An exploratory case study of an online mindset programme with grade four learners who experience learning disabilities in KwaZulu-Natal

by

PENNY LYNNE GOODRICK

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DECLARATION

I, Penny Lynne Goodrick (45713820) declare that this thesis *"An exploratory case study of an online mindset programme with grade four learners who experience learning disabilities in KwaZulu-Natal"* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

Penny Lynne Goodrick

11 August 2020

DEDICATION

This thesis is dedicated to my Dad, who always encouraged me to further my studies. I know he would be very proud of me.

ACKNOWLEDGEMENTS

ABSTRACT

The purpose of the current qualitative study sought to investigate how grade four learners with learning disabilities understand themselves as learners following Brainology instruction. The provision of various interventions to learners with LDs at the institution is founded on learner support that underpins the implementation of inclusive education in South Africa and globally. Based on the theories of intelligence framework, the sample group was purposively chosen and consisted of thirteen grade four learners who attend a special primary school in KwaZulu-Natal. Data sources included participant observation, focus group discussions and a reflective journal. Data analysis was thematic and was carried out concurrently with data collection. The study found that grade four learners with learning disabilities understood themselves as being intellectually, emotionally and practically equipped following Brainology instruction. Specifically, learners believed that intelligence can be developed, that they are in charge of their emotions and that they can apply practical strategies to strengthen their brain. The implications of these findings contributes to the understanding of how Grade four learners with learning disabilities see themselves as learners. Limitations of the Brainology programme within a South African context, such as limited resources and language options were noted. It was recommended that further research is needed to effectively address the role of mindset interventions and the teaching of non-cognitive factors in an inclusive primary school classroom context, particularly with learners who experience learning disabilities.

KEY TERMS:

Educational psychology, inclusive education, learning difficulties, theories of intelligence framework, growth mindset, fixed mindset, Brainology, mindset interventions, non-cognitive factors

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CHAPTER ONE

THE PROBLEM AND ITS CONTEXT

1.0 INTRODUCTION

This mini-dissertation sought to explore how grade four learners with learning disabilities (LDs) at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction in preparation for their placement in regular classrooms for inclusive education. It serves as a context for proposing strategies to enhance these learners' understanding of themselves as learners following Brainology instruction. This chapter presents the problem and its context. Aspects covered include background to the study, problem statement, aims and objectives, main and sub-research questions, the rationale of the study, an overview of the theoretical framework, overview of research methodology and design, ethical considerations, significance of the study and limitations and overcoming limitations of the study. The chapter will conclude with an outline of chapters and a summary of the chapter.

1.1 BACKGROUND TO THE STUDY

Inclusive education is a developing movement with a complex history (Hornby & Witte, 2010). It has evolved through several stages. These stages include the special education era, the era of integration, the era of normalisation and finally, the era of inclusion (Miles, Susie & Singal, 2010). During the special education era, learners who experienced barriers to learning (LWEBL) were excluded from mainstream society and placed in special schools and special classes in regular school classrooms (Engelbrecht, Nel, Smit, Van Deventer, 2013). Within these spaces learners were further segregated based on their disabilities inclusive of deafness, blindness and physical and motor disabilities and received specialised services from professionals including specialist teachers, occupational therapists and educational psychologists (Waitoller & Artiles, 2013). The placement of LWEBL in special schools was a violation of their right to inclusion in

education and society. The era of special education was succeeded by the era of integration. During this time, LWEBL remained within regular schools (Thomazet, 2009). The era of normalisation required LWEBL to be placed in regular schools to establish and maintain a culturally normative environment for both these learners and their typically developing peers (Foreman, 2011). Finally, inclusion was internationally adopted in 1994 following its reaffirmation by the Salamanca Statement and Framework for Action on Special Needs Education, which endorsed inclusive education as a guiding principle in the development of education globally (Walton & Nel, 2012). Despite the worldwide pursuit of inclusive education, there is no universally accepted definition of it (Pantic & Florian, 2015) because of conceptual difficulties in doing so including what counts as evidence of its practice (Majoko, 2019). Nevertheless, inclusive education is internationally generally perceived as accommodation of all learners in regular school classes, within their neighbourhood communities, regardless of their individual physical, intellectual, LDs, linguistic, social or emotional differences (Engelbrecht et al. 2013).

Several countries have passed policies, legislation and guidelines that mandate the right of all LWEBL, including those with LDs to have access to inclusive education, for instance, the Education for all Handicapped Children Act (1975), the Individuals with Disabilities Education Act (1990) and the No Child Left Behind Act (2001) in the United States of America (USA) (Hornby, 2015); and the Warnock Report (1978), the Education Act (1993) and Special Educational Needs and Disability Act (2001) in the United Kingdom (UK) (Ainscow, 2016). Similarly, Namibia passed a Sector Policy on Inclusive Education (2013) (Amukugo, 2017), while Uganda passed the Universal Primary Education (UPE) and Universal Secondary Education (USE) policies (Abimanyi-Ochom & Mannan, 2014).

The attainment of democracy in 1994 in South Africa coincided with the Salamanca Statement Framework for Action on Special Needs Education (UNESCO, 1994). The movement away from racially divisive and separatist policies of apartheid to inclusive policies and practices included a shift towards inclusive education. The move towards inclusive education aligned with the policies and acts implemented by the aforementioned countries and others (Walton, 2015).

South Africa's post-apartheid Constitution formalises the process of desegregation of schools across the country by mandating the non-discrimination of learners on any variable influencing human diversity. These include disability, race and language and comply with international legislation, policies and guidelines.

Key documents underpinning inclusive education include the South African Schools Act No. 37 of 1997, the White Paper on Education and Training of 1995, the White Paper on an Integrated National Disability Strategy of 1997 and the National Committee on Education Support Services (NCESS) of 1998. Key policies that mandate inclusive education in South Africa include the Education White Paper 6: Special Needs Education, Building an Inclusive Education and Training System (DoE, 2001), the National Strategy on Screening, Identification, Assessment and Support (SIAS, 2014) and the Curriculum and Assessment Policy Statement (RSA, 2012). Guidelines underpinning the implementation of inclusive education include Guidelines to Ensure Quality Education and Support in Special Schools and Special School as Resource Centres (Department of Education, 2007), Guidelines for full service/inclusive schools (DoE, 2010), Guidelines for Inclusive Teaching and Learning (DoE, 2010) and Guidelines for Responding to Learner Diversity in the Classroom through Curriculum and Assessment Policy Statements (DoE, 2011)

Propelling the impetus for inclusive education in South Africa and other countries are its benefits (Hornby, 2015). Inclusive education provides learners who experience barriers to learning the opportunity to a flexible, engaging curriculum alongside their typically developing peers (Srivastava, De Boer & Pijl, 2013), where they develop a sense of belonging and feel included in a "normal" class (Walton & Nel, 2012). The stigmatisation surrounding their barriers to learning decreases and their peers without developmental challenges develop acceptance and tolerance for them (De Boer, Pijl & Minnaert, 2010). Inclusive education provides learners who experience barriers to learning the opportunity to learn appropriate classroom and social behaviour (Engelbrecht et al. 2015). Other benefits of inclusive education include enhanced parental involvement (Srivastava et al. 2013), better partnerships between regular schools and special schools (Norwich, 2013) and communities based on collaboration among learners, parents and educators (Hornby,2015).

