benefit from lessons which are delivered by means of integrating ICTs?
3. What are the challenges of ICT integration in your school?

The focus group added an additional layer of data collected to inform the focus of the study as well as to provide insight from different perspectives regarding ICT integration at their school.

### 3.5 DATA ANALYSIS

Qualitative data analysis requires the researcher to actively interpret raw data in order to uncover deep underlying meanings. An inductive approach was used in pursuit of explanatory concepts that emerged from the data (Babbie & Mouton, 2016). After the data collection was concluded, the interviews were transcribed into text. The text was thereafter coded. Coding relates to attaching a particular name to the passage of text contained in the transcription (Flick, 2014). Coding is a product of ensuring that the text is condensed and in doing so the meanings and interpretations are not reduced, but summarised (Saldana's coding manual, 2009). Descriptive coding was adhered to in the data analysis phase.

Atlas.ti.8 software was used in order to analyse the transcripts. "Atlas.ti renders a code and retrieve function and provides support for theory building by facilitating connections between codes to develop higher-order classifications and categories, formulating propositions that imply a conceptual structure that fits in the data" (Henning, 2004, p. 133). This highlights how the software is appropriate to apply to the study as it assisted in providing a comprehensive interpretation of the perceptions special educational needs teachers hold regarding ICT integration and the connections, classifications and categories thereof. Open coding was used, as categorising the data in order to interpret the data by means of naming (Henning, 2004). As such, the data analysis was initiated using magnitude coding as based on the insights of Saldana (2009). This was associated with the categories of the benefits of ICT usage in a SEN school and the perception of ICT integration in terms of the teacher responses. The data analysis thereafter advanced into coding for patterns. A common goal for coders is to find repetitive, consistent and inconsistent data in the provided information (Saldana, 2009). This means to analyse the similarities, differences, causation of the reflections as illustrated in the data.

Codifying was advanced into the classification of themes. Codifying can be best described as categorising parts of data related to the information that can be thereafter analysed (Saldana, 2009). The codes were arranged in accordance with associated themes that made up small units of the data analysis. This was done to obtain a thematic analysis of the data as a result of analysing the segments of meanings

embedded in the data. Thematic ideas are represented by the use of codes (Flick, 2014). The content analysis component was conducted by means of establishing thematic ideas and patterns. It was only when data saturation occurred, the process of analysing all information from the data, (Flick, 2014). I then stopped analysing the data for interpretations and meanings.

The first step of data analysis was done by inserting codes relevant to the content of the transcripts by means of using a family coding approach. This took place before the captured interviews were applied to the various codes. Patterns that emerged were amalgamated into abstract themes drawn from the data sets (Maguire, & Delahunt, 2017).

Table shows the codes used when open coding was conducted. The following categories were made use of that derived from the data as encapsulated in the interview transcripts and observation notes. “The case study researcher, working inductively from what’s there in the research setting develops grounded theory” (Gillham, 2000, p.13). Thereafter codes relating to the TPACK theoretical framework were further analysed.

**Table 4: Open Coding Codes**

<b>Theme</b>	<b>Key aspects analysed</b>
<i>21<sup>st</sup> Century learning</i>	Authentic learning experiences for Learners who are MID.
<i>Applying in inclusive education</i>	Perceptions regarding this aspect.
<i>Assistive and adaptive technologies</i>	How they operate to enhance learning for learners who are MID
<b>Aspects such as pedagogy and content</b>	To determine what subjects are best supported in terms of ICT in the special needs school
<b>ICT and special needs education</b>	The basis and focus of this study
<b>the TPACK applicability in an inclusive education environment</b>	to determine the fundamental element of this inquiry, teachers perceptions, MID learners.
<b>the integration of TPACK into the teaching and learning experiences</b>	Teaching learners who are MID using ICTs.

It also becomes evident that these are the preliminary codes used to sort the data generated for the interview transcripts; the data codes at this point were subject to grouping and merging. An analysis of the data also informed the open coding and a



further analysis to be conducted in the next section will also associate the codes with each other, illustrating the connections, differences and ideas represented by the codes.

### **3.6 TRUSTWORTHINESS OF THE DATA**

The data generated from the study must ensure that it is in keeping with the standards that ensure that the data collected and analysed is valid. “Trustworthiness refers to the procedures researchers employ to ensure the quality, rigor, and credibility of a study” (Mogan & Ravitch, 2018, p. 1723). In addition to this, the elements embedded in maintaining the trustworthiness of data are credibility, transferability, dependability, and confirmability (Flick, 2014). “Trustworthiness has been further divided into credibility, which corresponds roughly with the positivist concept of internal validity; dependability, which relates more to reliability; transferability, which is a form of external validity; and confirmability, which is largely an issue of presentation” (Rolfe, 2006, p. 305). The reliability of research aims to ensure that the analysis can be attained by other observers using the same focus of study (Silverman, 2011). Furthermore, this relates to the framework as proposed by Lincoln and Guba, (1985) and Graneheim and Lundman, (2004). It is using this framework that ensured the research methodological selected as being rigorous. What follows is the application of the framework to the study under the elements identified in the framework that established trustworthiness of data.

#### **3.6.1 Reliability of data collected**

An audit trail could also ensure the reliability of data collected by means of establishing relationships and intertextualities by tracing all statements (Flick, 2014) Therefore, an audit trail was kept of the data generated. Rich descriptions as expressed by Merriam (1998) are more detailed accounts where patterns can be assessed. As such, rich descriptions were used as an approach to reliability as it reflected common pattern of responses.

During the interviews, to ensure the reliability of data collection, reflexivity was the measure in place. The researcher thinking, decision making and bias judgements associated with the participants’ responses (Richards, 2009). As such reflecting on my understanding of the problem will be a component of reliability that was present



throughout the data collection. Case studies require that data be collected with an open mind (Gillham, 2000). Thus, relating to the fact that when the data was collected during the interviews, an environment in which was able to reflect on my own understandings of the phenomena and respectively allow the participants to express theirs was maintained.

Reflexivity can be regarded as the journey of learning which is brought about through research (Palaganas, et al., 2017). This study has greatly contributed to my understanding of the realities of inclusive education in South Africa. Throughout the study, reflexivity was maintained by the development of an objective stance. Thus, allowing for my knowledge of the inclusive educational environment to be expanded up. Allowing the teachers to freely express their views regarding ICTs in a nonprejudiced way was also a strategy used to maintain reflexivity.

### 3.6.2 Credibility

Credibility as an internal validity measure attempts to ensure that the researcher establishes and maintains the research objectives and focus of research while data is collected and analysed. "Credibility is defined as the confidence that can be placed in the truth of the research findings" (Anney, 2014, p.274). Throughout the interview process of data collection, the focus of the study was emphasised upon by means of relating the participant responses to the initial focus of the interview or research. This ensured that the responses were not only guided through the use of semi-structured interviews but participants were continually reminded of the main theme embedded in the interview, which was the TPACK framework.

In terms of a strategy in attaining credibility, member checks, in accordance with the trustworthiness model were done, (Rolfe, 2006: Guba & Lincoln, 1989). This was done by means of checking whether or not the teachers' responses were consistent with the objectives set forth for the research study. Credibility is established when the research can ask the question that relates to, have we measured what we set out to measure (Silverman, 2011). This relates to gaining an understanding of the perceptions of ICT integration by teachers, which were present in the data analysis. This meant that during the data analysis, considerations were made of how the research focus of ICT

integration into the inclusive environment was best catered for by the data collection phase of the study.

Another strategy that served to ensure credibility of data is prolonged engagement in the field or site. This is helpful for any researcher as it allows for data to be gathered in a manner that minimises distortions of information (Anney, 2014). Data collected over a period of time ensures that the data is rich in its descriptions, in this regard credibility is maintained. Thus, applying the prolonged engagement ensured that participants were continually shaping their experiences and views relating to the integration of ICTs. As such a period of 6 months was spent in the field. Developing and maintaining subjectivity of the case at hand determines the validation (Gillham, 2000). This related to participants only sharing their perceptions and views and not assuming what the views of the learners would be.

While interviews were being conducted, some participants responded negatively in terms of the focus of data. However, for credibility purposes these negative cases could prove to be a characteristic of ensuring credibility. Reporting contradictory or negative data generated in the study ensure credibility (Anney, 2014). The interviews were transcribed verbatim so as to convey the exact responses however they occurred. This ensured that even though the research focus was not adhered to by the participant, it was still included in the transcript as a measure of ensuring quality of the data.

### 3.6.3 Transferability

One of the fundamental components of achieving trustworthiness of data is transferability as an external validity measure. "Transferability refers to the degree to which the results of qualitative research can be transferred to other contexts with other respondents" (Birks & Mills, 2014, p.198). This means that the data can be generalised in such a manner that allows for the topic and data to be taken to be applied to similar contexts using the same methods. This conveys the idea that the development of a hypothesis through data analysis, which can be applied in a variety of contexts. Researchers can work with a variety of sources to maintain transferability (Flick, 2014). As a case in point, the study made use of a variety of sources - written as well as interviews - that gathered the perceptions of teachers in a SEN and how they perceive

ICT integration. Analytical induction is a way of ensuring transferability (Yin, 2003). This means that the data provided the themes of the study in terms of teachers. This was attained by means of conducting of a thematic analysis using Atlas.ti software.

Other measures employed by the study include an audit trail, thick descriptions and purposeful sampling. “An audit trail involves an examination of the inquiry process and product to validate the data, whereby a researcher accounts for all the research decisions and activities” (Anney, 2014, p.278). In terms of the research collection and analysis, the steps were recorded. For instance, during the interviews some questions that overlapped were at times ignored, hence this influenced the data gathered. This serves to illustrate how an audit trail conveys changes in the data analysis and maintains transferability. In Thick descriptions allow for the data to be applied to other contexts (Anney, 2014). This means that the content relating to the data has the ability to be transferred to other studies of a similar nature. Lastly, purposeful sampling was used in this study as it focused on key knowledgeable participants (Anney, 2014) The participants of this study were teachers, however in order to attain understandings of how ICT integration influences skill-stream related subjects, the skills-set teachers were purposefully included into the study. This maintained the focus of study and ultimately ensured transferability.

#### 3.6.4 Dependability

Birks and Mills (2014), Henning (2004) concur that developing dependability in qualitative research focuses on ensuring that the data is consistent over time and deals with the issues thereof. This relates to the reliability of the data collected and the data analysis component relating to the study. “Dependability of the data can be promoted by having multiple researchers independently code a set of data and then meet together to come to consensus on the emerging codes and categories” (Baxter & Jack, 2008, p.556). This was evident in the data analysis phase of the research where data codes were related to each other to interpret patterns of responses which corresponded with each other. Thereafter, they were sorted into themes that were further discussed. An audit trail is best suited to this study as it ensures dependability because it captures the processes involved in the data collection and analysis phases (Silverman, 2011; Birks & Mills, 2014; Flick, 2014). This holds the view that although ICT integration will always change, the perceptions of teachers regarding its use

ensures that their focus of study is dependable. Thus, illustrating the data as being stable over time. This proved to be evident when the responses remained the same, even when a lapse in time was established.

### 3.6.5 Confirmability

Confirmability of the research data is aimed at attaining objectivity in the data related to the research. Objectivity is a characteristic as disclosed by to inculcate a sense of being neutral as the researcher (Birks & Mills 2014). "Confirmability refers to the degree to which the results of an inquiry could be confirmed or corroborated by other researchers" (Anney, 2014, p.279). This creates data which is varied in terms of the responses and covers multiple areas. In a similar way it entails a neutral stance of reflecting the findings (Flick, 2014). Thus, by the researcher being objective and considering the views and perceptions that teachers may have. This aspect relating to trustworthiness was accommodated for by the researcher applying reflexivity. As such, reflecting on how my understanding of the problem would be a component of reliability was present throughout the data collection and analysis of the data. This tackles the idea of ensuring that the research is neutral and sound conclusions can be made when interpreting the data that eliminates one sided hypotheses and themes.

## 3.7 SUMMARY

In this chapter, the approach to inquiry, the interpretive paradigm to qualitative research was discussed. The qualitative research design method, namely, a description case study was expressed. The reasons for qualitative inquiry as the suitable research methodology for the case in study were explored. *Atlas.ti* software as the means of coding and analysing the data collected through primary thematic analysis was discussed. The trustworthiness and establishing credibility, transferability, dependability and confirmability were revised by acknowledging a variety of strategies to ensure the trustworthiness of data collected and analysed.

## CHAPTER 4 FINDINGS

**“Research means that you do not know, but you are willing to find out”  
Charles Kettering**

### 4.1 INTRODUCTION

This chapter presents the findings related to the study: the perceptions of teachers in SEN education and their reflections of the role of ICT within their teaching context. Their contributions to the research study have been conceptualised by means of the engagement of aspects relating to the technological, pedagogical and content knowledge (TPACK) framework.

### 4.2 THE CODE IDENTIFICATION FOR GENERATED DATA

The individual and focus group interview transcripts were uploaded onto Atlas.ti software and coded using the thematic analysis approach. This meant that a study code was assigned to each segment of data appropriate for the focus of the study.

**Table 5 Codes generated from data**

Search Codes				
Name	Grounded	Density	Groups	
21st Century learning~	42		1	[Aspects of the 21st century] [ICT and the inclusive environment] [Techno
Applying in Inclusive education~	57		2	[ICT and the inclusive environment]
Assistive and Adaptive technologies~	26		2	[ICT and the inclusive environment]
challenges~	27		2	[Obstacles in implementing ICT in the inclusive environment] [TPACK Fi
Divergetnt learning~	10		0	[TPACK Framework]
diversify your teaching portfolio	3		2	
Educational gaming and online learning~	22		1	[Aspects of the 21st century]
ICT training~	11		0	[Obstacles in implementing ICT in the inclusive environment] [TPACK Fi
Improving abilities~	17		1	[ICT and the inclusive environment]
Multiple intelligence and learning styles~	12		3	[TPACK Framework]
Pedagogy and content	6		3	[Technological Pedagogical Content Knowledge] [TPACK Framework]
Technological Knowledge and Inclusive Education~	12		3	[Technological Pedagogical Content Knowledge] [TPACK Framework]
Technological shortcomings~	10		1	
TPACK competency~	16		3	[Obstacles in implementing ICT in the inclusive environment] [Technolo

Table 5, illustrates the codes generated from the data provided for by the interviews and observation notes. In respect of the findings, it was interesting to note that the technological knowledge and TPACK competency had to be treated as separate data codes as the participants treated them as isolated concepts. This revealed an

interesting component of this inquiry, which is that some teachers viewed technological knowledge as a skill and not as a means of delivering content. A deductive thematic analysis of the data will be explored in this chapter.

In addition to this, the codes were further grouped into group codes so as to analyse their association with each other. Codes were further assigned to quotations, see appendix, for the table of codes as identified in this research project. [\(cf. Appendix F\)](#)

### 4.3 PCK, TK, TCK AND TPK

#### 4.3.1 Pedagogical and content knowledge

As a point of departure for the data gathering, teachers were asked questions relating to the subject or skill-stream that they offer learners at their school. The following aspects were found to be important findings, as derived from the data analysis. The teachers associated their pedagogy and content as separate aspects relating to teacher characteristics. *“Diversify your teaching portfolio”* Teacher quote 1. A teacher added that in developing pedagogy and content a teacher must consider the role of presenting the content in various forms, and how it contributes to developing pedagogy. This reflects a good understanding of the role pedagogy plays in presenting the content in an appropriate manner.

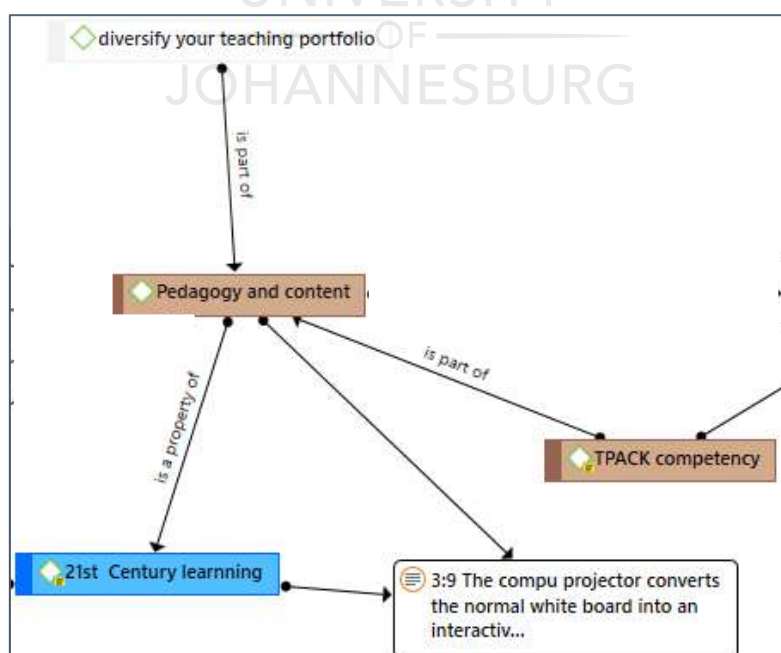


Figure 7: Codes for Pedagogy and Content knowledge



Figure 7 expresses the codes used for determining the pedagogical insights of the teachers. These pedagogical insights were further linked to 21<sup>st</sup>-century learning and how it influences teaching and learning in the inclusive educational setting. *“Comprehension passage from a video”* T2. This shows the extent to which that particular teacher is able to modify the teaching approaches so as to accommodate the content. To add onto that, this reflects a fundamental component of ICT integration as including the use of online or downloaded videos and integrating them into the lesson. Upon analysing the data, the respondents disclosed the following in terms of their pedagogical practice and teaching methods. ICT provides for teachers to adjust their teaching methodologies in response to learning needs (UNESCO,2013) Teachers expressed that, at times, the content must be modified in order to accommodate the level of understanding displayed by learners. This illustrates a relation between pedagogical practices and ICT integration.

One teacher expressed that it is sometimes difficult to modify their teaching strategies and include ICT, due to the fact that they are already modifying the content to the level of the learners, so including ICTs would be time consuming. The most interesting contribution was made by teachers who revealed that they make use of ICT only to acquire the content needed for the lesson. *“Looking for lessons or worksheets using ICT”* T3. This illustrates the focus of ICT as being the means for attaining lesson related resources rather than regarded as the means for the lesson to be conducted. It is this view that presents ICT as being a resource instead of a source of learning. Thus, revealing the technological knowledge as being associated with the gathering of content rather than being involved in delivering that content. As noted by Gutiérrez and Zaragoza (2011) in their study, teachers are providing ways in which ICT activities can be made available to learners with intellectual disabilities.

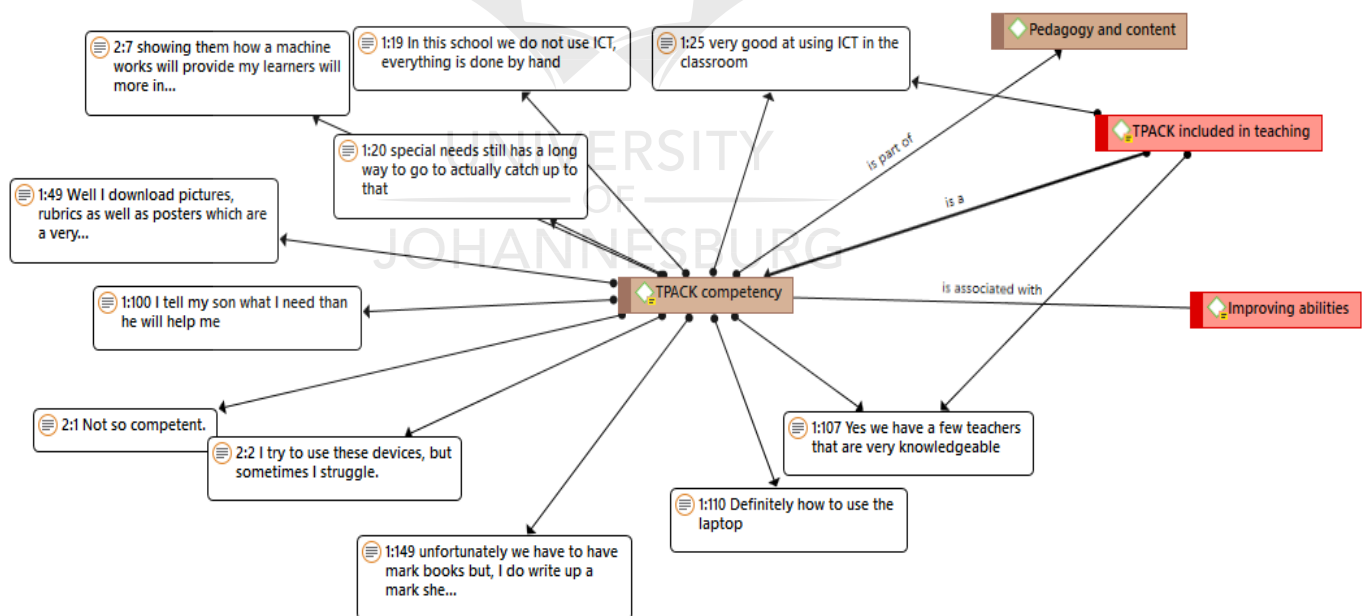
A cross-reference of the quotations revealed that many teachers were still using traditional ways and methods of delivering content. *“We still use our textbooks and chalkboards for teaching and learning”* T4. This uncovered that many of the teachers do not want to explore their technological knowledge and apply it to their teaching context. One teacher referred to the content of her subject as being developed into a new curriculum that they are expecting to receive training on. However, the means to delivering that content was not emphasised on. This reflected a sense of willingness to develop pedagogical practices that accommodate the manner in which the



curriculum is brought forward to learners who are MID. Most teachers reflected on their level of technological knowledge by making references to what they know in terms of technology. In referring to their technological knowledge (TK), it became apparent that using technological knowledge and the pedagogical and content knowledge were isolated aspects. Thus, teachers were not able to establish the TPACK framework as the basis of ICT integration. Previous research suggests that a clearly defined manner to design ICT lessons for learners with IDs is not yet established due to the nature of intellectual disabilities (Dekelder, et al., 2015). This provides reason, that responding to individual intellectual disabilities through the use of ICT could be problematic.

#### 4.3.2 The teachers' technological knowledge

This aspect of the study was to be able to identify the extent to which the teachers are competent in their technological knowledge. In order to establish this competency a relation to the pedagogy and content was made during the data analysis as it occurred in the transcripts.



**Figure 8: Quotes for Technological Knowledge competency**

Figure 8 reveals that, when asked about their technological knowledge competencies, many teachers made references to their skills as being the determining factor in applying ICT in the classroom. An analysis of the quotations revealed that most

teachers struggle with being online and typing skills. They believed that if these can be developed, they will be regarded as being technologically competent. In addition, one teacher expressed, *“We still use mark books and do not complete administrative related tasks online or using any system”* T4. This was contradicted by another teacher who shared that they have access to the school system for the capturing of marks. In essence, this uncovered that when it comes to technological knowledge, teachers engage with technology based on their ability to complete a particular task by means of technology.

Many teachers reflected upon the technological competencies of other teachers. *“We have teachers who are knowledgeable about technology”* T5 This revealed that only a handful of teachers are relied upon in order to complete tasks using ICTs. It also pointed out that applying technological knowledge into classrooms for teaching and learning is done to a very limited extent by the teachers. Studies show that a lack of support in ICT for learners with ID hampers learning opportunities (Li-Tsang et al., 2007). A very revealing statement was made by one teacher, who responded by saying that *“My son does all the searching and if I need anything online he does it for me”* T6. This highlighted the fact that some teachers would rather rely on the technological knowledge of others rather than cultivating their own.

Teachers were able to expose their weaknesses in terms of technological knowledge. Upon running a co-occurrence of the responses, many teachers indicated that they do try and incorporate the use of technology in their administrative duties and teaching, however they felt that there were areas in which they could improve in. Six teachers responded that they feel training is needed.

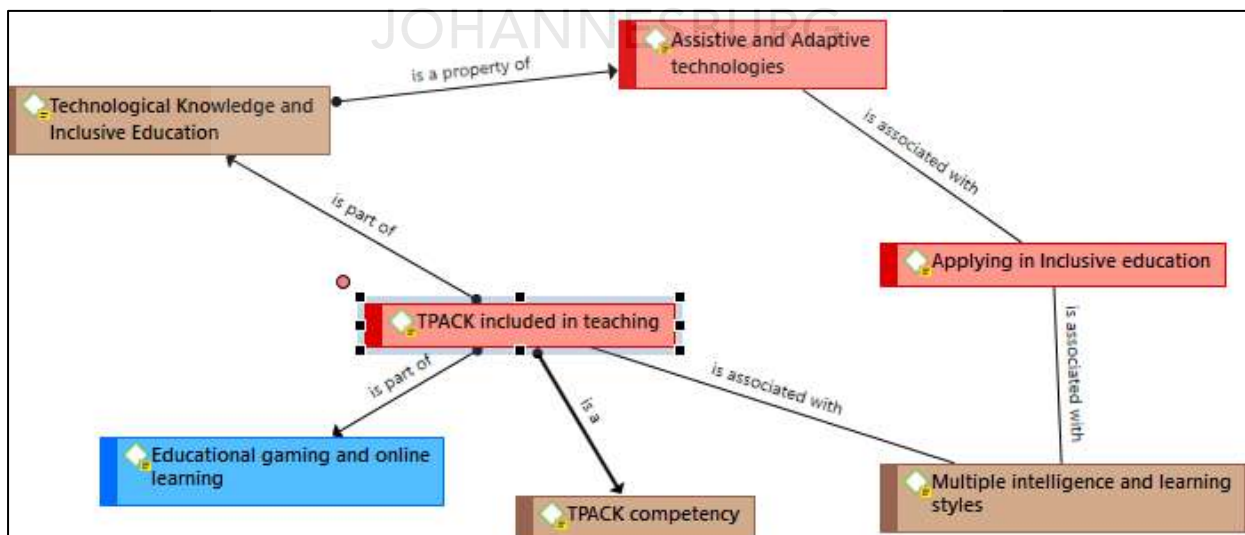
One teacher reflected her fear in terms of technological knowledge, *“It takes make a long time to learn something new hence I tend to feel a sense of frustration”* T7. This revealed that a common fear faced by the teachers is that they will struggle to learn something, so instead they seek the assistance of others whom they regard as competent in terms of technological knowledge.

One teacher shared the following *“I battle to switch on devices and get it set up, I ask someone for assistance”* T8. This shows the reliance of those who do not wish to engage with the functionality of a particular device or program as continually requiring assistance from someone else. One root of this problem could be seen when one

teacher 9 added *“My weakness is that I started too late”*, reflecting on their technological knowledge. This uncovered that some teachers believe that technology is changing at a rapid rate and that keeping abreast of these changes is difficult. A lack of ICT integration means that learners with IDs are not able to be fully included into the e-education system. (Stendal, 2012) The teachers who shared that they are very technologically competent related the knowledge of technology to knowing how to operate a particular device. *“I use my laptop every day, so I am competent.”* T10. An analysis of this reveals that many teachers associated technological knowledge with only being a knowledge domain rather than connecting it to their teaching methods using the appropriate content.

#### 4.3.3 Technological and content knowledge

The following was uncovered when investigating the aspects relating to the content and how it informs the teachers’ choice of technology usage. A comparison of the codes associated with the technological content knowledge aspect relating to the TPACK model revealed the following. Most teachers focused on the assistive technology component in terms of LSEN rather than how instruction can be informed by technological knowledge. Some teachers shared that the ICT centre which is available to LSEN focuses on developing skills and viewed the computer classes as a separate subject. ([c.f. Appendix E](#)).



**Figure 9: Technological Content Knowledge**

Figure 9 shows the outline of the codes applied to determine the technological content knowledge of the teachers. An interesting analysis was that teachers associated the content with technological knowledge as being the basis for teachers who wish to integrate the various learning styles. Many teachers shared that ICT, *“provides learners with another view on the content”* T11. This means that teachers are able to acknowledge the role that technology plays in ensuring that the content is approached from multiple views or perspectives. One teacher added that *“I use videos as means of a listening comprehension”* T12. When asked why they added that *“Videos instead of written text allows for learners to understand the content”* T13. It is based on this contribution that one can interpret the content as being a great factor in the choice of technology and how teachers are able to apply their technological knowledge. The teachers illustrated that the content and context informed his choice of technology.

One skill-set stream teacher maintained that by showing the learners a video tutorial of how their trade goes about *“spraying cars”* T14. Learners responded positively by following the instructions as contained in the video. This shows that, for that teacher, showing learners the video became the basis of the learning experience as learners are expected to replicate what is being shown to them by working on the cars step by step. One underlying component of the analysis of technological content knowledge was searching online for content for LSEN. Two teachers added that they use online teacher repositories for content that they can convey it in class. When asked why, one added, *“The content needs to be modified on the level of our learners, online resources assist me in doing so”* T15. A cross-reference of the quotes provided revealed that the teachers used the content and further modified it so as to allow learners to better grasp the content. It must be mentioned that here, the technological knowledge or how to gather online resources became the determining factor for the selection of content. Furthermore, it provides an indication of skill-set stream teachers being able to better integrate ICTs into the inclusive classroom as opposed to teachers who teach academic subjects.

One teacher commented that when it comes to using technology by means of showing learners a video, *“You always need to adapt the content, especially language”* T16. This serves to show the place for technological knowledge in the inclusive education setting as allowing content to be modified so as to accommodate LSEN. It also reflects the ability for the teacher to acknowledge the manner in which technology influences

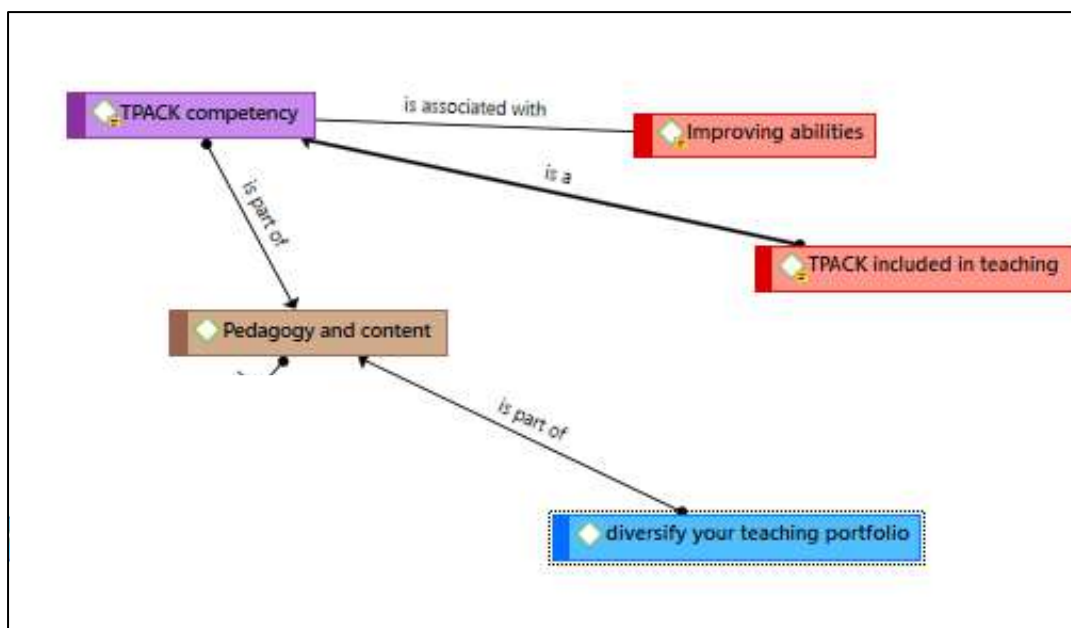
the content and show a response to the 21<sup>st</sup>-century learning needs, particularly to learners who are MID.