Despite the benefits of inclusive education, there are several challenges to its implementation (Florian 2010). These include inadequate training of teachers (Engelbrecht et al. 2015) to meet the diverse needs of all learners in regular classes (Donohue & Bornman, 2014). Teachers who trained before the introduction of inclusive education in 1994 lack knowledge and experience relating to LWEBL (Walton, Nel, Hugo & Muller, 2009). These teachers tend to revert to their original deficit-oriented teaching practices (Basson, 2011) and thus resist the new, progressive ideologies of inclusive Education (Walton & Nel, 2012). LWEBL are less likely to be accepted by and have fewer friendships compared to their typically developing peers (De Boer et al. 2010). A lack of funding and resources, as well as ambiguous policies that do not translate into practice, interfere with the effective implementation of inclusive education (Donohue & Bornman, 2014). Despite the intention of inclusive education to ensure equal, accessible and quality learning opportunities for all learners, many learners do not receive the support they require in regular classes (Ladbrook, 2009). McLeskey & Waldron (2011) reveal that inclusive classes are not able to offer differentiated, individualised instruction, which is integral in the academic progress of LWEBL.

There are various barriers to learning, including learning disabilities (Donohue & Bornman, 2014). LDs are a range of difficulties in receiving, processing, expressing or retrieving information, which affects an individual's ability to function effectively in learning areas such as language and mathematics (DoE, 2002). Common manifestations of LDs include disorders of attention, reading difficulties, auditory processing difficulties, gross and fine motor difficulties, oral and written language difficulties and social skills deficits (Cortiella, 2014). There are a variety of language intervention programmes for reading, spelling and written expression (Vaughn, Wanzek, Murry & Roberts, 2012) as well as mathematics intervention programmes (Hott, Isbell & Montani, 2014). There are also intervention programmes used to support learners with auditory processing difficulties (Chacko, Bedard & Marks, 2013), poor motor skills (Smits-Engelsman, Blank & van der Kaay, 2013) and social-emotional difficulties (Hanover Research, 2013). There are further intervention programmes that focus on cognitive neuroscience, which emphasises on the brain and how learning occurs (Orosz, Peter-Szarka & Bothe, 2017). These include Brainology, which is the focus of this study.

The Brainology programme was developed by Professor Carol Dweck at Stanford University in 2011 and stemmed from her research on mindset. Dweck (2012) understands 'mindset' as individuals' beliefs about their intelligence. Individuals can have growth or fixed mindsets (Dweck, 2012). A growth mindset entails the belief that intelligence is malleable while a fixed mindset entails the belief that intelligence is static. The acquisition of a growth mindset leads to increased academic achievement of individuals (Dweck, 2012; Blackwell et al. 2007). Thus, many researchers have implemented growth mindset interventions, encouraging learners to adopt a growth mindset (Paunesku & Dweck, 2011; Donohoe, Topping & Hannah, 2012). To provide a broader platform to reach more learners, the Brainology programme was developed as an online intervention programme to develop growth-mindset oriented thinking in learners.

Brainology is a fun, interactive programme that encourages learners to adopt a growth mindset (Donohoe et al. 2012). Animated characters, Chris, Dahlia, and Dr Cerebrus assist learners in understanding about how the brain functions (Mindset Works, 2011). Brainology recognizes the challenges that many learners experience in school, especially in relation to attention, emotion, and memory (Orosz et al. 2017). To assist learners in overcoming these challenges, learners are taught that through effort, perseverance and practice, their brains would grow stronger, and ultimately they will improve in learning areas they struggle with (Blackwell et al., 2007). Brainology also teaches learners about emotional-regulation techniques, healthy habits, study strategies, and other valuable non-cognitive skills that help them to become successful (Mindset Works, 2011). The programme does this through interactive activities that teach learners how the brain works, how it grows stronger with learning through effort, hard work and practice, and how learners can use this information to help them improve their own learning strategies (Blackwell et al., 2007; Mindset Works, 2011). Figure 1 on the following page depicts a screenshot of the Brainology characters.

FIGURE 1: SCREENSHOT OF THE BRAINOLOGY CHARACTERS

Rattan, Savani, Chugh and Dweck (2015) found that mindset interventions are effective when carefully prepared and implemented and that such interventions can reduce learning gaps, particularly among low-achieving learners, including learners with LDs. However, mindset interventions using Brainology intervention studies are limited and yield inconsistent results. Both Donohue et al. (2012) and Rattan et al. (2015) suggested that further research on the longer-term impact of Brainology is needed as most of the studies have focused on the short term effects. Paunesku, Goldman & Dweck's (2011) quantitative study of the Brainology intervention with a group of grade 8 learners in Scotland found that the learners who received Brainology instruction achieved higher reading scores in comparison to the learners who did not partake in the intervention. Similarly, Saunders's (2013) study in the United States of America (USA) established that Brainology improved the attitudes of at-risk Grade 6 learners towards reading. In addition, Romero, Paunesku, Dweck and Gross's (2014) quantitative study revealed that a sample of grade 7 learners in the USA achieved better results in their final mathematics grades after participating in the Brainology programme. Inversely, Donohue et al. (2012) study found that Brainology had no long-term effect on mindset or academic performance of high school learners. Similarly, Willkins' (2014) quantitative study found that

Brainology had no significant impact on the grade 7 learners' mindsets, but a positive increase in science engagement and motivation was noted. Based on the literature search, the researcher knows of no studies that have been conducted on Brainology instruction in South Africa. Thus, this study sought to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction. The study aims to serve as a context for proposing strategies to enhance these learners' understanding of themselves as learners following Brainology instruction

1.2 STATEMENT OF THE PROBLEM

Learners fare better in their education if they believe that their intellectual abilities can be developed particularly if they have a growth mindset (Johnston, 2012, Duckworth & Seligman, 2005). Learners need to adopt a growth mindset for improved learning outcomes (Yeager & Walton, 2011, Dweck, 2014, Morehead, 2012). Targeted interventions in classrooms can encourage learners to adopt a growth mindset (Dweck, Walton, & Cohen, 2014). Nevertheless, the mindset theory and mindset interventions have received minimal attention in South African education policies, practices and studies. Instead, emphasis has been placed on conventional, more tangible factors like school resources, teacher's qualifications and assessment standards (Yu, Frempong & Winnaar, 2015).

Without intervention, learners' mindsets are likely to remain static over time (Robin & Pals, 2002). Learners' mindset can be transformed through intentional instruction based on the theories of intelligence framework, resulting in increased motivation, greater self-efficacy and improved grades (Aronson et al. 2002; Blackwell et al. 2007; Good et al. 2003). Since a growth mindset can have a positive impact on how learners understand themselves as learners, educators must include this kind of support in collaboration with the teaching content knowledge and academic skills. This current study aims to increase the knowledge of how Brainology instruction supports learners with LDs and specifically how they better understand themselves following Brainology instruction. The following section presents the main research question and its sub research questions.

1.3 RESEARCH AIM AND OBJECTIVES

1.3.1 AIM

This study sought to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction. The study serves as a context for proposing strategies to enhance these learners' understanding of themselves as learners following Brainology instruction.

1.3.2 OBJECTIVES

This study sought to:

- Explore the perceptions of grade four learners with learning disabilities following Brainology instruction at a specific primary school in KwaZulu-Natal

- Describe the perceptions of grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal of their emotions and learning following Brainology instruction

- Explore the perceptions of grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal of their practical strategies to enhance learning following Brainology instruction

1.4 MAIN RESEARCH QUESTION

How do grade four learners with learning disabilities at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction?

1.4.1 SUB RESEARCH QUESTIONS

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu-Natal perceive their intelligence following Brainology instruction?

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their emotions and learning following Brainology instruction?

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their practical strategies to enhance learning following Brainology instruction?

1.5 RATIONALE FOR THE STUDY

Various personal, policy and scholarship factors prompted the execution of this study. The use of Brainology instruction to support learners with LDs at a primary school for nine years triggered my interest in studying about it. My classroom observations revealed that learners with LDs seem to have negative perceptions of their academic abilities and fixed ideas on what they can and cannot do. When the Brainology programme was introduced as a form of support for the learners with LDs at the school where I work, it prompted my study on this form of support that specifically targets the mindsets of these learners. To the best of my knowledge, based on a literature search, there is currently no research in South Africa on the implementation of the Brainology programme. Much of the Brainology research has been conducted within the USA and has focused on teenagers or adolescents both with and without LDs (Fraser, 2018). This study is among the few that explored the influence of Brainology instruction on learners using a qualitative research approach. There has been no implementation of the Brainology programme in any other school in South Africa. To address this research gap, this qualitative case study sought to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction.

1.6 AN OVERVIEW OF THE THEORETICAL FRAMEWORK

The current study is framed by Dweck's theories of intelligence framework. The theories of intelligence originally stemmed from Dweck's early research into how children respond to failure (see Diener & Dweck, 1980). It holds that learners respond to failure in a helpless or a mastery-orientated way. Learners with a helpless orientation view their failure as unchangeable, whereas those with mastery orientation show persistence in mastering the task. Theories of intelligence posit that individuals develop theories and implicit beliefs about themselves (Martin, 2015). Individuals hold two different theories or mindsets about their intelligence. Individuals with an "entity" theory/fixed mindset view intelligence as being unchangeable and a fixed, static characteristic, whereas individuals with an "incremental" theory/growth mindset believe that their intelligence is malleable, dynamic and can increase through hard work, perseverance and effort (Dweck, 2012). These two contrasting mindsets influence what learners attribute their academic failures to, the types of goals they set, their reactions to challenges, and their academic achievement (Blackwell et al. 2007).

Embedded in Dweck's theories of intelligence framework, this study will explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction.

TABLE 1: MINDSET CHARACTERISTICS

Fixed Mindset Characteristics (Entity Theory)	Growth Mindset Characteristics (Incremental Theory)
Views intelligence as fixed/unchangeable	Views intelligence as dynamic, malleable, something that can develop
Believes effort is fruitless	Believes effort leads to mastery
Sets performance Goals	Sets learning goals
Avoids challenges	Embraces and persists through challenges

Adapted from Dweck (2012)

1.7 AN OVERVIEW OF RESEARCH METHODOLOGY AND DESIGN

Research methodology refers to the researcher's approach in conducting a study (Leedy & Ormrod, 2014). Research methodology can therefore be viewed as an overview of the methods used to identify, select, collect and analyse information related to the research topic.

A research paradigm is the philosophical worldview of a researcher (Mertens, 2014). A research paradigm can therefore be seen as a way of understanding the world through a specific research perspective. This study used an interprevist paradigm to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction. The epistemological assumption of interpretivism is that knowledge is built through developing ideas from observed and interpreted social constructions (Rubin & Babbie, 2016). In the current study, I engaged with developing data by observing and interpreting the learner's responses to gain an in-depth understanding of how the learners understood themselves as learners following Brainology instruction. The ontological assumption of the interprevist paradigm is that there are multiple realities which are shaped and nuanced by participant views, as well as values and aims of the researcher (Creswell, 2012). Thus, upon entering the current study, my conscious and unconscious questions, assumptions, and beliefs made up my ontological position.

1.7.1 RESEARCH APPROACH

The current study used a qualitative research approach. The qualitative research approach aims to discover the values and meanings that individuals attach to events they experience (Creswell, 2014). This study sought to discover how learners with LDs understand themselves following Brainology instruction. The current study adopted a qualitative approach. The various characteristics of a qualitative approach are discussed in Chapter Four.

1.7.2 RESEARCH DESIGN

The research design is a plan or blueprint for carrying out the research (Babbie & Mouton, 2008). A research design can therefore be seen as a description of the methods used to conduct a study. This study employed a single case study research design to explore grade four learners with LDs understanding of themselves following Brainology instruction at a primary school. Single case studies are based on extensive data collection from multiple sources (McMillan & Schumacher, 2010). The data collection instruments used in this study included participant observation, focus group interviews and a reflective journal. These are covered in Chapter Four. Below is a table illustrating the data collection procedure.

TABLE 2: DATA COLLECTION PROCEDURE

DATA COLLECTION PROCEDURE	
METHOD	**WHEN**
Participant Observation	Ongoing throughout Brainology 03/10/16 – 18/11/16
Focus Group Interviews (6 in total)	Before and after each Brainology support session 03/10/16-18/11/16
Reflective Journal	Ongoing throughout Brainology 03/10/16 – 18/11/16

1.7.3 PROCEDURE

The implementation of the online Brainology programme took place over six weeks in the 4th term between the 3rd October 2016 and 18 November 2016. Thirteen grade four learners with LDs participated in the programme. There were six Brainology sessions in total, which included a pre and post-Brainology focus group interview. The pre-Brainology focus group interview took

place directly after the short introductory unit, whilst the post-Brainology focus group interview took place in Week 6. Each Brainology session lasted for approximately one hour. The learners completed a unit each week. It is recommended that the units be scheduled at least one week apart to allow time for learners to apply and integrate what they learn in each unit (Mindset Works, 2011). The learners completed the programme as a group with the use of a projector screen in their classroom. Data was collected during and after each session. Data collection and analysis took place concurrently. The implementation of the Brainology programme was based on ideas and principles gleaned from several studies including Romero et al., (2010), Donohoe et al., (2012) and Saunders (2013). Table 3 below presents a brief overview of the Brainology programme.

TABLE 3: OVERVIEW OF BRAINOLOGY PROGRAMME

WEEK 1: Introductory Unit
Learners begin with an introduction to Brainology. The unit introduces the learners to Dhalia and Chris, who will guide them through the programme. They take learners on a tour of the virtual brain lab where they meet Dr Cerebrus, the neuroscientist. Learners discuss their challenges and answer questions relating to their beliefs about their intelligence. This activity is done to encourage learners to start reflecting on their own understanding of themselves as learners.

WEEK 2: Unit 1 – Brain Basics
Main Focus: Basic Brain anatomy
Highlighted study strategy: How to improve concentration
Dhalia and Chris set out to understand the basic structure and functions of the brain. The challenge of concentration is highlighted as a personal challenge. Learners learn how the brain focuses attention, the role that attention plays in learning, and how they can maximise their ability to focus through study strategies.