One teacher stated, *"I use the compu-projector almost all the time"* T17. This was referring to how they include technology to conduct lessons and deliver content. By means of a cross-reference, another teacher mentioned that they use the compu projector. A compu-projector is an interactive data projection device. ([c.f. Appendix D](#))

When asked why, they responded *"it is easier for them to interact"* T18. These comments demonstrate how some teachers make use of the technological devices available at the school to shape learning, as is the case with the "listening video comprehension" T19. Others use the technological device to ensure that interaction from the learners is maintained in the classroom. This points out the effective use of technology and eliminates the perception of ICTs being a substitution to direct instruction.

#### 4.3.4 Technological Pedagogical Knowledge

An analysis of the technological and pedagogical knowledge element as shown by the data revealed that the teachers perceived the role of the technology as both a means for delivering content and ensuring learners are engaged. *"Times have changed"* T20 indicated one teacher, thus reflecting there is a need for change in the teaching methodologies. In doing so, an association was made between 21<sup>st</sup>-century teaching and learning and developing TPACK competency. As represented by figure 10 below, the technological knowledge and pedagogy as interacting components were related to each other by means of associating corresponding codes with one another. The following findings were uncovered.



**Figure 10: Technological Pedagogical Knowledge Codes**

An interesting connection made by associating the above codes was that “*diversifying your teaching portfolio*” T21 as mentioned by a teacher was associated with the development of technological pedagogical knowledge. This uncovered that the teacher associated the use of technological pedagogy as being responsible for teachers diversifying their teaching strategies that they use to conduct lessons.

The point of TPACK being a part of technology included in the teaching revealed that teachers were able to distinguish the various reasons for changing their pedagogical practices to include their technological knowledge. A reason given by one of the teachers was that it allows learners to engage in the content and lesson as a result of their interest brought about through technology. The teacher mentioned this, “*involve technology in the classroom and you tend to capture the interests of your learners*” T22. This reveals an acknowledgement that the learner characteristics have changed and also reveals the awareness of the teacher that learners who are MID are indeed attracted to lessons using ICTs. Additionally, some teachers uncovered that by basing their pedagogy in a manner that includes ICTs, it assists them when it comes to classroom management. “*The ICT lab taught me a thing or two, and when applying it into my classroom is also assisted me with the discipline*” T23. This statement firstly discloses the aspect of self-learning in terms of developing an ICT-focused pedagogy, thereafter it relates to how it became advantageous for the teacher to apply insights to their pedagogy.



Three responses by teachers attributed technological pedagogy knowledge as being the determinant for attaining learner participation. Under the improving abilities code, *“Using YouTube allows for learners to engage with the content”* T24. This reveals that the teachers who allow their learners to engage with the content make use of videos and tutorials on *YouTube*<sup>5</sup>. Many teachers made references to showing learners who are MID videos to enhance learning. When asked why, they responded *“Our learners struggle with basic concepts and when using the videos, learners are able to view the concept rather than listening to our voice”* T25. This uncovers the perception of ICTs in their setting as being the component that assists in allowing learning barriers to be managed through the use of technological devices which display videos.

Teaching methods and strategies will always be informed by the resources available at the school for teachers to use in their educational experience offerings. Having the necessary technology available allows for pedagogy to be modified so as to include the use of ICTs. One teacher uncovered that ICT can, *“create experiments using the smartboards”* T26. This proposes that the teacher’s perception regarding technological knowledge informing pedagogy is not limited to making use of online resources but allowing their pedagogical practices to be shaped through technological knowledge. A quotation that contradicted this in terms of the analysis was when a teacher indicated that technological knowledge is applied when, *“Looking for lessons and sometimes I use the internet to give learners worksheets”* T27. This perception is reflected as with the introduction of smartboards in schools, it has changed the manner in which teachers approach learning. This teacher illustrated that the pedagogical aspect relating to teachers is very much as a consequence of technological knowledge embedded in the TPACK framework and 21<sup>st</sup>-century teaching and learning experiences.

As stated by one teacher, *“using the compu-projector has changed my life”* T28. This acknowledged that the teacher’s profession was shaped for the better by including technological knowledge into the aspect of pedagogical knowledge, in an inclusive educational environment. It concurs with the perception that ICTs continue to change the way teachers go about conveying content to learners who are MID. The pedagogy allows for the appropriate technology to be applied. A teacher mentioned that she

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<sup>5</sup> YouTube- A video-sharing platform, videos can be streamed.

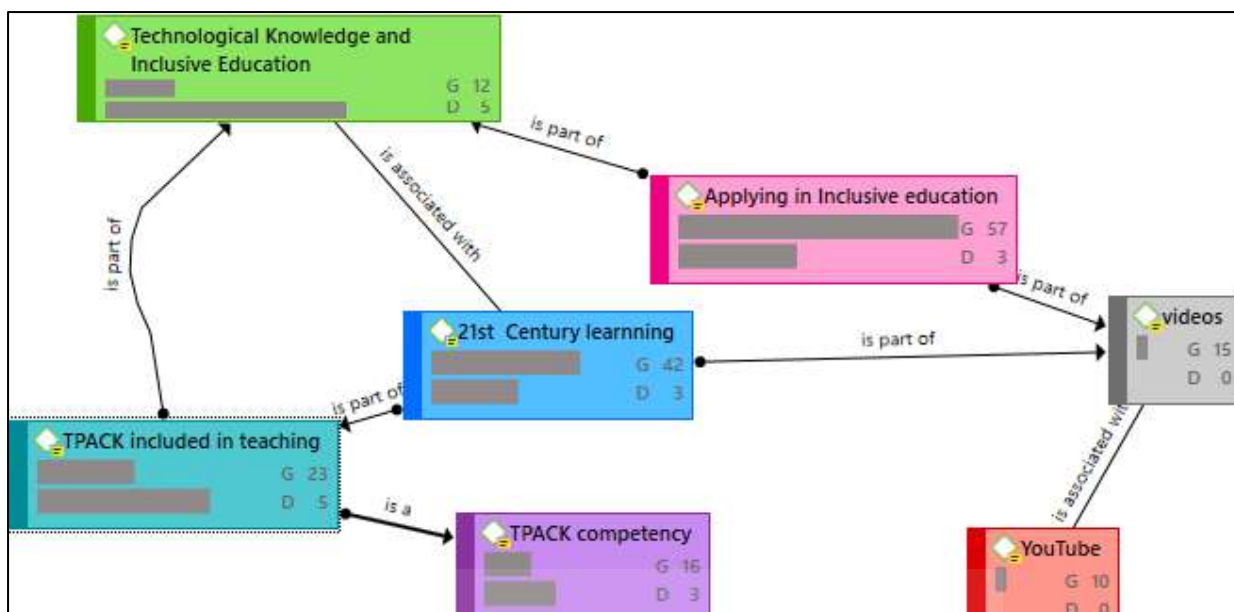


employs a more learner-centered approach to teaching. *“They are used to seeing things so that will interest them by coming and doing something on the computer”* T29. In doing so, she involves the learners in the learning process, which captivates them. This reflects a perception that as a consequence of ICT integration, a radical shift is needed in terms of how teachers go about conducting lessons. Additionally, it reflects that the teacher perceives the role of ICTs as allowing learners who are MID to be autonomous of their learning experiences.

To end off the analysis of this component, a quote that stood out while analysing the data was, *“By using technology in the appropriate ways, our learners will have more information available to them, than what they have now”* T30. The teacher reflected a perception regarding ICT integration, that was aimed at exploring the possibilities for technology providing sound learning experiences for learners who are MID. It also reveals that teachers acknowledge the role ICT plays in terms of reaching out to learners who are MID.

#### **4.4 TPACK FRAMEWORK CONCEPTUALISATION AND INCLUSIVE EDUCATION**

The technological, pedagogical and content knowledge framework was used as a conceptual framework for this study. An analysis of the data in terms of the aspects relating to the TPACK model was conducted, in interpreting the findings and making meanings from the data and associating the data with relevant findings revealed the following. An analysis of the various other codes contained in the data codes and the co-occurrences were analysed. To determine the grounded and density of the quotations as compared with other thematic codes.



**Figure 11: TPACK Framework codes**

An analysis of how TPACK, from the teacher perspectives, can be included into teaching in an inclusive environment is shown by figure 11. What was interesting to note was that YouTube was compared to the TPACK framework component such that the grounded association reflected a “15”. Thus, the model was shaped by understanding that teachers reflected that the TPACK was best described by using videos and YouTube as an example. Upon interpreting this, it provided an interesting perception as being disclosed by the teachers. The perception was that teachers viewed ICT and the TPACK framework as including only the use of videos in their teaching strategies used to deliver content to learners who are MID.

In examining the data code using the query tool, applying in inclusive education and TPACK included in inclusive education, the following quote was re-occurring. *“Our learners do not like to write so by showing them a video and then asking them to repeat what was shared on the video, helps”* T31. Interpreting this revealed that teachers’ perceptions of TPACK included in inclusive education and applying ICTs in an inclusive educational setting were conveyed it as showing videos to learners. In describing the analysis of these components, one would ascribe the characteristics of ICT in terms of the perception of the teachers as a component as basic as showing videos to learners who are MID.

A teacher quote that reinforced the idea of the use of technology and overlapped in terms of the codes depicted in the network was, *“Today’s generation is technologically*

*inclined*” T32. This highlighted an awareness by the teachers of the learner seated in the classroom today as being influenced by technology. Furthermore, in interpreting this aspect, the teachers conveyed the perception that their teaching methods should change to accommodate the learner who is technologically inclined, and in doing so mentioned that quote. An interesting quote that appeared in all codes related to the network, the common code, was when a teacher expressed how technology improves the learning experiences of learners who are MID. *“In special needs, if we as teachers involve technology into our teaching we can keep them interested for a longer time and it becomes easier for them they for the knowledge they need”* T33. This accounted for the perception that ICTs allows for learning to be better grasped by learners who are MID.

This interprets a number of conclusions: firstly, learners who are MID can gain in terms of the knowledge shared through the use of ICT, secondly, it appreciates the breakthrough in terms of the fact that some learners in a SEN school struggle to focus for extended periods of time, considering the learners who are MID and display ADHD<sup>6</sup>. Providing them with educational experiences that allow them to benefit in the sense they are more attentive in class conveys the role of ICTs in the inclusive educational environment. The teacher explicitly acknowledged that ICTs can assist in terms of helping them with learning.

Including ICT in the inclusive educational setting revealed that, in association with the TPACK model, teachers are to ensure that learner who are MID develop their technology proficiency to function in a society that demands that citizens be computer literate. *“Society and many jobs will require our learners to know how to use these technologies”* T34. This quote revealed that special education teachers perceive that the role of ICTs and their TPACK should be aimed at ensuring that learners who are MID are equipped to participate in the economy and acknowledge that computer literacy is needed. In interpreting this statement, it conveys that idea of teachers first being computer literate in order to convey those skills to learner who are MID.

When linking multiple codes in determining the variances between quotes in terms of the TPACK model, all teachers conveyed their perception regarding the use of ICT as focused on videos. However, one teacher assessed their own TPACK. *“In this*

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<sup>6</sup> ADHD - Attention Deficit Hyperactivity Disorder

*generation, the more you link your lessons using technology the more they learn, the chalk and board does not work any longer*" T35. This uncovered the teacher perceiving that the traditional method of delivering content as not being adequate in responding to the educational needs of learners, who learn best through the use of technology. An interpretation of this quote conveyed the following in terms of the perception held by this teacher:

1. Learner characteristics have changed; learners want to see ICT integration take place.
2. A reflection on her own TPACK embedded in her teacher identity would convey the use of technology to ensure learners who are MID become interested in the lesson.
3. The traditional means of delivering content can be considered as relevant if only some form of technology is integrated. Thus, focusing on blended learning<sup>7</sup> as the approach to ensuring that ICT integration takes place within the inclusive educational setting. One teacher acknowledged that learners who are MID enjoy lessons using ICTs. *"They want to see lessons using technology, they enjoy it"* T36. An analysis of this shows that the teacher exclaimed that lessons using ICTs must become a reality for teaching and learning at SEN schools.

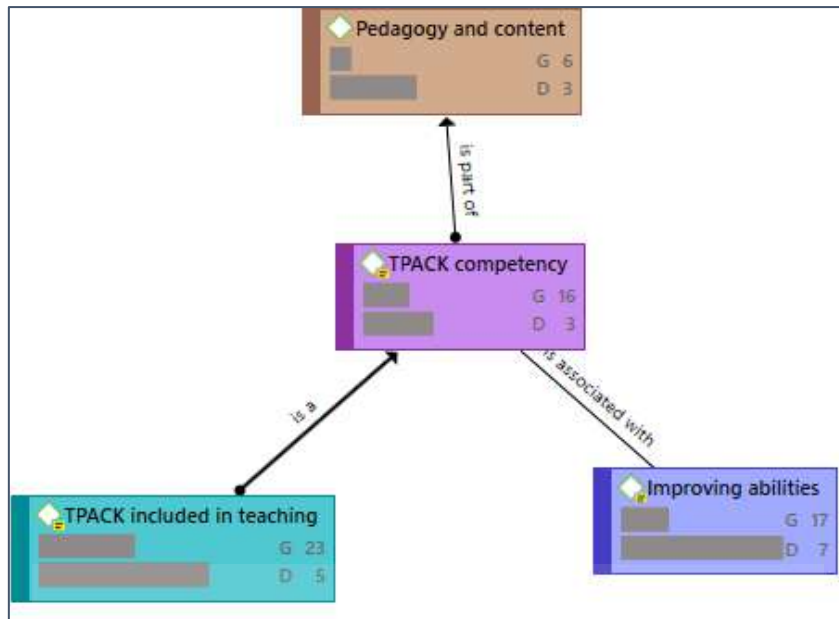
By cross-reference analysis of the TPACK framework as included in SEN education revealed the perception that teachers aligned with the benefits of ICT integration in the special educational setting. *"Kids who do not know how to read will view a video and pick up faster"* T37. This teacher expressed that MID learners who do not know how to read can use the videos as means of gaining information and therefore 'pick up' on the concepts faster. Although again the association of ICTs is made in terms of videos, what is of interest is that the teacher conveyed that learners who are MID can learn a concept faster by integrating ICTs into the inclusive classroom. In keeping with this perception, another teacher perceived ICTs as providing the means for learners who are MID to better understand concepts by using ICTs. *"Learners grasp the content better when they have concrete examples which ICT provides"* T38. This serves to illustrate the perception that ICTs and TPACK from the teachers can give MID learners

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<sup>7</sup> Blended learning - Educational offerings that combine digital media with traditional classroom methods.

concrete examples that enhance learning for them, and in doing so result in them having a better understanding of a concept being explored.

Some negative quotes were made, which, upon analysing, did not add any value to the study. However, after interpreting the following quote, it revealed favourable results in understanding a particular teacher's perception regarding the role of ICTs in inclusive education. *"I feel as if I do not understand the context of learning anymore"* T39. In interpreting this quote, the teacher's perception is that the context of learning has changed. As such, a reflection and shift in terms of developing PCK to include the technological knowledge component is needed to effectively teach in the learning context of inclusive education that is also influenced by technology in the same vein that mainstream schools are influenced. One dissenting quote from the analysis of the group codes of TPACK included into the inclusive environment revealed a sense of reluctance by a teacher. *"If ICT is not used in a correct way it can be negative"* T40. Interpreting this quote disclosed that the teacher's perception focused on the fear that many teachers have in terms of ICT integration. This perception is best understood by reflecting on teachers who are reluctant to adopt educational technologies into their teaching practices out of fear that the negatives would outweigh the positives for learning. A teacher expressed that they felt that learners who are MID are more easily distracted, and using technology in the learning context would further distract them. Contrary to this, in general most quotes focused on the development of the aspects relating to the TPACK framework, as being the way to integrate ICTs into the inclusive educational environment.