WEEK 3: Unit 2 -Brain Behaviour
Main Focus: Emotional Regulation
Highlighted study strategy: How to regulate emotions, particularly anxiety and anger
The second unit focuses on the structure and function of the brain. The learners are taught about the different physical parts of the brain. They also learn how the brain functions and are exposed to new words like "neurons" and "synapses." Learners are taught how emotions influence the brain and how to implement strategies to manage negative emotions and how to enhance positive emotions.

WEEK 4: Unit 3 - Brain Building
Main focus: Brain Plasticity and the belief that intelligence is malleable
Highlighted study strategy: Visualisation of brain growing through practice
The third unit focuses on brain plasticity and how new learning changes the brain. Learners are taught how the repeated use of the neural network in the brain develops by working on a skill or concept. During this unit, Chris and Dahlia explore how to learn new and difficult material. This idea sends the message to learners that intelligence is not fixed, but can be developed through mental exercise. Learners are exposed to research findings on neuroplasticity.

WEEK 5: Unit 4 -Brain Boosters Main Focus: Consolidation of Brainology Highlighted study strategy: Long term memory The final unit extends on neuroplasticity and places focus on long term memory. Learners are taught practical study skill strategies on how to improve their memory to retain information and consolidate what they have learnt while building multiple pathways for knowledge retrieval. After successfully completing the final challenge, learners acquire the status as "brain masters."

1.7.4 POPULATION, SAMPLING TECHNIQUE AND SETTING

Population refers to all the people or subjects about whom the study is meant to generalise (Jackson & Mazzei, 2008). According to Mertens (2014), population refers to all individuals within a population that usually have a shared, binding characteristic or trait. The population of this study were all grade four learners with LDs in South Africa.

Non-probability or purposive sampling is used in qualitative research. Researchers intentionally select individuals to assist them in fulfilling their research question (Creswell, 2012). Purposive sampling, particularly the homogeneous sampling strategy, was used in this study.

This study took place at a co-educational primary school in Durban, KwaZulu-Natal, South Africa. Originally built in 1896 and founded by the Presbyterian Church of Scotland, the school was later donated to the Department of Education in 1906, where it became a dual-medium school for English and Afrikaans speaking learners. In the early 1960s, the school closed, and the learners were transferred to a local school. The school building remained empty until it formally re-opened in 1982 as a short-term remedial school. Currently, the school operates as a Learners with Special Educational Needs (LSEN) resource centre which aims to assist fellow educators at neighbouring schools. The school constitutes 892 learners and 104 staff members. Learners who attend this school are transferred from mainstream schools, as they are struggling to read and write at an appropriate age and grade level. They have been formally diagnosed with one or more specific learning disability. The school's mission is to ensure that learners experience success and are academically prepared to return to mainstream schooling

and ultimately gain a passion for lifelong learning. Learners usually attend this school for 2-3 years, before returning to mainstream schooling. There is a large focus on learning support using different learning programmes, including Brainology instruction and curriculum differentiation. The school uses the curriculum and assessment policy (CAPS). All learners are taught by educators that are qualified in special needs education and inclusive education.

1.7.5 DATA ANALYSIS

Data analysis is an ongoing process of making sense of data obtained through consolidation, reduction and interpretation (Merriam, 2015). Data analysis can therefore be viewed as the process of examining and reviewing the collected data to reach a suitable conclusion. Using the data collected from participant observation, focus group interviews and a reflective journal, the data analysis in the current study was based on Braun & Clarke's (2006) six-phase framework for thematic analysis (See Chapter Four, Table 7).

1.7.6 TRUSTWORTHINESS

Trustworthiness is a method of ensuring rigour in qualitative research (Silverman, 2011). Trustworthiness is when the research can be trusted and that it is conveyed appropriately in a truthful manner. According to Lincoln & Guba (2005), there are four main criteria that underpin trustworthiness in qualitative research, namely credibility, dependability, transferability and conformability. To uphold trustworthiness in the current study, the above mentioned strategies were put in place. These strategies are discussed in Chapter Four.

1.7.7 ETHICAL CONSIDERATIONS

Ethical considerations refer to the norms and standards that distinguish between ethical and unethical practice when conducting research (Mertens, 2014). Ethical procedures should be a primary consideration, and researchers need to be acutely aware of and observe ethical considerations in all phases of the research (Creswell, 2014). The following ethical considerations were observed in this study. Permission, informed consent, protection from

harm, confidentiality and anonymity and honesty with professional colleagues. These ethical considerations will be covered in detail in Chapter Four.

1.8 SIGNIFICANCE OF THE STUDY

It is envisaged that this study may benefit various stakeholders of inclusive education including researchers, policymakers, teachers and learners with LDs. This study is anticipated to add to the limited literature base on the use of Brainology in supporting the learning of learners with LDs in South Africa and elsewhere. This study is also envisaged to yield findings that can serve as a springboard for future studies on the use of Brainology, in South Africa and other countries. This study is expected to accumulate knowledge and information that school management teams may use to underpin the management of intervention programmes in their schools. Lastly, learners with LDs are also anticipated to benefit from the increased understanding of the way intelligence is viewed.

1.9 LIMITATIONS OF THE STUDY

This study used a small sample size of thirteen learners. Therefore, the sample may not be representative of all grade four learners with learning disabilities in KwaZulu-Natal. As the learners worked together as a group during the Brainology programme, the objectivity of their individual contributions during the discussions can be questioned. The analysis may have an inherent bias due to my dual role of educator/researcher. Further to this, the learners may have responded in a manner that they thought to be "appropriate" to me as I was their teacher. Learners' absenteeism placed limitations on the study as three learners each missed one Brainology session. A final limitation is related to the age of the sample group. The Brainology programme is recommended for learners from grade four upwards, so there could have been a possibility of some learners not fully understanding the various terminology, especially that related to more complex concepts founded in neuroscience.

1.9.1 OVERCOMING LIMITATIONS

To combat the above-mentioned bias, I kept a reflective journal during the data collection and analysis phase (see Appendix C for an example from my reflective journal). I spent a considerable amount of time reflecting on my own judgements related to the learners' responses during the Brainology programme. I acknowledged the limitation of the small sample size and therefore tailored the aims of the study accordingly. It was important for me to conceptualise the dual role as an educator and researcher. During the Brainology session, learners were made aware of the two different roles. However, upon reflection, it is recommended that further research is implemented in separate capacities. Absenteeism of learners from school is a usual occurrence and therefore expected. To combat this, I ensured that feedback from previous sessions and the opportunity for absent learners to ask questions was provided.

1.10 DELIMITATIONS OF THE STUDY

The current study sought to understand how grade four learners with LDS understand themselves as learners following Brainology instruction. The study was delimited to a primary school in KwaZulu-Natal using a purposively chosen sample group of thirteen grade four learners. Their ages range from 9-10 years old. All the learners were diagnosed with one or more learning disability. The study took place in a classroom environment. The study was limited to the duration of the Brainology Intervention from the 3rd October 2016 till the 18th November 2016. The Brainology intervention was administered as a group using a computer and a projector screen. Focus group interviews, participant observation and a reflective journal served as the data collection instruments.

1.11 OUTLINE OF CHAPTERS

The current study is presented in seven chapters.