**Figure 12: Network group of TPACK competency, teaching and improving qualities**

The network group as shown in figure 12 consisted of TPACK inclusion in teaching in an inclusive educational setting,

The correspondence of TPACK competency as cross-referenced with improving abilities indicated by the density 7 meant that, based on this association, the codes linked to improving abilities deriving from the TPACK competency are much stronger in terms of the association. This means that the teachers reflected a perceived agreement that indeed the TPACK framework can provide an underpinning for the improvement of qualities, which is linked with density 3 in terms of pedagogy and content. Upon analysing this association, a quote shared the way many teachers perceive technology as relating to learning and understanding. *“Technology will provide the learners with more information”* T41. This focused on the perceived benefits for ICT integration in the inclusive educational setting as providing learners with more information. This, when interpreted, relates to teachers requiring an additional layer to the delivery of content, which they concur can be brought about through the use of technology.

The TPACK competency as associated with improving abilities as a result displayed a grounded of 17 and density of 7. This created a strong code link between teachers’ TPACK and improving the abilities of learners who are MID. One teacher commented that, *“Technology can improve language and perceptual abilities”* T42. This revealed that the teachers perceive the role of ICT in the inclusive education as allowing



learners who are MID to develop their skills or areas where they display weak cognitive and social development. An analysis of the data codes for the query of pedagogy and content and TPACK was compared using the “and” query input. It revealed that the underlying quote, as generated by the data, was that teachers ascribed technology in the inclusive educational environment as having many learning benefits for learners who are MID. The benefits are a consequence of them including the technological knowledge in their knowledge domain as special education needs teachers.

#### 4.5 TECHNOLOGICAL KNOWLEDGE IN AN INCLUSIVE ENVIRONMENT

At the heart of the study was the exploration of perceptions regarding ICT usage from the teacher position. It asked how teachers apply their technological knowledge in the inclusive educational environment. As shown in figure 13, the codes were used to determine these perceptions in terms of ICT and special needs education.

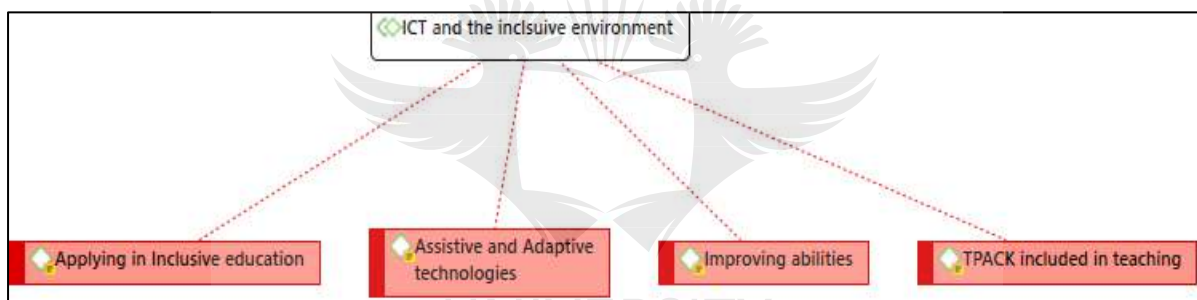


Figure 13: ICT and Inclusive Education Codes

The network comprised of sub-groups or family groups, i.e. applying in inclusive education, assistive and adaptive technologies, improving abilities, and TPACK included into teaching. One interesting quote that deviated from the quotation group upon using the query tool was, “*Inclusive education in special needs education, still has a long way*” T43. In interpreting this statement, showed that the teacher indicated that more development in the area of ICT integration in SEN schools is needed.

The role of ICT in the special needs’ education was uncovered by an analysis of the above identified groups and the following quotes. All teachers interviewed shared this sentiment. *The learner who can’t read properly can view something from a picture being displayed and would be able to pick up faster on what is being discussed*” T44. This presents an interesting finding: that the perception of the contribution of ICTs in an inclusive educational environment can be regarded as more beneficial than that of



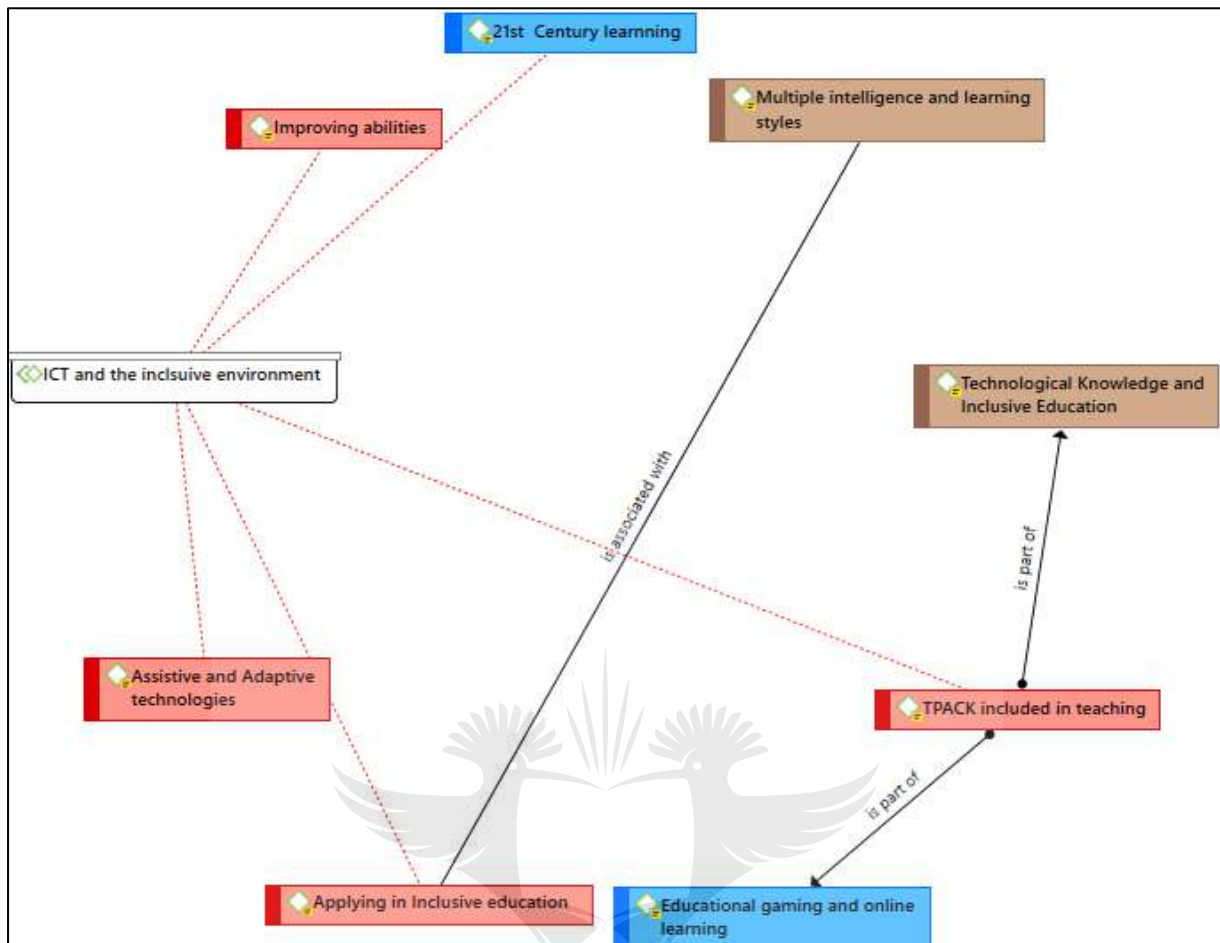
mainstream schools. An interpretation of this uncovers that teachers in an inclusive environment regard ICTs as the means of allowing learning to take place in a manner that ensures the MID learner is provided with another source of learning, through ICTs. For these teachers, ICT is neither a substitution for teaching, nor does it accommodate the manner in which learning is conducted. For them ICT is learning. This entails that the learning context of learners who are MID is shaped by their learning through ICTs.

The context of inclusive education influences ICT integration. *“When something is relevant to a child’s context, they will want to learn more about it”* T45. Analysing the semantics here, context can also be associated with the level of understanding reflected by learners, as contained in the learner attributes<sup>8</sup>. This teacher revealed that learners who are MID have certain characteristics which they associate with actual learning. A cross-reference of such disclosed a very revealing quotation where a teacher indicated *“other teachers don’t adapt, they just cut and paste meaningless worksheets”* T46. This means that this particular teacher holds the perception of what learning should entail in their context, and as such can relate with the effective use of technologies to evoke thought.

On the other hand, another teacher’s perception established that learners with MID should be afforded the same ICT opportunities, conveyed to mainstream schools. *“Just because our learners are MID, it doesn’t mean that we can’t teach them using technology”* T47. On a superficial level, this implies equal education for all. However, upon interpreting that statement it becomes apparent that many teachers perceive that learners who are MID are being excluded in terms of ICT integration efforts. In addition to this, it demonstrates a sense of willingness by teachers who teach in SEN schools to apply their technological, pedagogical and content knowledge to their teaching experiences. The reflection on how best ICT can be included into the inclusive educational setting by means of the skills-subjects was uncovered by a teacher who reflected how they use ICT to allow learners who are MID to gain in understanding how the skills should be applied to the subject. *“They enjoy videos and pictures instead of reading”* T48. This was followed by an explanation of how seeing is the most appropriate way to follow the instructions on a video for MID learners to master a particular skill.

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<sup>8</sup> Learner attributes - The background, intellectual capabilities embedded in a learner or group of learners.



**Figure 14: ICT in the Inclusive Educational Setting**

Figure 14 illustrates the associations made of in terms of integrating ICTs into the inclusive educational setting. Deriving from the link is the association that including ICTs into the inclusive environment requires that teachers develop thought-through lessons that incorporate a variety of learning styles, which will be discussed later in this section. A teacher reflected that *“In panel beating we do not make use of a lot of technology besides, Google and YouTube”* T49. In analysing this quote, one could argue in favour of the ability of a variety of learning styles to be accommodated for through the use of video. This relates to the question on whether or not multiple intelligences of learners who are MID can be represented by means of a video. This expands the perception that all learners can relate to videos and it can influence learning for MID learners. The improving abilities code, among many other aspects, revealed the following sentiment shared by one teacher mentioned *“Since I have been using ICTs in my classroom, the marks of my learners have improved”* T50. When asked how, the teacher expressed the perception that learners who are MID find it

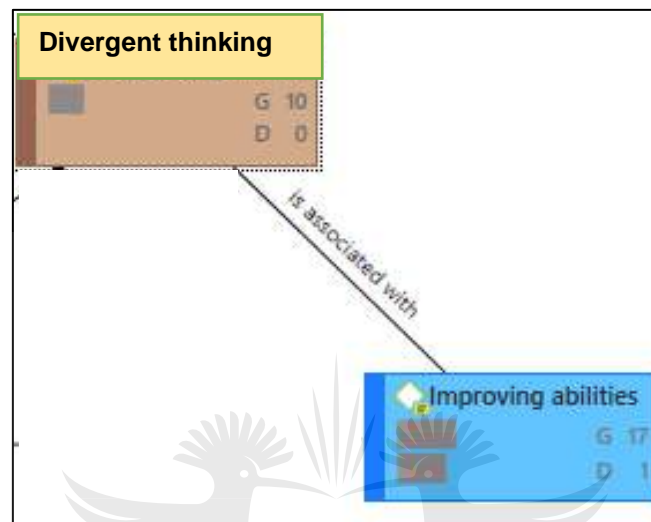
difficult to grasp concepts in their entirety, so breaking down the concepts by using ICTs allows for them to see the concept as systematic. An interpretation would uncover that the teacher asserts the fundamental aspect of using ICTs, which is that ICTs should be for learning experiences that are meaningful to learners, and that one way of ensuring that learners who are MID find meaning is if they are firstly interested in the manner in which the meanings are presented.

In addition, one teacher indicated that ICTs will also help learners who are MID to not only remember, but also to understand concepts. *“Kids get involved and remember things better, kids these days do not want to read”* T51. This reflects the perception of the realities of the classroom today: that learners do not want to read. An interpretation of that remark would reveal that learners who are MID struggle to read, and as such they do not want to read in class. However, sharing this allowed the perception to be uncovered that indeed ICTs influence learning for learners who are MID in a positive way. A similar quote that derived from a co-occurrence analysis associated ICT usage with attaining interest from learners who are MID. *“Once you use technology, the moment you go into the class, they are hooked in the lesson and learn a lot”* T52. This captures the perception related to ICTs as being a driver for learner participation, particularly for learners who are MID.

In relation to authentic and deep learning in an inclusive educational setting as brought about through the use of ICTs. A cross-reference of the including TPACK into the inclusive setting codes uncovered a statement that stood out. One teacher alluded to the fact that by creating activities and learning, the gap between a concept and real life is bridged. *“It allows for real world experiments to take place through creating a virtual reality”* T53. This conveyed the perception that learners who are MID respond well to the use of ICTs as it provides them with practical examples in the real world, which activates deep learning. It provides them with more than one way of looking at concepts that are discussed in the classroom.

#### 4.5.1 Divergent thinking

A discussion of divergent thinking came up in the interviews<sup>9</sup>. Teacher This was understood as teachers allowing learners to approach a particular concept from multiple views. Although closely related to multiple intelligences, divergent thinking applies to the processes of thinking rather than the stimulus that results in thinking.



**Figure 15: Divergent Thinking Network**

As indicated in figure 15 the analysis of divergent thinking, it associates with improving abilities of learners who are MID with the density 1 based on the quotes. Divergent thinking grounded 10 and regards it as part of multiple intelligence with a density of 12. *“By means of using technology you are showing them another way of reflecting their understandings” T54.* The use of media in classrooms provides stimulation for learners to gather multiple platforms of knowledge acquisition (DBE, 2004). This contribution can be regarded as divergent thinking because it reflects on ways of thinking rather than ways of learning. This means that the perception that divergent thinking could improve abilities of learners who are MID is subject to individual teacher perceptions.

The network also explains that, often, teachers associate divergent thinking with multiple intelligences. An interpretation of this means that teachers are not being able to conceptually distinguish between the two, although one does form part of the other. What is of interest is the analysis that divergent ways of thinking using ICTs is

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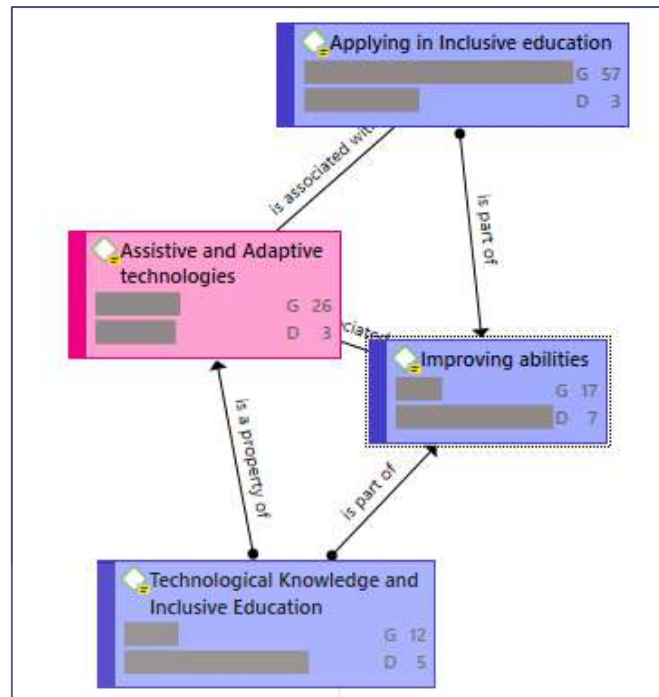
<sup>9</sup> Divergent thinking - the actual process of thinking that explores multiple possible solutions in order to generate creative ideas.

considered as part of improving abilities of learners who are MID. The nature of barriers being experienced could sometimes be unknown to respond to through the use of ICTs therefore multiple ways of content delivery need to be developed (Chadwick, Wesson & Fullwood, 2013).

The White Paper on e-education recommends that the flexibility of the content must be established to ensure the effective integration of ICTs (DBE, 2004). In chapter 4 of the white paper on e-education it is noted that ICT must be used to create more flexible tools that accommodate the thinking processes of learners (DBE, 2004).