Chapter one constitutes the problem and its context. This comprises of the background to the study, problem statement, aims and objectives and research questions. It also includes the

rationale of the study, an overview of the theoretical framework, an overview of methodology and design and ethical considerations. The significance of the study and limitations, delimitations of the study and definition of key terms conclude the chapter.

Chapter two presents the theoretical framework that underpinned the study, namely the theories of intelligence framework.

Chapter three presents discourses informing inclusive education, an exposition of learning disabilities, and support of learners with LDs in selected developed and developing countries. A review of literature on the focus of the study structured around the sub research questions of the study illuminating research gaps is also presented.

Chapter four illustrates the details relating to the research methodology and research design of the current study. The research paradigm, research approach, research design, ethical considerations and trustworthiness are highlighted. The data collection instruments and details relating to the data analysis is presented.

Chapter five provides the data presentation and analysis of the study. Data is presented in a pre and post-Brainology format. The three major findings are presented.

Chapter six presents a discussion of the findings. The discussion is based on the theories of intelligence framework and available literature.

Chapter seven concludes the study and presents the summary, recommendations for future research and concluding remarks.

1.12 SUMMARY OF THE CHAPTER

Embedded in the theories of intelligence framework, this study set to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction. A description of the background of the study introduced the study. Next, the problem statement, the research question and the aim and objectives of the research were established. The theoretical framework and the rationale and significance of the

study assisted in contextualising the research. This was followed by a description of the methodological components which included the research paradigm, research approach, research design, sampling methods, data collection strategies and the data analysis procedures. The ethical considerations were addressed, whereby strategies to enhance trustworthiness were highlighted. Limitations and delimitations of the study were presented, followed by the definition of terms. Finally, the outline of chapters concluded the chapter. Chapter two presents the theoretical framework that underpinned the study.

1.13 DEFINITION OF KEY TERMS

Brainology. A research-based online intervention designed to teach about the neuroplasticity of the brain with the goal of developing growth-mindset oriented thinking in learners (Mindset Works, 2011). In this study, Brainology is the online programme which encourages learners to develop growth mindset characteristics, underpinned by a belief that intelligence is malleable and can be developed.

Fixed mindset. The belief that intelligence/ability is a fixed trait. Individuals with a fixed mindset tend to see effort as unnecessary, avoid challenges, give up easily and are fearful of looking inadequate (Dweck, 2015). This study defines a fixed mindset as a belief that one's level of intelligence is static.

Growth mindset. The belief that intelligence/ability can be cultivated through hard work, persistence and effort. Individuals with a growth mindset tend to value effort, embrace challenges and view challenging tasks as learning opportunities. (Dweck, 2012). In this study, growth mindset refers to a belief that intelligence is malleable, and that it can be developed through effort and hard work.

Inclusive education: Inclusive education responds to and meets the diverse needs of all learners through increased participation in all spheres of life, including learning, cultures and communities (Pantic & Florian, 2015). It seeks to reduce exclusion from education and envisages a whole education system where all role-players embrace the challenges and benefits

of diversity. Inclusive schools provide learning environments where every learner has an opportunity to succeed and where the diverse needs of all learners are met (UNESCO, 2009). Inclusive education in this study refers to learners with disabilities who attend regular schools alongside their peers, and receive the required support that they need to excel in all spheres of school life.

Learning disability. A learning disability is defined by a disorder in one or more psychological processes that can have a negative impact in areas of learning, such as mathematics, reading or written expression. Learning disabilities may present in a variety of ways and differ from individual to individual (DSM-5, 2013). In this study, learning disabilities refers to the above definition and is referred to as LDs.

Mindset. Coined by Carol Dweck, mindset refers to the beliefs individuals hold about their intelligence, including their abilities, or personality traits (Dweck, 2012). Similarly, this study refers to one's mindset as a set of beliefs that shape an individual's way of thinking about themselves.

Mindset intervention: An intervention that targets individual beliefs about intelligence, abilities and talents (Yeagar & Walton, 2011). In this study, mindset intervention refers to an intervention that encourages participants to adopt a growth mindset.

Neuroplasticity. A term which emphasises malleability of the brain and that the brain can adapt to learn new, various concepts over time (Dubinsky et al. 2013). This study refers to neuroplasticity as the brain's ability to change continuously throughout an individual's life.

Non-Cognitive skills. Often termed as "soft skills," non-cognitive skills are in contrast to cognitive skills, such as thinking, reasoning, or remembering, and rather related to motivation, self-regulation and resilience in challenging situations (Gutman & Schoon, 2013). In this study, non-cognitive skills can be seen under the broad umbrella of personality traits, feelings, opinions and behaviour.

CHAPTER TWO

THEORETICAL FRAMEWORK

2.0 INTRODUCTION

This dissertation sought to explore how grade four learners with learning disabilities at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction in preparation for their placement in regular classrooms for inclusive education. The previous chapter presented the problem and its context. This chapter presents the theoretical framework that underpinned the study.

2.1 THEORETICAL CONTEXT

MINDSET INTERVENTIONS

Many studies have been informed by the theories of intelligence framework. There is consensus in the literature that learner's mindsets, and consequently their academic performance can be transformed through interventions (Romero et al. 2014). Directly teaching psychological constructs that typify a growth mindset can lead to higher achievement outcomes for both learners and teachers (Blackwell et al. 2007, Dubinsky et al. 2013). Studies that target individual beliefs about intelligence, abilities and talents have been termed as psychosocial interventions or mindset interventions (Yeager & Walton, 2011). Mindset intervention studies have been carried out in educational settings in different countries and among different age groups (Fraser, 2017). Psychosocial interventions or mindset interventions have been implemented in various ways in promoting the acquisition of a growth mindset (Burnette, Russell & Hoyt, 2013). The core message being that intelligence is malleable, and that effort is positively correlated with success (Walton & Cohen, 2011).

Mindset interventions can increase academic achievement and motivation, particularly among learners who are struggling academically (Blackwell et al. 2007). They can reduce racial (Boaler, 2013), gender (Leslie, Cimpian, Meyer & Freeland, 2015) and social class achievement gaps (Walton & Cohen, 2011), are inexpensive to implement (Paunesku, 2013) and can be implemented for a large-scale sample group (Paunesku et al. 2015).

The interventions are self-administered by educators or researchers and do not come with a manual. Instead, they rely on the critical insights and knowledge of the professionals who implement them. Notably, they do not seek to replace traditional education reforms, but rather complement them by targeting learner's thoughts, feelings and beliefs (Yeagar & Walton, 2011). Mindset interventions are not an instant solution, but with proper implementation, they can be an excellent point of entry in assisting learners in reaching their full potential (Dweck & Master, 2009).

Many of the mindset interventions are quantitative and use a pre-post mindset score to highlight any changes in learners' mindsets. The measurement of an individual's mindset is scored using the mindset assessment profile (see Appendix D). The assessment contains eight statements, four related to a fixed mindset such as "You have a certain amount of intelligence, and you really can't do much to change it'' and four related to a growth mindset such as ''You can always greatly change how intelligent you are'' (Dweck, 1999). Responses are given using a 6 point Likert scale (1= strongly agree and 6=strongly disagree) with Cronbachs alphas in the .90-.96 range. Learners may agree with some aspects of both beliefs, but will usually lean towards one mindset. Reliability and validity in relation to the mindset scale include an internal reliability of .78 (Blackwell et al. 2007). Several studies have adapted a pre-test-post-test quantitative design using the scale, yielding compelling results, indicating a positive shift to acquiring a growth mindset (Donohoe et al. 2012). However, there has been criticism surrounding the strict dichotomies of the scale, resulting in exaggeratedly divisive answers and therefore producing inaccuracies in the learners' mindset scores (Kristjansson, 2008). In the current study, a qualitative approach was deemed suitable to explore how grade four learners with learning disabilities at a primary school in KwaZulu-Natal understand themselves as

learners following Brainology instruction. The complimentary link between the chosen methodology and the theories of intelligence is discussed in Chapter four.

Early mindset interventions were mainly conducted among low-achieving and low-income groups in the United States and yielded promising results (Orosz, Peter-Szarka, Bothe, Toth-Kiraly & Burger, 2017). One of the earliest interventions was led by Aronson, Fried & Good (2002) who taught African American college students to think of intelligence as malleable, who then taught the same content to a group of primary school learners. This experience resulted in increased test scores among African American college students (see Aronson et al. 2002). Another intervention yielded similar results for Hispanic, low achieving college students (see Good et al. 2003). Recently, Yeager & Dweck (2012) investigated the impact of mindsets on learners' resilience when faced with academic and social challenges. The study showed that learners who believe that intelligence is malleable tend to show higher achievement and greater resilience in completing challenging mathematics courses (Yeager & Dweck, 2012). Another quantitative study tested the impact of a 6-session mindset intervention with grade 9 and 10 high school learners (see Yeager, Trzesniewski & Dweck, 2013). In each session, learners were taught that intelligence is malleable. Findings included reduced levels of aggression and stress among the learners in the treatment group, building upon research that a growth mindset can aid in reducing aggressive behaviour and combat stress (Dweck, 2012).

The Brainology programme is based on Blackwell et al. (2007) malleable intelligence intervention, which revealed that teaching learners about the understanding of synaptic plasticity can lead to learners acquiring a growth mindset. These findings solidified that there is a causal link between a growth mindset and academic achievement (Dubinsky et al. 2014). The study was broken into two parts. The first phase constituted a quantitative study which focused on 373 American Grade 7 learners, who were making the challenging transition into High School. One group learnt about the characteristics and benefits of acquiring a growth mindset, and the comparison group learnt about study skills. Over two years, the grades of learners who had received growth mindset instruction increased, whilst the grades of learners who did not receive instruction displayed a steady decline (Blackwell et al. 2007). Notably, there was a marked improvement in the learners' grades that were seen as 'vulnerable' and who struggled

academically (Donohoe et al., 2012). Building upon the first study, Blackwell et al. (2007), the second phase of the study focused on the brain. An eight-session intervention programme was administered whereby learners were placed into experimental and control groups. Learners in the experimental group learnt about how the brain functions by growing new synapses. These learners were taught that by working those synapses, through effort and practice, their brains would grow stronger. The intervention also stressed the understanding of synaptic plasticity, the idea that we can alter and change our brains, and that intelligence is malleable and can be developed (Dubinsky et al. 2014). Since then, studies have demonstrated the plasticity of the brain, which support the beliefs of the mindset theory that intelligence can be developed. There is scientific evidence that mindsets have a strong association with learning, and brief interventions which taught learners about the plasticity of the brain had a positive influence on a learners' mindset (see Abiola & Dhindsa, 2012, Tirri & Kajula, 2016).

2.2 THEORIES OF INTELLIGENCE

The Theories of Intelligence Framework postulates that individuals hold two contrasting beliefs or theories about intelligence (Dweck, 2012). Individuals typically perceive intelligence as a fixed, unchanging characteristic or perceive intelligence as malleable and prone to development (Yeager & Walton, 2016). Individuals who believe intelligence is fixed are entity theorists or are said to have a fixed mindset, whilst those who believe that intelligence is malleable are incremental theorists and are said to have a growth mindset (Dweck & Leggett, 1988). An individual's theory of intelligence or mindset shapes how they approach learning, challenges, and respond to their environment (Dweck, 2012). The acquisition of a growth mindset has significant effects on academic (Burnette et al., 2013) social (Romero et al. 2014) and socioeconomic domains of learners (Claro et al. 2016).

Dr Carol Dweck, a Stanford University professor of psychology, has led the research into the field, having studied self-theories of learning since the early 1980s. Commonly termed as the mindset theory, the theories of intelligence framework has been widely examined in the classroom context (Blackwell et al. 2007; Walton and Cohen, 2011; Yeager et al. 2013, Burnette

et al. 2013). Learners who believe that intelligence is a fixed quantity are susceptible to decreased performance when confronted with failure, while learners who view intelligence as malleable are more successful in their learning (Dweck & Sorich, 1999). Notably, even when learners display similar abilities, their beliefs relating to the nature of intelligence influence their reactions to academic challenges (Fraser, 2017). Learners who hold a fixed view of intelligence apply less effort and do not perform as well on challenging tasks as learners with a growth mindset (Yeagar & Walton, 2012). The figure below depicts the theories of intelligence with its accompanying two theories, the entity theory and the incremental theory, which link up with the fixed and growth mindset.
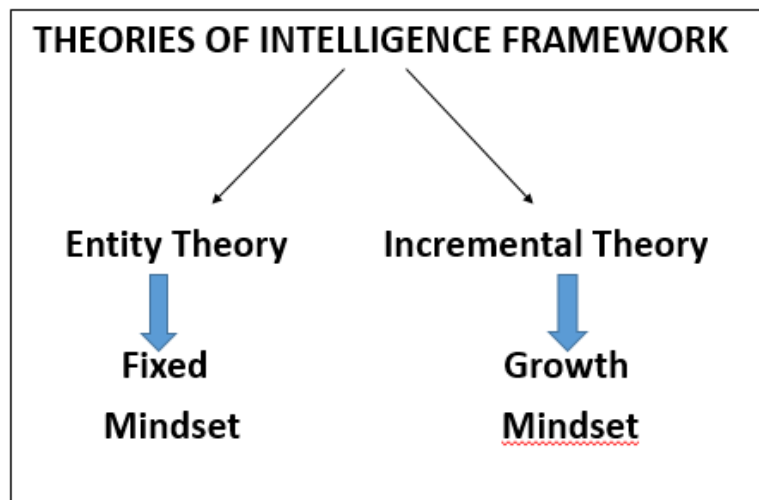
FIGURE 2: **THEORIES OF INTELLIGENCE FRAMEWORK**

2.3 FIXED AND GROWTH MINDSET

ENTITY THEORY (FIXED MINDSET)

Individuals who hold entity or fixed theories of intelligence tend to believe that skills and abilities are static and that their performance is a consequence of that stability (Hong, Chiu, Dweck, Lin & Wan, 1999). They attribute mistakes to lack of ability (Hong et al. 1999), assume helpless strategies in the face of challenges (Robins and Pals, 2002), are likely to adopt

performance goals focused on demonstrating their abilities (Costa & Faria, 2018) and are highly vulnerable to negative feedback (Yeagar & Walton, 2012). Furthermore, learners with an entity mindset do not see value in effort and tend to feel inadequate if they have to work hard. Learners with a fixed mindset may swiftly discontinue effort, place responsibility on others, lie about their achievements, and even contemplate cheating (Burnette et al. 2013). Those with a fixed mindset respond poorly to challenges, often giving up on the task at hand task due to fear of failure.