#### 4.5.2 Assistive and Instructional technologies for learners with MID

Technologies are created for different purposes; educational technologies can be integrated for assistive or instructional purposes. Assistive is described as devices such as hearing aids and instructional is related to computer applications and the use of software such as text to speech applications and interactive whiteboards that can serve as devices which aid learning. There is very little research that explores the opportunities that ICT has for people with disabilities (Stendlal, 2012). Research is focused upon the development of hardware devices which enable learners with disabilities, the emphasis of ICT in terms of learning for learners who are ID is limited. Assistive technology is aimed at making the educational environment more inclusive whereas instruction is related to the technologies in the lesson. In the study, it was established that the SEN school, rely on assistive technologies aimed at enhancing learning for learners who are MID, the possibilities for instructional technologies is limited.



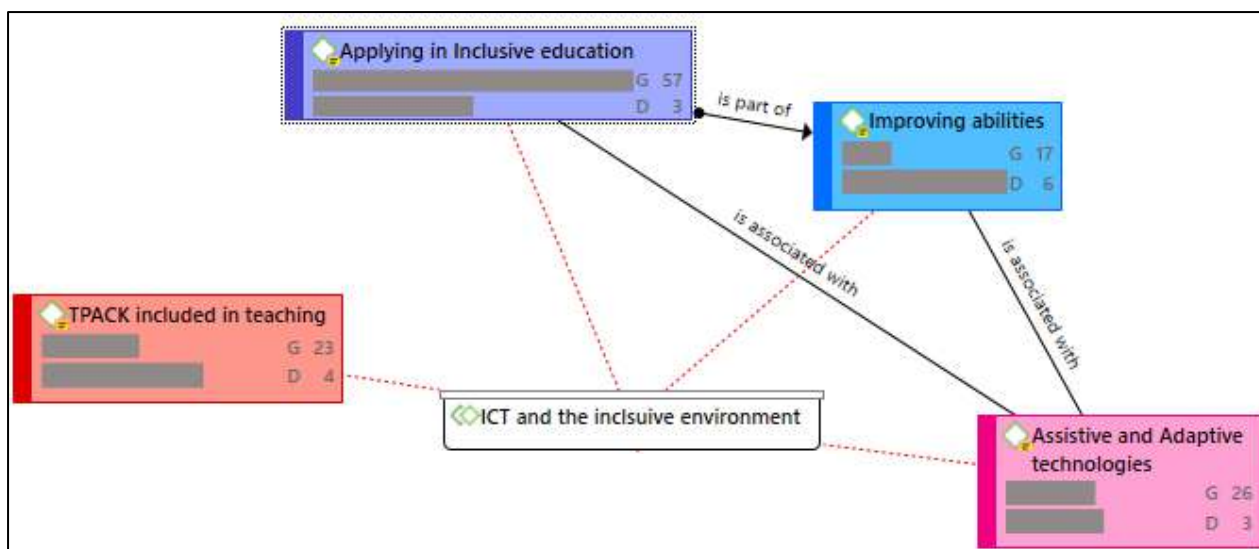
**Figure 16: Frequency of Assistive and Instructional codes**

The description as formulated by Figure 16 reveals that assistive and instructional technologies are associated with improving abilities and are a property of technological knowledge and inclusive education. “Year 1s and 2s are directed to a special lab that specifically deals with the development of fine motor skills” T55. This was the only contribution about instructional technologies. Another teacher mentioned that the school arranges for learners to go for eye testing so as to cater for their assistive physical needs. This uncovers the uses of assistive and instructional technologies that directly and indirectly improve the skills of learners who are MID. Although in previous studies it was noted that there are challenges for ICTs to address the inequalities of learners with IDs (UNESCO, 2013).

#### **4.6 IMPROVING SKILLS THROUGH ICT INTEGRATION IN AN INCLUSIVE EDUCATIONAL SETTING**

A fundamental aspect of this inquiry was how teachers perceive the role(s) that ICT plays in the inclusive educational environment. An analysis of the extent in which teachers perceives the ability for ICT to improve the intellectual and social abilities of learners who are MID was conducted.





**Figure 17: ICT improving skills of MID learners**

Figure 17, details the codes that were cross-referenced to ICT and the inclusive educational environment. The strongest association existed in terms of the co-occurrence between codes, applying in inclusive education and improving qualities, thus illustrating a strong contribution by the teachers as far as ICT is concerned in improving skills of learners who are MID.

An interesting contribution by a teacher in respect of how ICT can improve the abilities of learners was made through a reflection of the school's ICT centre. *"The ICT centre helps the little ones with perceptual skills and how to make meanings from sounds, it is beneficial to the kids and they really enjoy it"* T56. The data code here provided an interpretation that using ICT tools as assistive instead of instructive technologies is the perception embedded in this view. Furthermore, it explicitly uncovers the possibility of ICTs improving the cognitive abilities of learners who are MID. Evidence presented by *EduNet* prove the effectiveness of ICT to improve the levels of knowledge and skills of learners who are MID (UNESCO, 2013).

Another teacher conveyed that, when it comes to ICT and developing the abilities of learners, it only provides advantages. *"ICTs can help verbal skills"* T57. An analysis of these quotes revealed that although the ICT centre is used for the development of cognitive skills and processes needed for instance communication.



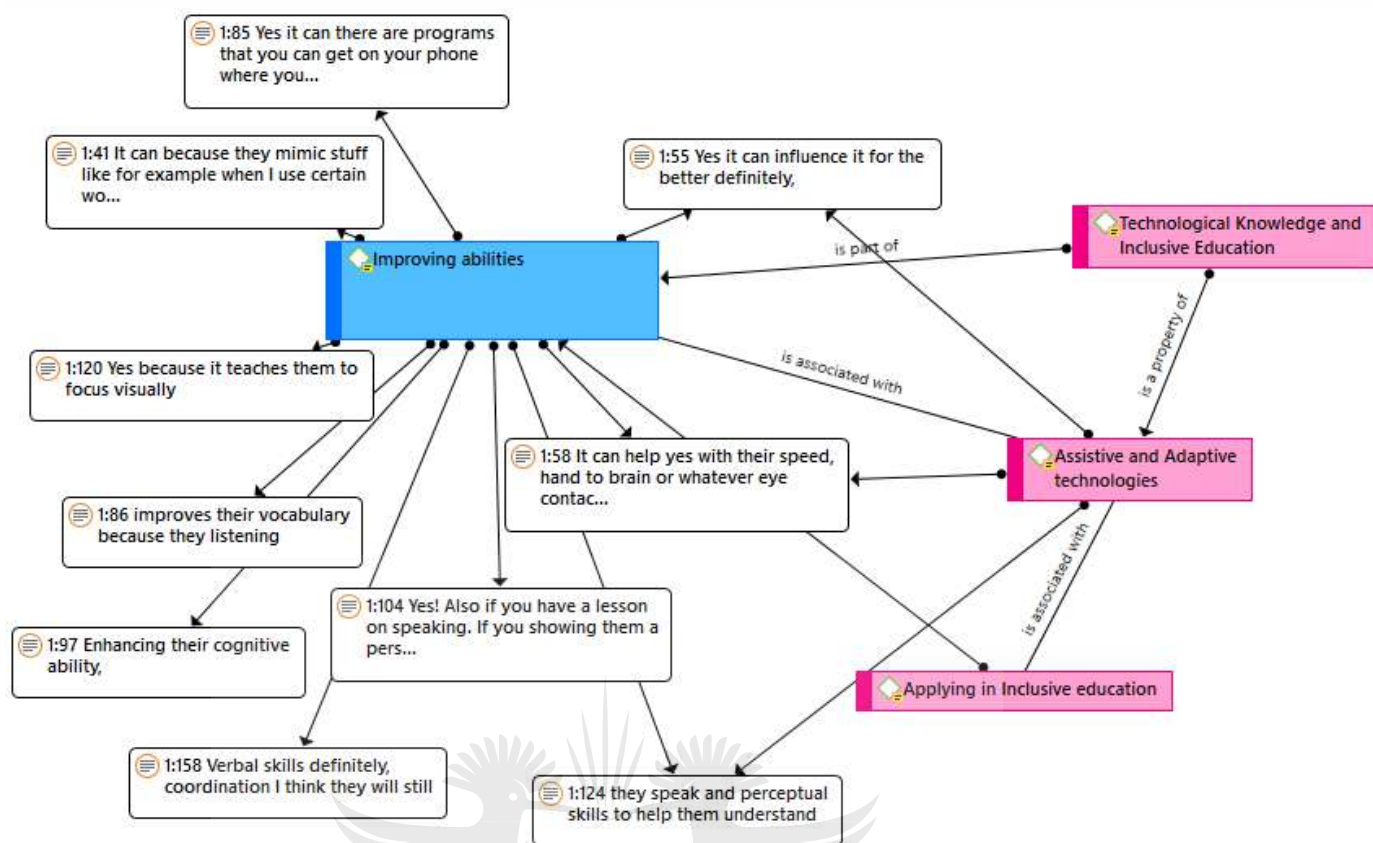


Figure 18: ICT as improving skills quotes

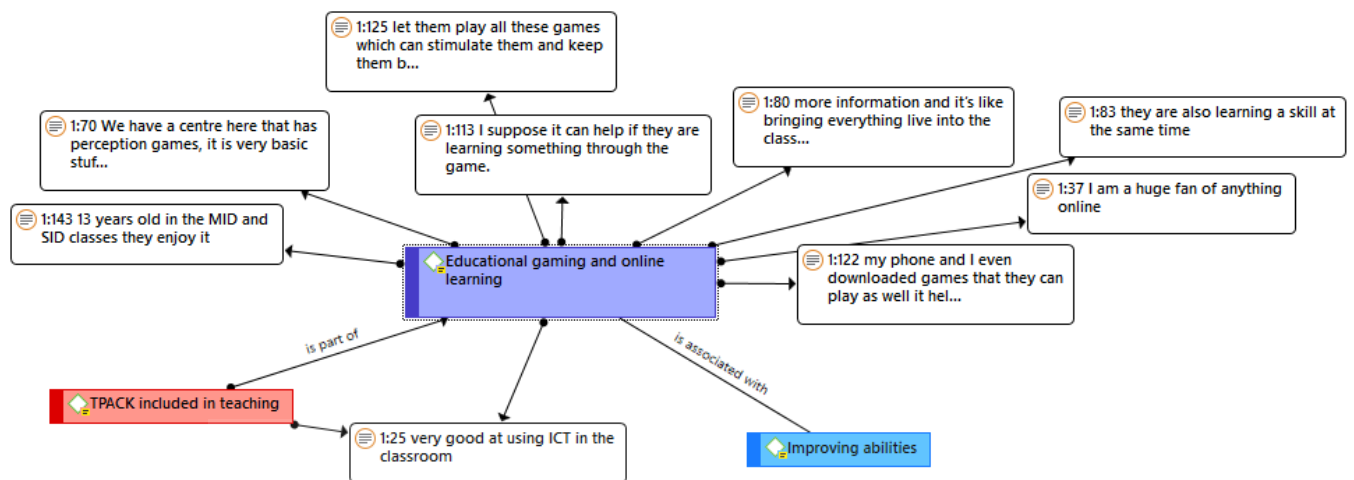
Considering the analysis provided by figure 18 of the quotes, one aspect of interest was, “*It teaches them to focus visually*” T58. This relates to demonstrations shown by means of a video. One teacher focused on how computers as a form of ICT can assist learners in developing speed of reading and co-ordination skills.

This, interpreted into another perception, reveals that the nature and functionality of ICT devices can inhibit the ability of learners who are MID to acquire skills relating to co-ordination and sequencing items on the computer. Not limited to the computer, a teacher expressed the view that in terms of mobile learning and the downloading of applications, learners who are MID can acquire the necessary cognitive and social abilities.

#### 4.6.1 Educational gaming and online learning for learners with MID

One aspect was uncovered during the analysis of data that did not keep with the research focus initially but, by virtue of the interview proceedings, was included was

educational gaming and online experiences. It was interesting to note the quotes that derived from this segment of data.



**Figure 19: Educational gaming and online learning**

Figure 19 encapsulates the responses received regarding educational gaming and online learning. It must be noted that it was the most controversial question in the interview, therefore analysing the data generated from the interview was a matter of interest. One teacher responded “*Some classes enjoy it*” T59. This provided an understanding that some teachers make use of online educational gaming for learning purposes. A teacher who initially associated educational gaming as having no educational value changed his perception. “*I suppose it can help if they are learning something online*” T60. This revealed that there is a place for educational gaming using ICT tools available online. As long it is used for educational purposes it will be welcomed by teachers in the inclusive educational setting. “*I download games on my phone and allow learners who are struggling with the content to play*” T61. Educational gaming is essential for teaching learners who are MID skills related to the real world (Stendal, 2012). This means that virtual reality plays a role in the development of skills acquisition in real life for learners who are MID. This proves an acknowledgement of the benefits associated with the use of technological devices for learners who are MID.

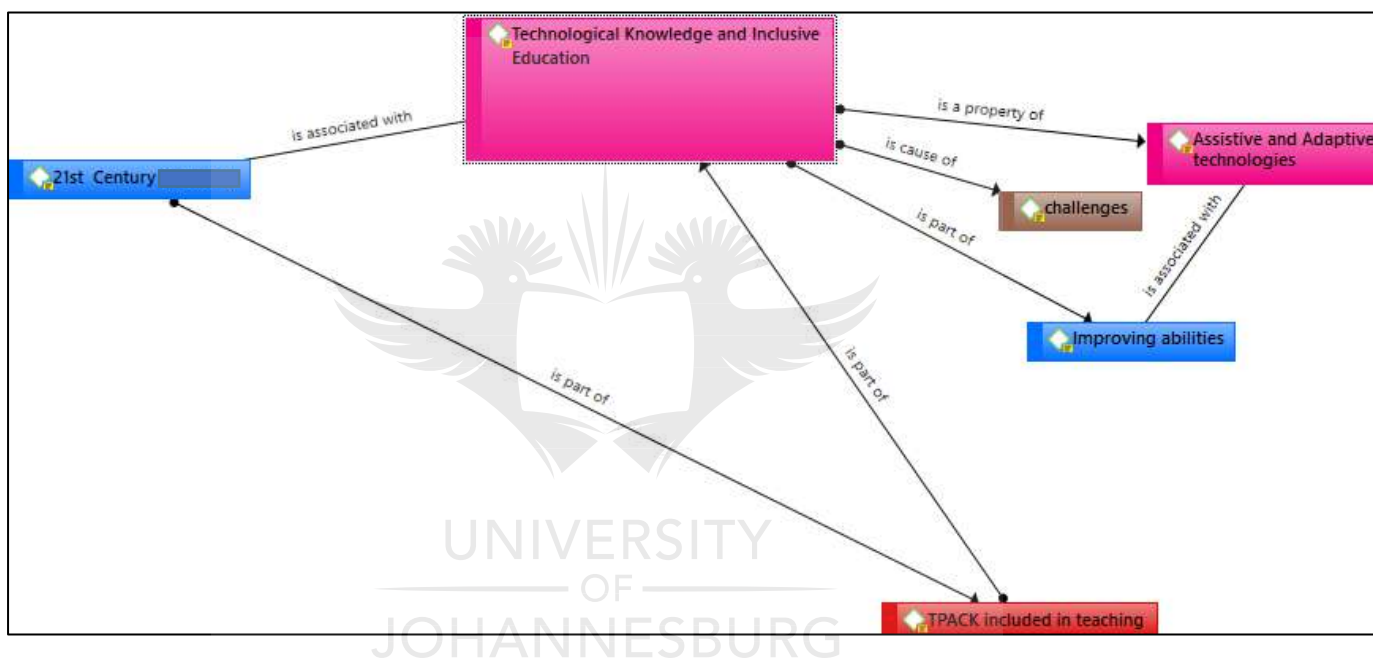
Teachers were asked whether they associate the online space with discussion groups on WhatsApp<sup>10</sup>. Most teachers responded by saying no, except for one who said, “*I*

<sup>10</sup> WhatsApp – a social media application that allows for messages, videos and pictures to be sent and received.

am a huge fan of anything online” T62. This revealed that very few teachers are interactive online. Online interaction is limited to the access of resources.