INCREMENTAL THEORY (GROWTH MINDSET)

Learners who hold a growth mindset believe that intelligence can be developed (Dweck, 2012). They tend to set learning goals (Dweck and Leggett, 1988), value effort (Hong et al., 1999) and view mistakes as learning opportunities (Robins and Pals, 2002). Entity theorists show resilience when faced with challenges as they interpret challenging work as an opportunity to learn (Hochanadel & Finamore, 2015). Thus, they are inclined to embrace challenging activities while expending effort to improve and overcome their difficulties (Dweck & Leggett, 1988). Due to their belief in the malleability of intelligence, learners with a growth mindset welcome assistance in areas in which they are struggling (Dweck, 2012). Notably, the belief that intelligence is malleable means that intellectual ability can always be further developed, not that everyone has identical potential in every domain or will learn every topic with equivalent ease. Learners who hold a growth mindset, are more likely to believe in increasing ability through effort and display a strong realisation that everyone has to work hard to succeed in their learning.

The image below depicts the contrasting characteristics of the fixed and growth mindset.
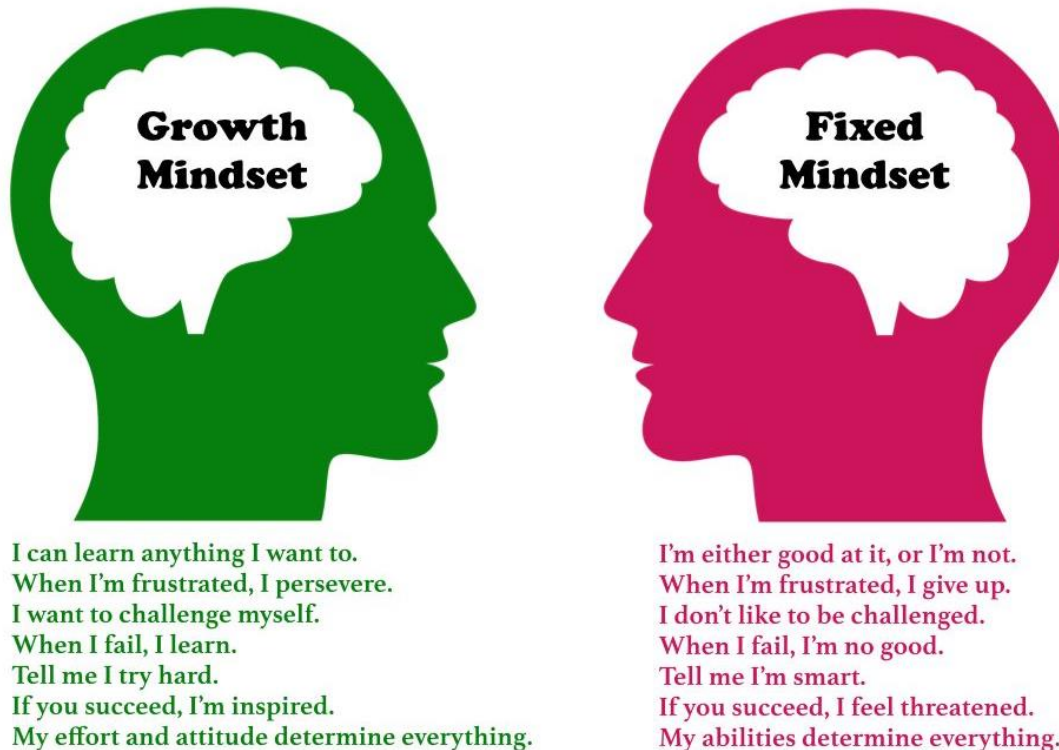
FIGURE 3: **GROWTH AND FIXED MINDSET CHARACTERISTICS**

Sourced from: www.ideapod.com

2.4 CONCLUSION

This chapter presented the theoretical framework which underpins this study, namely the Theories of Intelligence framework. The entity theory and incremental theory were highlighted alongside the typical characteristics that portray the fixed mindset and the growth mindset. The subsequent chapter presents a review of related international literature on the support of learners with LDs and a review of literature on the focus of the study structured around the sub research questions of the study.

CHAPTER THREE

REVIEW OF RELATED INTERNATIONAL LITERATURE ON SUPPORT OF LEARNERS WITH LEARNING DISABILITIES

3.0 INTRODUCTION

This dissertation sought to explore how grade four learners with learning disabilities at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction in preparation for their placement in regular classrooms for inclusive education. The previous chapter presented the theoretical framework that underpinned this study. This chapter presents discourses informing inclusive education, support of learners with LDs in selected developed and developing countries and a review of literature on the focus of the study structured around the sub research questions of the study. The following section presents discourses informing inclusive education.

3.1 DISCOURSES SHAPING INCLUSIVE EDUCATION

Discourses underpinning inclusive education are evolving. Worldwide, the education of learners with special educational needs has been seen as discriminatory to both society and individuals (Mittler, 2012). The changing discourse from special education to inclusive education revealed a paradigm shift from a medical model of disability to a social inclusion discourse grounded in equality and capability education. This shows tensions that abound in inclusive education debates. Tensions relating to valuation of difference as promoting unity, juxtaposed with a plurality of values and dilemmas of difference take centre stage in these debates.

3.1.1 MEDICAL DEFICIT MODEL OF DISABILITY

As far back at the early 1900s, the dominant discourse in education was the medical deficit model, also known as the "within-child model" or "individual model" of disability (Walton, 2011). It originated in the medical field, borrowing terminology and practices from the medical field. Based on the view that all learning problems are the result of an organic disorder or disease, the medical model of disability assumes that any difficulties that the learner may be facing are independent of cultural, physical, or political environments and instead a comprehensive diagnosis of physical, neurological or biological disorders should precede intervention within educational settings (Haegele & Hodge, 2016). This model of disability solely focuses on the learner's condition, seeing the deficiencies and limitations within the child, trying to find a way of treating the child to fit in his or her environment. Similarly, the model looks at how to "cure" a learner, taking a "find out what is wrong and fix it" approach (Mittler, 2012). Contextual factors relating to the learner's circumstances and consideration of environments that might intensify or adversely affect the learner's functional abilities are totally disregarded. The learner's disability is seen as the direct consequence of the impairment and therefore becomes the sole focus of attention (Haegele & Hodge, 2016).

The core discourse of the medical model of disability is that of segregated schooling and special needs education, resulting in categorisation and segregation, preventing many learners from accessing mainstream education. With this segregation, stereotyping and defining learners by a condition or their limitation takes place, and labels such as "learning disabled," Attention Deficit Hyperactivity Disorder (ADHD) and Dyslexia are attached to these learners. Key terms associated with the medical model of disability includes "handicap", "deficiency", "remedial", "segregation" and "exclusion" which all carry negative connotations (Graham & Slee, 2011).