#### 4.7 21<sup>ST</sup> – CENTURY SKILLS CULTIVATED IN AN INCLUSIVE EDUCATIONAL SETTING THROUGH ICT

Throughout the data analysis, certain codes of data associated inclusive educational contexts with ICT and 21<sup>st</sup>-century skills. Therefore, the analysis conducted was followed by importing the neighbouring codes of technological knowledge and inclusive education as far as the networked codes were concerned.



**Figure 20: 21st-century skills cultivated in inclusive educational settings through ICT**

As indicated by the coded network in Figure 20 TPACK included in teaching was associated with 21<sup>st</sup>-century learning. One important analysis made was teachers referring to ICT-shaped learning experiences as a natural educational experience for the “*current generation*” T63. Multiple references were made to how the learners respond positively to technology as a consequence of them always being surrounded by technological devices. “*Learners need examples on how to better understand a concept, and technology allows that*” T64. This relates to the awareness of ICT literacy as a determining factor in 21<sup>st</sup> century learning.

One teacher quote uncovered the perception of ICT as assisting learners to gain deeper meanings and understandings of a particular concept. “*We as teachers can*

*use technology to develop higher order thinking skills” T65. This contribution reveals an interesting perception associated with this study, which is that, through the use of ICT in the inclusive educational environment, learners who are MID can have the opportunity to develop higher-order thinking skills. 21<sup>st</sup>-century learning is based on the creation of shared learning experiences, which allows the learners to make meaning of the content being explored in the classroom. A teacher expressed how the technological devices available to them can allow for such conditions. “The ability for the compu-projector to create meaningful authentic tasks, it is like real world tasks for our learners” T66. This reflected the perception that the compu-projector can create the means for lessons to be more realistic for learners who are MID. The creation of realistic lessons is in itself authentic learning. A study conducted by Stendal (2012) on virtual trips, learners who are ID to explore the world from the classroom and to make certain travel decisions virtually which could influence real world decisions. This means that ICT creates the conditions for learners with ID to make decisions based on the information accessible to them.*

Turning to the skills set, what follows is an analysis of a component that was uncovered in the observation notes. Most SEN schools have two streams, the academic and the skills set. The academic relates to subjects done in mainstream schools in their simplest form. On the other hand, the skills-subjects relate to trade-specific offerings by the school. *“New ways of learning how to complete a task in a trade” T67. This relates to the ways currently being explored by a particular trade in society. One teacher makes the point that skills needed in the 21<sup>st</sup> century need to be developed. “In the trade of building we see cement mixing is now machinery intensive” T68. He added that learners should learn how to operate these machines through visuals provided. An interpretation of this is that the teacher acknowledged the role ICTs play in not only academic subjects, but is extended to the trade subject which, by its nature, prepares learners who are MID to become active participants and include themselves into the workforce once they have completed the training. Learning though ICTs is to create opportunities for deep learning to take place and not for them to complete tasks (DBE,2004).*

#### 4.7.1 The Teachers' technological knowledge shortcomings

A component that related to the perception of teachers in special needs education regarding the use of ICT was identifying the shortcomings in terms of the teachers' technological knowledge. As associated with the TPACK theoretical framework, technological knowledge is included. Developing an understanding of the elements that hinder the development of technological knowledge and the application thereof into an inclusive educational environment was of interest for this study.

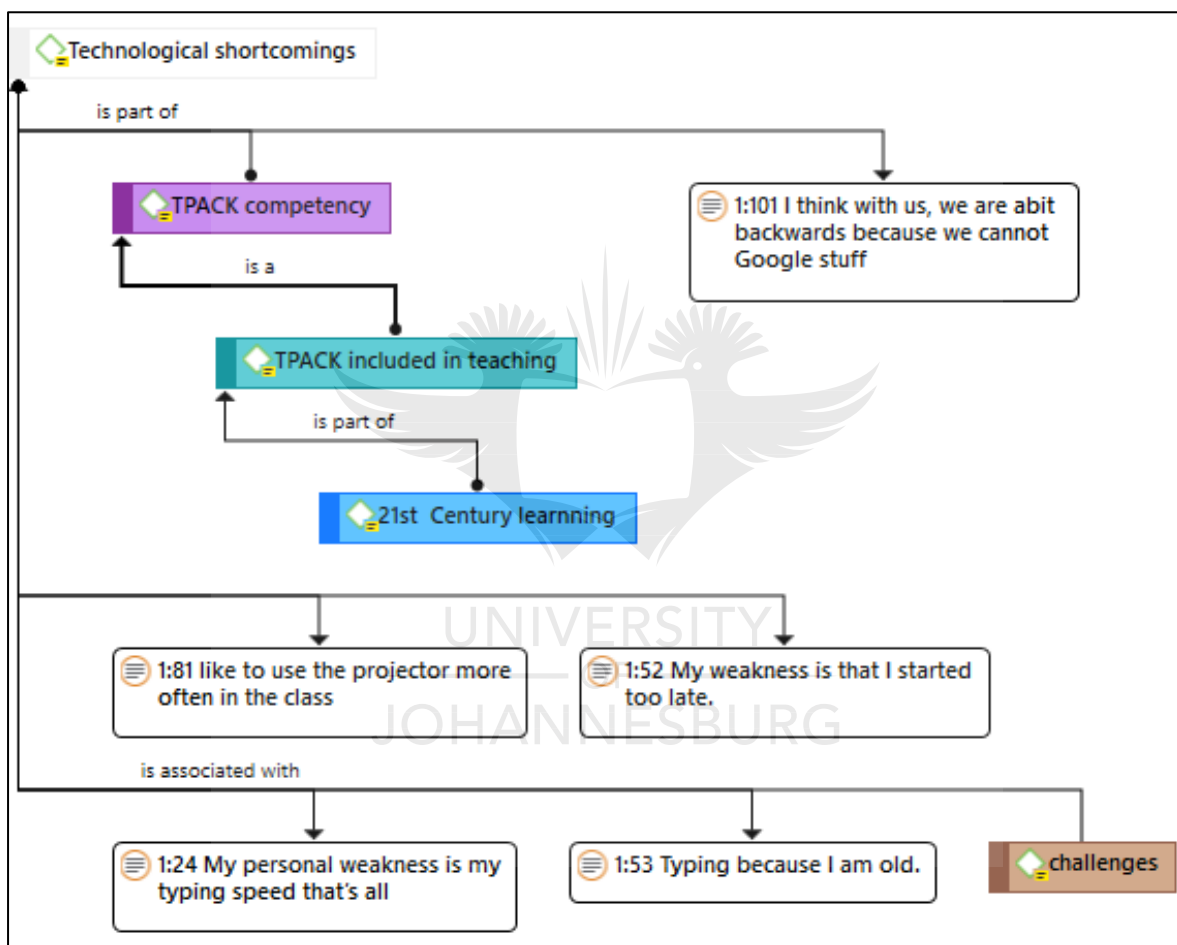


Figure 21: Technological Shortcomings of teachers

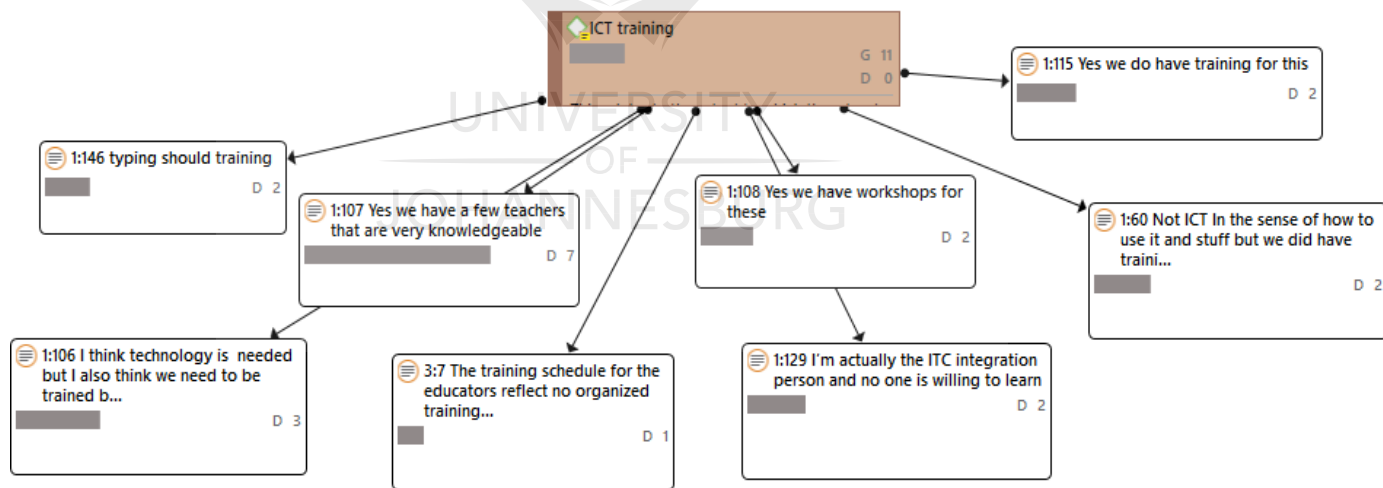
Teachers were very open about the challenges that they are experiencing in terms of developing their technological knowledge, as reflected in figure 21. Some teachers provided reasons why they do not apply ICTs into their lessons. *“My weakness is that I started too late”* T69. This reveals that keeping up with the changes in technology poses problems for some teachers.

As shown in this network group, the technological knowledge shortcomings code influences the TPACK competency code, and an analysis of this showed that technological knowledge shortcomings is part of TPACK competency. This linkage in the codes illustrates an element integral to the study. *“We cannot google stuff”* T70: This response resulted in the interpretation that many teachers are still struggling with basic concepts related to technology.

This reveals that the foundational aspects related to technological knowledge must be emphasised upon, thereafter the technological knowledge. This provided the research inquiry with an understanding of the realities influencing the TPACK framework. Many teachers associated their shortcomings in terms of technology with training.

#### 4.7.2 Teacher training

This aspect came as a consequence of the questions asked during the interviews which can be associated with technological knowledge. As such, capturing these data findings was found to influence the understanding of the technological knowledge sphere embedded in the TPACK framework.



**Figure 22: Technological Knowledge training**

Figure 22 outlines the teachers’ insights with reference to the ICT training codes. These quotes revealed, among other things, the willingness by teachers to attend workshops and training sessions aimed at not only improving their personal technological knowledge but also exposing learners to the possibilities of making use of ICTs in the classroom. -learning will require teachers to improve on their teaching



methods (DBE, 2004). Many teacher quotations reflected the need for “typing training” sessions to be conducted T71. This was interpreted as a personal weakness rather than a weakness relating to ICT integration in the classroom, to cater for the educational needs of MID learners. T.58. “*Technology is needed, but training is also needed*”. Teachers now become facilitators of learners (DBE, 2004). This uncovered, that teachers perceive the integration of ICTs as needed by the 21<sup>st</sup> century learner, however ensuring they are knowledgeable when it comes to these technologies is an area of concern.

#### **4.8 SUMMARY**

This chapter presented the findings related to the study. It revealed the positive resultants between elements such as technological knowledge and the inclusion of TPACK in the inclusive educational environment. Among other aspects the following findings were pertinent to the study. Teachers conveyed the perception that their teaching methods should change to accommodate learners who are MID. While most teachers reflected a good understanding of the role pedagogy plays in presenting the content in an appropriate manner. In terms of technological knowledge, it was revealed that most teachers are concerned with technology as a means of making content available rather than being involved in delivering that content. Furthermore, the findings uncovered that skill-set stream teachers are able to better integrate ICTs into the inclusive classroom as opposed to teachers who teach academic subjects. In relation to technological knowledge and the inclusive educational environment, the perception held by some teachers is that videos provide ICT learning experiences for learners who are MID. While teachers acknowledge the benefits of using ICTs in the classroom, as far as the theme of improving skills through ICT integration in an inclusive educational setting was concerned. The common perception reflected that ICT is limited to accessing resources by means of online websites by teachers. The cultivation 21st-century skills in an inclusive educational setting through ICTs uncovered the following aspect. The perception that ICTs continue to change the way teachers go about conveying content to learners who are MID. This showed that many teachers recognise the change that is brought about by technology. However, challenges in terms of the integration of ICTs in learning experiences of learners who are MID were exposed.



## **CHAPTER 5 SUMMARY, DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS**

**“There is no research without action, no action without research” Kurt Lewin**

### **5.1 INTRODUCTION**

The aim of this study, as conceptualised in chapter 1, was to explore the perceptions regarding the use of ICT from a teacher perspective in the inclusive education context. The study aimed to establish an understanding as to what they perceive ICT to be and what the integration thereof entails. The study was conceptualised by a review of the TPACK theoretical framework and MID by associating concepts of ICT integration into the inclusive educational environment, as discussed in chapter 2 of the study. Particular emphasis was placed on the technological knowledge component as contained in the TPACK framework. The findings, as presented in chapter 4, that derived from an analysis of the data reflected an agreement in terms of the literature consulted for theoretical underpinnings. The manner in which any education system can effectively train teachers is to provide knowledge and skills on selection and use of technology at the teacher’s disposal (Majoko & Phasha, 2018). As expressed by the results of the data analysis, presented sound findings associated with the TPACK theoretical framework and the inclusive educational environment. This chapter expresses the summary of the study.

### **5.2 SUMMARY OF THE RESEARCH METHODOLOGY**

The study was founded upon an interpretative research design paradigm. By means of the qualitative method to inquiry sought to uncover the research focus. Additionally, a descriptive single-case study was utilised in investigating the perceptions that teachers who teach in an inclusive school hold in relation to ICTs. The aspects of integrating ICT into the classroom where learners with MID are present was of particular interest for this study. The case study site was purposefully selected based on the specific criteria used for sampling, teachers who teach MID learners in a SEN school. Furthermore, the participants of the study comprised of grade 10 teachers. Grade 10 as being the highest level in terms of grading in a SEN school. The study

developed a single case study into the teacher perceptions relating to the integration of ICTs. Through semi-structured individual and group interviews, the perceptions regarding the interactions of content and pedagogical technological knowledge were captured.

### **5.3 KEY POINTS FROM THE LITERATURE REVIEWED**

The study was based on the conceptual framework as expanded upon by Mishra and Koehler (2009), namely, the technological, pedagogical and content knowledge that can be associated with teacher characteristics. For the study, the emphasis was on determining the views with regards to how technological knowledge, as contained in this framework, can be applied in the inclusive educational setting. Thus, the research was focused on the perspectives regarding ICT integration into a context or classroom that could influence learning for learners who are MID. Children with intellectual disabilities require learning experiences that are modified in response to their educational needs (Hodgson, 2018). Teachers who are currently teaching at a SEN school that accommodates for learners who are MID were included in this study. Capturing the meanings from literature attempted to form a connection between the integration of ICTs to learners who are MID. Teachers comprised of both those in the academic and skill-set offerings. The teachers reflected on the role ICT plays in their teaching context, as well as how technological knowledge allows for teachers to better apply ICTs for effective learning to take place. The study focused on the ways in which technological knowledge accounts for the effective integration of ICTs in the classroom where learners of special educational needs are present.

### **5.4 SUMMARY OF DATA ANALYSIS RELATING TO THE STUDY**

The data was analysed using *Atlas.ti* by means of open coding, to initiate a deductive thematic analysis of the findings. This data included the interview transcripts and the observation notes. The preliminary findings were then sub-grouped into code groups and analysed for co-occurrences and quotes that were overlapping. The code groups were then combined into respective networks and analysed. While the analysis of the data was conducted reference to the theoretical framework, TPACK was made in conjunction with the network groups. The TPACK framework was applied to the various other groups. The query tool provided the means to determine which quotes

were relevant for the study. The results established the understanding that teachers associated the TPACK model with many aspects relating to the delivery of content. These associations were regarded as positive findings in terms of the density to other codes included in the analysis.

One major finding that emanated from the study is the ICT integration in a SEN school, is merely showing videos to learners who are MID in the lesson. This, in turn, resulted in an important observation in terms of the technological level of teachers in the inclusive educational environment, which was that many utilised videos as a means to evoke thought and provide learners with a graphical representation of the content being explored in the classroom. It was also discovered that many teachers displayed a sense of understanding of the possibilities of designing and delivering meaningful lessons using ICTs and acknowledged that this can be brought about through continually increasing their technological knowledge.

## **5.5 SUMMARY OF KEY THEMES**

The study uncovered the following themes, after analysing the data generated. The notion of TPACK, pedagogical content knowledge, technological knowledge, technological content knowledge and technological pedagogical knowledge. The second theme established was the association of the TPACK framework and inclusive education, uncovering the extent to which technological knowledge informs teaching practices. Thereafter the theme relating to technological knowledge proficiency and the inclusive educational environment, with particular focus on divergent thinking and assistive and instructional technologies, was established. The fourth theme discovered was the improvement of skills in the inclusive educational environment through ICTs, with emphasis also placed on educational gaming. The fifth theme revealed was the cultivation of 21<sup>st</sup>-century skills through the interactions of the TPACK framework. Teacher training and knowledge in terms of the technological aspect were expanded upon.

## **5.6 INTERPRETATION AND DISCUSSION OF THE FINDINGS**

The interaction of technological knowledge as embedded in the TPACK model was of interest to the study. It was noted that the all teachers acknowledged that the role ICT plays in their context in terms of technological knowledge extends beyond merely

being a teacher who is computer literate. The ability to choose a technological tool best on its fitness to pedagogy and content is what TPACK embodies (Koehler & Mishra, 2006). Many teachers reflected on how the use of visual aids and videos in their lessons could result in the learners being gainfully engaged in relation to the content. An account of this was seen when a teacher revealed their perceptions regarding the benefits of including videos that would enhance learning for learners who are MID. In addition, the teachers disclosed an understanding of how the content that they have to deliver in the class and the technological decisions they make influence each other. This conveyed the perception that the content is to be modified in accordance with the technology selected. An interesting contribution made by one teacher was that she uses videos as a form of incentive. This means that if the learners are well behaved, they are allowed to watch videos not related to any concept, but for entertainment purposes. However, this perception seems to be vague in terms of ICT integration. "Teachers working in inclusive classrooms can make adjustments and take certain actions for increasing the success of students with special needs" (Yildiz 2015, p.178). It reflects the willingness of the teacher to include ICT as a form of positive reinforcement as it actively considers the creative and innovative aspects involved in the integration of ICTs.

Furthermore, this presented a unique contribution to an understanding of how the educational environment also plays a role in ICT integration. The technological knowledge, as conveyed by teachers, is the structuring of lessons using ICTs that ensures the learning goal is attained. As revealed by the teachers, that technology is constantly changing and they should adapt their learning environment so as to include or respond to these changes. One teacher added that when it comes to ICT. This revealed teachers' awareness that applying ICTs in the classroom requires a level of technological knowledge that can ensure that the appropriate technology usage is applied to concepts being explored. It is based on the interaction between pedagogy and technology that the TPACK framework may be strengthened (Mishra & Koehler, 2009).

In addition to this, the findings revealed that teachers attributed the increase in information processing by learners who are MID to the use of technology. Visual media is a way in which learners can be stimulated during lessons (Peng & Mohd Daud, 2016). This uncovered that, not only do the visual aspects related to ICT allow for

learners to be stimulated, but also accounts for them being able to process the information given by the teachers. MID learners are shown some practical examples in the form of videos. This reveals a sense of learners who are MID as finding meanings from visual representations of the content as provided by teachers. It also reveals the perception of teachers associating ICT with video, however this time a more meaningful association is made. Many learners who are MID focus on their learning barriers, and as a result, teachers encounter challenges in terms of interaction. This result in learners becoming reluctant to engage in learning experiences out of fear that they will not be able to understand due to their learning barrier. Through the use of ICTs motivation and engagement can be increased in the classroom (Paul & Rosa, 2016). This points out the perception that originates from the findings, that ICT makes learning fun and creates deeper learning to take place at the same time. This reflects that the view that ICT can not only gain the interest of learners who are MID but equip them with fun ways to learning through games. Moreover, it conceptualises the idea of ensuring that 21<sup>st</sup> century learning experiences are shared in SEN schools. One interesting aspect here is that many teachers aligned their perceptions of ICT as reaching out to the current generation through the use of technology. This was interesting to note as it revealed a sense of some teachers keeping abreast with the technological changes as influencing their environment.

In relation to the findings that originated in the data analysis phase of the study, teachers expressed their perception that technological knowledge can improve the cognitive abilities of learners who are MID. Teachers need to explore how new technologies can be exploited for learners who are MID (Koh, et al, 2015). The resultant codes for the association of TPACK included in the inclusive educational setting and improving abilities codes. As indicated by Mishra and Koehler (2009) technology can address some of the barriers that learners face. This was a perception held by many of the teachers who were interviewed. For them, concrete examples are an absolute must, to ensure that the learners remember and understand what has been shared in the class. To add onto this, the school has support systems in terms of the ICT labs that allow learners who are MID to develop tactile, co-ordination and fine motor skills. This, in essence acknowledges the role that ICT can play directly in ensuring that learners who are MID are given the opportunity to use programs and

software that aid their holistic development. This has been emphasised by the teachers as assistive technologies.

Furthermore, we found that many teachers in the special educational needs' schools are specialists in their fields, especially those offering trade subjects such as bricklaying. Upon conducting the interviews, it was discovered that besides the skill-set stream teachers and two other teachers, the other teachers were not specialists in the field of ICT. This discovery indicated that although some of those teachers have technological knowledge related to their profession, without being a specialist in inclusive education the technological efforts in class become problematic because the other aspects relating to the TPACK model are not present. This meant that some teachers still struggle with the pedagogical content knowledge, which raises the question of how their technological knowledge can be aligned.

Most quotes revealed under the codes that the teachers aligned technology and multiple ways of learning. "New approaches put the focus on learners and are intended to adapt to their needs and limitations" (Pareja-Lora, Rodríguez-Arancón, & Calle-Martínez, 2016, p.2). This relates to the inclusive educational environment as responding to the learning needs of learners who are MID. One teacher mentioned explicitly that their learners become frustrated and disinterested in the lesson if there is not more than one way of approaching the content. This shares the perception that the daily lessons taking place in SEN schools embed multiple intelligence as a fundamental component in ensuring learners who are MID receive a variety of ways of learning.

The common thread among the responses revealed that the teachers shared their perceptions regarding the use of ICTs in their teaching context as the way in which teachers responded to was the changes in technology as influencing learning. This furthered the idea that the teachers were aware of the complexity associated with responding to a generation whose daily lives are surrounded by the use of technology. It also highlighted that teachers perceived that learners who are MID can learn through the use of technologies because it is what they are good at. A statement made by one teacher was that her learners are knowledgeable about technological devices. However, when interpreting this statement, one would establish that there was a time when a technological device was used in class that required the assistance of learners.



Here acknowledging that they are good when it comes to the functionality of devices reveals that the teacher considers using it for learning purposes.

Throughout the data analysis, the findings related to the challenges which were naturally included by the teachers in the interviews revealed the following findings. The teachers who enjoyed using technologies expressed that the school is not connected online. Every school should have access to ICTs, (DBE, 2004). They revealed that they make use of their personal devices for learning as signing out the school's devices is a lengthy procedure. Internet connectivity issues hinders the integration of ICTs (Paul-Obillos & Rosa, 2016). This expands the idea that without the adequate infrastructure, efforts in terms of ICT integration in a school are very limited. ICT is still not accessible to all (Gutiérrez & Zaragoza, 2011). Infrastructure is a prerequisite of ICT integration (UNESCO, 2013).

The most distinguished finding was the teacher as exposing a critical reflection of their roles regarding ICT integration. This contributed to the study in a number of codes. The determining factor for ICT integration is the teacher (Peng & Mohd Daud, 2016). Teachers did not refer to anyone else as being responsible for ensuring that technology is included in their lesson other than themselves. I found this very interesting. Very often, teachers associate their role(s) in terms of ICT integration to that which must be done by the Department of Education. The aspect that stood out was teachers indicating that they would love to reach out to their learners by engaging more with ICTs. That for me was the highlight of this inquiry as it indicated an awareness being reflected by teachers that, although policies are devised by policy makers, they are responsible for the implementation thereof.

Furthermore, teachers conveyed that the learners that they teach continually seek news ways to grasp the particular content. "Technology play a vital role in creating an effective and adaptable learning environment for teaching individuals with special needs" (Isteni, 2010, p.102). This presented findings that ascribed the perception that adaptive technologies should be emphasised upon in inclusive educational environments.

Lastly, the findings related to the technological knowledge component of the TPACK framework when associated with the technological knowledge shortcomings of the teachers revealed a positive association. This meant that teachers were able to



identify the aspects that pose challenges to ICT integration. “Training teachers for the new roles and tasks in society should include the use of ICT in (Isteni, 2010, p. 28). The teachers shared their areas of weaknesses in terms ICT integration. In addition to this, they highlighted how they can be supported in terms of developing these areas. This revealed a sense of a decline in terms of teachers who are reluctant to apply ICTs into their classrooms, for the mere fact that they are willing to engage in professional development activities aimed at improving their technological knowledge as contained in the TPACK framework.

## **5.7 RECOMMENDATIONS**

For this study, some changes in the methodology and conceptual framework could have presented different findings. The aspect of including some quantitative aspects in the data would have resulted in a more expanded view of findings. The following are recommendations for practice and further study. For SEN schools: To provide the necessary assistive and instructional technologies needed to enable learners with MID to captivate the benefits associated with 21<sup>st</sup>-century learning and learning through the use of ICTs. A perspective that ought to be considered is that technology does not substitute teaching and that the learning experiences offered at an educational institution should not rest solely on merely including ICTs into the classroom. However, educational managers are responsible for ensuring that the meaningful use of ICTs in the inclusive educational environment is developed and maintained.

For teachers as the main stakeholders in an inclusive educational setting: The development of an understanding that LSEN can learn through the use of ICTs in the classroom, to task themselves with improving their technological knowledge and appropriately applying them to the classroom and learning experiences. The delivery of ICT is hampered by capacity related issues (DBE, 2004). An acknowledgment that the learning environment has changed owing to the advancement in technology. The use of assistive and instructional technologies in a manner that accommodates for learners with MID. As such, the use of technology to complement teaching methods and the content must be an integral part of a 21<sup>st</sup>-century teacher’s attributes.

Turning to district officials and the Basic Department of Education: More emphasis should be placed on the development of a new policy on e-education that incorporates

the inclusive learning environment. For SEN teachers to be exposed to training of the necessary ICT skills needed to ensure the integration of ICT into SEN schools. Policy improvement and the implementation of policies relating to ICT integration should also be developed in the context of SEN schools. Additional resources in SEN schools in respect of adaptive and assistive technologies should be provided. This should happen through joint efforts, as well as the investment into ICT infrastructure into inclusive educational settings, by both the government and the private sector. Equal distribution of ICT educational resources (DBE, 2004). This statement reveals that mainstream and inclusive educational institutions should experience the benefits associated with ICT integration. In relation to policies, a standardised ICT white paper on e-education for the inclusive environment should be considered.

## **5.8 LIMITATIONS AND STRENGTHS OF THE STUDY**

The limitations of this study came as consequence of the methodology applied when selecting participants. Purposeful sampling of the participants allows a researcher to collect data that is more focused (Henning, 2004). This means that instead of purposefully selecting participants, which I did, I could have included some random sampling candidates for the interviews. However, the other teachers provided the research study with a variety of perceptions relating to ICT integration. Another strength relating to the study was that the participants were very cooperative and gave in-depth data relating to their perception of ICT within their teaching environment. This allowed me to improve my knowledge as a researcher relating to qualitative data analysis. The limitations experienced were related to time; the teachers were approaching their final end of year examinations. Therefore, the sample size was influenced in terms of the availability of teachers. Triangulation as a means to generate data would have allowed for qualitative data along with quantitative data to be generated and compare in relation to the perceptions of ICT from teachers who teach MID learners.

## **5.9 AREAS FOR PRACTICE**

The school has an ICT lab and using this lab to advance the technological knowledge of teachers is the aspect that will enhance teaching and learning experiences through the use of ICTs. In addition to this, SEN schools should ensure that they can provide

learners who are MID with specialist teachers that will ensure that their needs are adequately identified and supported through using ICTs. From the findings of the study, it becomes apparent that many teachers in the special educational environment are not adequately exposed to instructional technologies and merely focus on the utilisation of assistive technologies. Based on the study, one important policy that could be developed and implemented is a White Paper on e-education within the inclusive educational environment. In addition to assistive technologies, it should respond to the needs of learners with MID through ICT integration as a result of instructional technologies. Online gaming in the inclusive educational environment could also be used as a way to integrate ICTs into the special educational environment. One example is, Bellavista, a leading school in innovation, has developed an application called (*Feed the Monster*), developed by its “Share” sector. This game entails the learning of words and spelling to improve literacy levels in all local languages. ([ftm@bellavistaschool.co.za](mailto:ftm@bellavistaschool.co.za))

#### **5.10 FURTHER RESEARCH**

ICT in teaching and learning in special needs education remains only partially understood by educationalists and policy makers, and inconsistently applied in schools (Peter and Sutherland, 2004). This points out that the realities of ICT cannot go unnoticed if effective ICT integration is to be achieved, not only in SEN schools but throughout the South African education system. Some aspects for further study follow. Firstly, how can ICTs result in deep learning approaches for learners who are severely intellectually disabled? This study was limited to learners who are mildly intellectually disabled. Secondly, how can ICTs influence the trade subjects offered in SEN schools. This is brought about through an understanding that the findings alluded to that videos are the only form of ICT that can be included in the trade lessons. As for other aspects relating of further study. The notion of pedagogical digital competence. “Digitalisation has increasingly introduced a new dimension in teachers’ pedagogical skills and competences, which we have chosen to call Pedagogical Digital Competence (PDC)” (From, 2017, p.43). A similar study can be conducted involving a variety of characteristics relating to the context and participants, such as other schools, parent involvement, a curriculum alignment, schools offering other languages, different

grades and phases, socio-economic standards and different severe intellectual disabilities.

### **5.11 CONCLUDING REMARKS**

Every learner seated in the classroom possesses a unique set of strengths and weaknesses. This implies that not all learners are on the same intellectual level, and as such, their ability to grasp the content and skills associated with learning is directly linked to their intellectual capabilities. With 21<sup>st</sup> century learning being shaped by the use of ICT-integrated learning experiences, teachers should utilise technology as a means of capitalising on the intellectual strengths of MID learners. In doing so, teachers need to ensure that they make certain accommodations and considerations in attempt to modify the content and pedagogy to best suit the use of technology. It is through careful planning and acknowledging the role of the TPACK framework, that can respond to the changes associated with the 21<sup>st</sup>-century classroom. This study has tremendously contributed to not only my understanding of the inclusive educational environment, which was very limited prior to this study, but it allowed me to gain new insights into the realities of ICT integration in SEN schools. Ultimately it informed my perception of how best ICT can be integrated into not only mainstream schools, but also the special educational environment. technologies. The study has shown the benefits associated with ICT integration in SEN schools. The study has made a valuable contribution in revealing that more strategies and steps to effectively integrate ICTs in SEN schools should be taken. This will ensure that MID learners are provided with an opportunity to explore 21<sup>st</sup>-century learning experiences, which ultimately strives for the ideals of education for all.

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## Appendices

### APPENDIX A - ETHICAL CLEARANCE CERTIFICATE



#### ETHICS CLEARANCE

Dear Brenton Jayswin Dass

**Ethical Clearance Number: Sem 2 2018-013**

**The role of Information and Communication Technology (ICT) in teaching and learning in an LSEN school.**

Ethical clearance for this study is granted subject to the following conditions:

- If there are major revisions to the research proposal based on recommendations from the Faculty Higher Degrees Committee, a new application for ethical clearance must be submitted.
- If the research question changes significantly so as to alter the nature of the study, it remains the duty of the student to submit a new application.
- It remains the student's responsibility to ensure that all ethical forms and documents related to the research are kept in a safe and secure facility and are available on demand.
- Please quote the reference number above in all future communications and documents.

**The Faculty of Education Research Ethics Committee has decided to**

- Grant ethical clearance for the proposed research.
- Provisionally grant ethical clearance for the proposed research
- Recommend revision and resubmission of the ethical clearance documents

Sincerely,

Dr David Robinson  
**Chair: FACULTY OF EDUCATION RESEARCH ETHICS COMMITTEE**  
30 October 2018



**APPENDIX B - DBE PERMISSION LETTER**



**GAUTENG PROVINCE**  
 Department of Education  
 REPUBLIC OF SOUTH AFRICA

8/4/1/2

**GDE RESEARCH APPROVAL LETTER**

Date:	18 September 2018
Validity of Research Approval:	05 February 2018 – 28 September 2018 2018/304
Name of Researcher:	Dass B.J
Address of Researcher:	517B/75 Mount Coana Street Ext 4 Lenasia South 1829
Telephone Number:	071 677 2638
Email address:	bjaydes@gmail.com
Research Topic:	The role of Information and Communication Technology (ICT) in teaching and learning in an LSEN school.
Type of qualification	B Ed Masters
Number and type of schools:	Two LSEN Schools
District/NO	Johannesburg Central

***Re: Approval in Respect of Request to Conduct Research***

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

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

*Handwritten signature and date: 18/09/2018*

Wangamphela SSS&S&Wangamphela

Office of the Director: Education Research and Knowledge Management  
 7th Floor, 12 Senekela Street Johannesburg, 2001  
 Tel: (011) 325 5488  
 Email: Pvdh.Tsholekwa@prokwd.gov.za  
 Website: www.education.gov.za

## APPENDIX C - PARTICIPANT CONSENT FORMS



### FACULTY OF EDUCATION

Dear Mr/Mrs/Ms

#### **Re: Request for your participation in the study on ICT.**

My name Brenton Jayswin Dass and I am a masters student at the faculty of Education at the University of Johannesburg. I am doing research on the perceptions of ICT usage of educators in an LSEN school.

Your participation in this research process is voluntary and you may choose to withdraw from this process at any time. If you choose not to participate or withdraw from the research process, there will be no penalty.

The collected data will be specifically used for this research only. Thus apart from me, only the lecturer and our research project moderator will have access to the data. They will treat this information with the strictest of confidentiality.

For the purposes of anonymity and confidentiality the names of both your school and yours will not be mentioned throughout the data and findings of the research. Pseudonyms (another name instead of your name) will be used in the writing of the final assignment.

Should you so require, please do not hesitate to contact me or my supervisor and lecturer, Prof Geoffrey Lautenbach – [jeanf@uj.ac.za](mailto:jeanf@uj.ac.za).

Thanking you in advance for your participation.

Yours sincerely

Brenton Dass (201125820)

I hereby confirm that I understand that Brenton Dass is conducting research solely for academic reasons. I hereby allow my participation in his research and agree to him using the findings for the purpose of completing his research project.

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Educator's Name

-----  
Date

-----  
Signature

**INFORMED CONSENT/ASSENT FORM**

*Project Title:*  
**Teachers' perceptions of Information Communication Technology in teaching learners with Intellectual Disabilities**

*Investigator:*  
**Brenton Jayswin Dass**

*Date:*  
**28 October 2019**

*Please mark the appropriate checkboxes. I hereby:*

- Agree to be involved in the above research project as a participant.
- Agree to be involved in the above research project as an observer to protect the rights of:
  - Children younger than 18 years of age;
  - Children younger than 18 years of age that might be vulnerable\*; and/or
  - Children younger than 18 years of age who are part of a child-headed family.
- Agree that my child, \_\_\_\_\_ may participate in the above research project.
- Agree that my staff may be involved in the above research project as participants.
- I have read the research information sheet pertaining to this research project (or had it explained to me) and I understand the nature of the research and my role in it. I have had the opportunity to ask questions about my involvement in this study. I understand that my personal details (and any identifying data) will be kept strictly confidential. I understand that I may withdraw my consent and participation in this study at any time with no penalty.

Signature: .....

*Please provide contact details below ONLY if you choose one of the following options:*

- Please allow me to review the report prior to publication. I supply my details below for this purpose:
- Please allow me to review the report after publication. I supply my details below for this purpose:
- I would like to retain a copy of this signed document as proof of the contractual agreement between myself and the researcher

Name: .....  
Phone or Cell number: .....  
e-mail address: .....

\* Vulnerable participants refer to individuals susceptible to exploitation or at risk of being exposed to harm (physical, mental, psychological, emotional and/or spiritual).



## APPENDIX D - COMPU- PROJECTOR



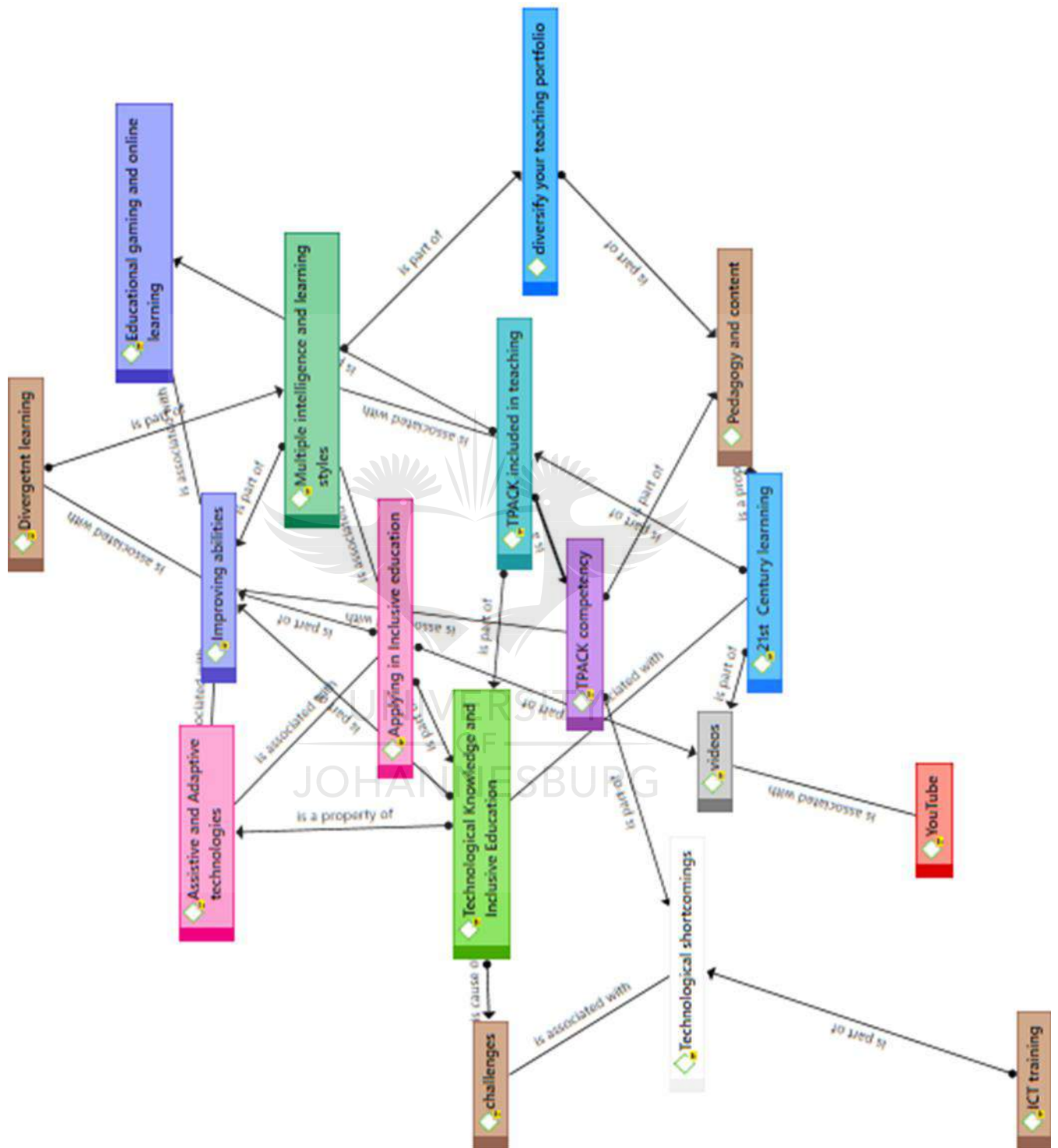
## APPENDIX E - COMPUTER CLASSROOM



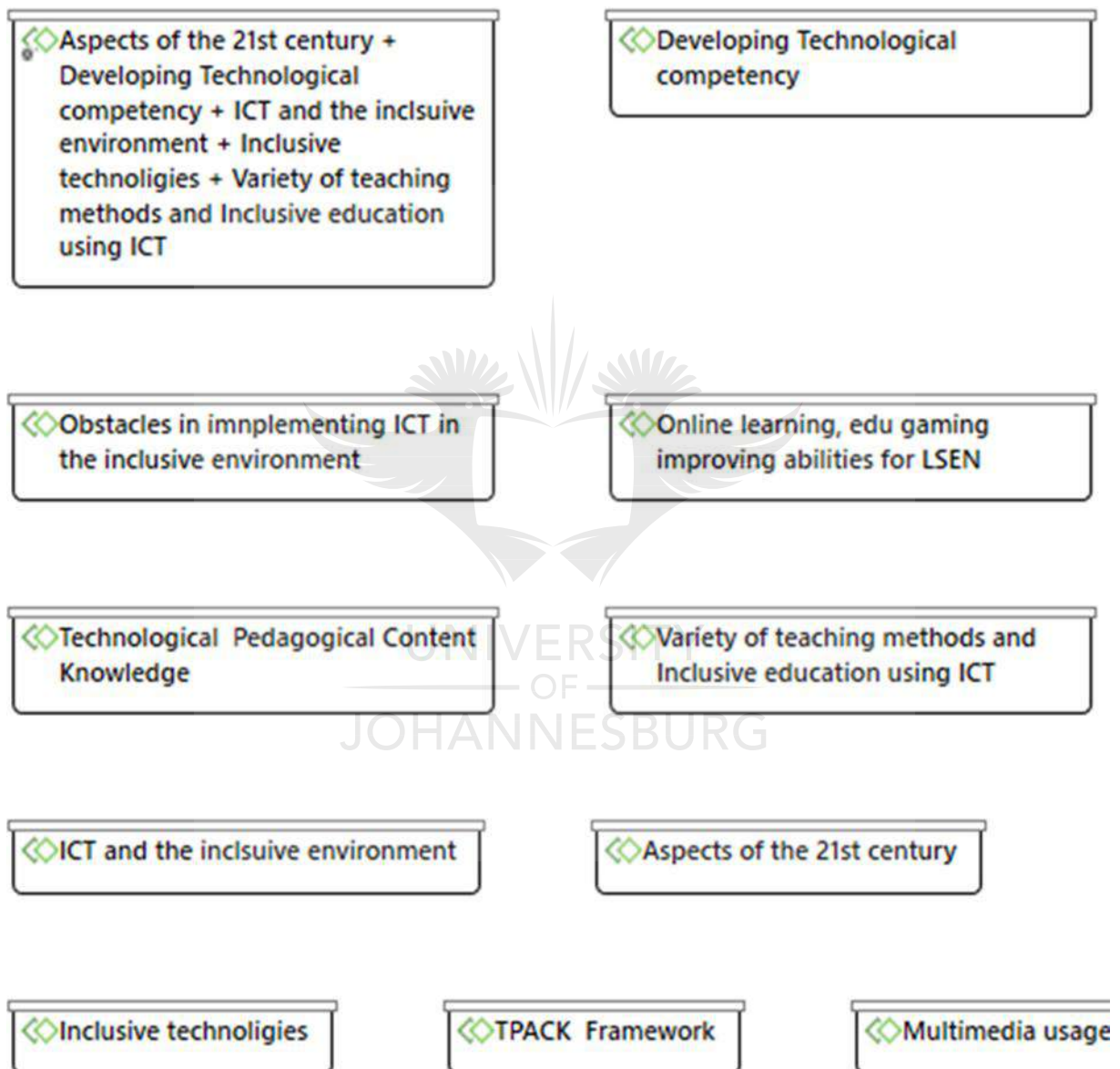
UNIVERSITY  
OF  
JOHANNESBURG



## APPENDIX F - CLOUD RELATED TO THE CODES GENERATED

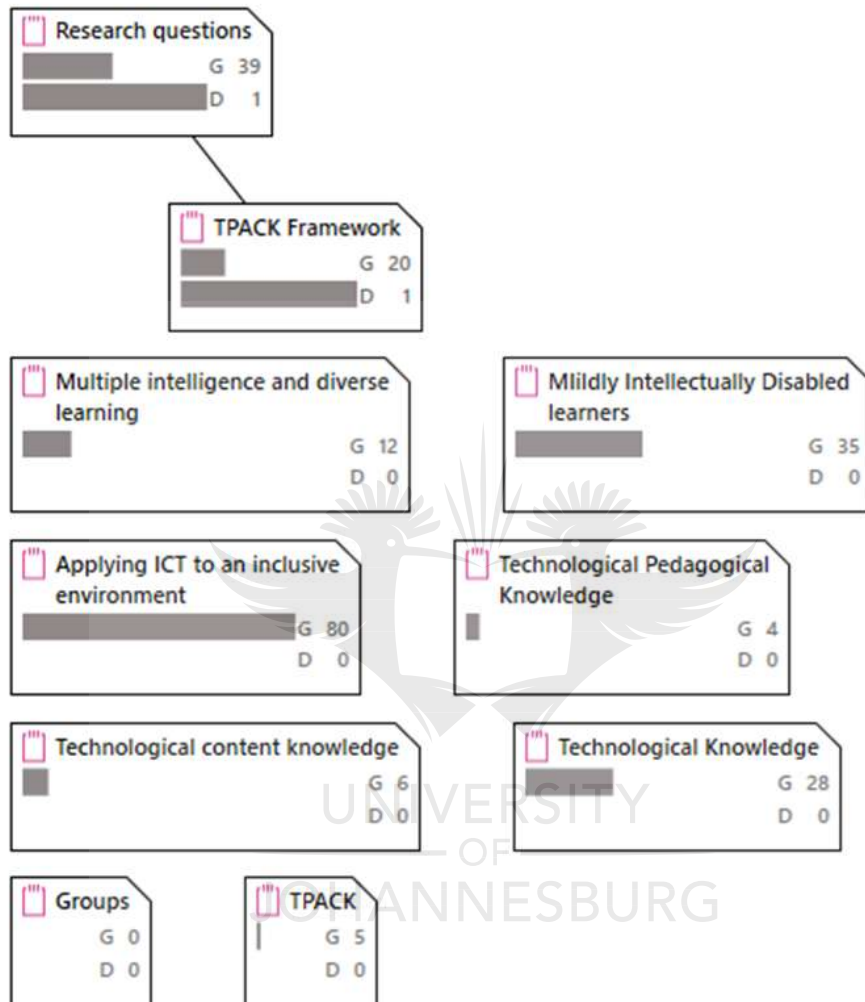


## APPENDIX G - CLOUD RELATED TO CODE GROUPS





## APPENDIX H - MEMO CLOUD



## APPENDIX I - CO- OCCURRENCE OF CODES IMPROVING SKILLS THROUGH ICTS

	Applying in Inc	Improving abili	TPACK includer	videos	
21st Century learning	18	3	9	1	
ICT training	2		1		
Pedagogy and content	2		1	1	
TPACK included in teac...	17			1	

## APPENDIX J - CO- OCCURRENCE DOCUMENTS AND MULTIMEDIA USAGE

	Multimedia u...	Totals
D 1: transcription of int...	15	15
D 2: focus group intervi...	2	2
Totals	17	17

## APPENDIX K - WORD CLOUD OF UNIQUE QUOTES