The practices associated with the model of disability includes a thorough assessment of the child's limitations against developmental and functional norms (Walton, 2011). A diagnosis is usually made, and an appropriate treatment protocol is designed for the learner. The treatment protocol usually includes intensive monitoring, assessment and various therapy programmes based on the diagnosis given to the learner. Learners receive various interventions carried out

by learning support teachers, previously known as remedial or special needs teachers (Walton, 2011). If the treatment is deemed successful, re-entry into a mainstream class is arranged. Alternatively, the learner is permanently excluded from mainstream education if the treatment is deemed unsuccessful. Ultimately, the structure of the medical model enforces learners experiencing LDs to become passive recipients of alternative services aimed to cure or manage their exceptionality (Palmer & Harley, 2012). Some of these alternative services include psychologists, doctors, surgeons, occupational therapists and speech therapists.

The medical model of disability ensures that society remains unchanged. Not surprisingly, it is met with much criticism (Mittler, 2012). A notable critique includes the considerable influence of medical professionals who use diagnoses and labels to categorise individuals. Another critique is the negative perceptions of disability that are embedded within the model (Donald, Lazarus & Lawana, 2010). Despite these critiques, traces of the medical model exist today and are evident in the policies, practices and attitudes of educators (Mittler, 2012). This study examined the influence of the medical model of disability to the provision of services to learners with LDs.

3.1.2 SOCIAL CONSTRUCTIONIST DISCOURSE AND THE SOCIAL MODEL OF DISABILITY

The social constructionist discourse of disability examines the development of jointly constructed understandings of the world relating to reality construction and knowledge production (Gergen, 2015). Social constructionism is informed by postmodernism and has its roots in phenomenology, social history, hermeneutics and social psychology (Burr, 2015). Social constructionist perspectives have been used to support a variety of practices in the fields of education, health care, community work, conflict resolution, and organisations (McNamee & Hosking, 2012).

Social constructionism is based upon the relations between individuals and how meanings are developed from the social interaction between people (Burr, 2015). The main features of social

constructionism include rejecting the traditional positivistic approaches to knowledge, taking a critical stance concerning taken-for-granted assumptions about the social world, and maintaining the belief that understanding the world is a product of the interaction between groups of individuals (Galbin, 2014).

Social constructionists believe that realities are socially constructed and are constituted through language. Language, communication and speech are seen as integral components of the interactive process through which individuals understand themselves and the world around them (Gergen, 2015). Social constructionists believe that knowledge is sustained by social processes in which reflexivity in human beings is emphasised, and that meaning derives from a constructed reality and is the product of the prevailing cultural frame of social, linguistic, discursive and symbolic practices (Cojocaru & Bragaru, 2012).

Criticism of the social constructionism discourse includes dismissing the contributions and influences of biological and physical sciences, (Lock & Strong, 2010), being one-sided in its focus towards language, thus placing other important psychological factors aside (Cromby, 2012), and a lack of clarity between hierarchies or levels of meaning. However, many strengths surround social constructionism. According to McNamee and Hosking (2012), social constructionism can be a useful approach in revealing new possibilities of carrying out research. Social constructionism encourages new ways of thinking, with a distinct focus on collaborative efforts, creative ideas, and process-centred interventions, moving away from the traditional, rigid, rational, hierarchical and result-focused models (Galbin, 2014).

Pertinent to this study, social constructionism creates an awareness of how one perceives disability. Fundamental to the social model of disability is the notion that disability is perceived as being socially constructed (Campbell & Oliver, 2013). The social model of disability was developed in reaction to the limitations of the medical model of disability (D'Alessio, 2011). In contrast to the medical model, the social model of disability locates disability not within the

individual with a disability, but rather on the environmental, economic and cultural barriers that exist in society.

Within education, the social model of disability sees the child as being valued and part of society, where diversity is welcomed, relationships are nurtured, and most importantly, all children, irrespective of their differences or disabilities are included (Oliver & Barnes, 2012). Learners with disabilities face many obstacles, including inaccessible school environments, inaccessible transport to get to school, poverty, segregated services within the school environment, inferior education offerings, discrimination and unequal employment opportunities and overall a lack of understanding surrounding disabilities, which can lead to a lack of autonomy and a sense of feeling devalued in society (Haegele & Hodge, 2016). The social model advocates that children with disabilities have the right to attend mainstream schools alongside their typically developing peers. Children with disabilities should have their strengths and needs identified by themselves and others. They should have access to suitable resources to assist them and receive the appropriate support to meet their needs by professionals. (Oliver & Barnes, 2012). Parents and professionals receive specialised training to be able to best support a child with disabilities. Within the social model of disability, education is seen to evolve society to become inclusive. This study explored the influence of the social model of disability on service provision to learners with LDs.

3.1.3 POST-STRUCTURAL DISCOURSE

The Post-Structural discourse is informed by the works of a series of mid-20th-century French philosophers and critical theorists who came to international prominence in the 1960s and 1970s (Delamont, 2016). Prominent writers associated with post-structuralism include Foucault, Derrida and Deleuze (Scheurich, 2014). The post-structural discourse challenges the structuralist conceptions of meaning, truth, knowledge and the subject of self (Burr, 2015). It does this by downplaying the role of the author and radicalises the nature of language by seeing the signified as the signifier and separates truth from concrete reality (Burr, 2015). Post-structuralism sees reality as being more fragmented, diverse and culturally specific, thus emphasises the diverse meanings and interpretations of different people (Rosiek & Gleason,

2017). Post-structuralists believe that to understand something, one has to understand the object itself, and the systems of knowledge that surround that object (Burr, 2015).

Foucault, in particular, concerned himself with understanding how, within particular systems of knowledge, certain human acts, practices, behaviours are problematised as "not normal" (Tremain, 2005). Foucault's work explored diverse systems of categorisation, including sexuality, criminality, mental health, including the diagnosis of disabilities. For example, labelling a child in connection with their inadequacies marks them as being different from the category of 'normal', and the powerful institutions which define it. Foucault suggested disability is socially constructed through discourse and social normative practices, rather than an actual condition (Allan & Youdell, 2017). Foucault 's work stimulates new ways of thinking about disability, while promoting inclusive education and resisting the pernicious effects of normalisation within modern societies (Tremain, 2005).

According to Graham and Slee (2008), inclusive education is a complex, contentious notion due to the multiple discourses and meanings that are attached to it and the term itself is yet to be conclusively defined. Slee (2011) contends that both exclusionary and inclusionary practices need to be identified and understood. A key issue that surrounds the terminology and discourse of inclusive education is that there are various competing discourses which result in diverse meanings and understandings (Graham & Slee, 2008). Researchers have drawn attention to the persistence of normative assumptions of traditional special education that shape and drive policy implementation (Delamont, 2016). The need to develop more sustainable and context-appropriate policies and practices in more developing contexts has been raised (Denzin & Lincoln, 2011).

The post-structural discourse allows for the exploration of one's self, as it is not so focused on rigid economic hierarchical structures (Burr, 2015) and does not place any restrictions of what can be analysed, therefore allowing for a unique way of framing and analysing a study. Despite these positive aspects, post-structuralism has received critique from many perspectives, including Rationalists, Liberals, Marxists, and critical theorists who have questioned the rigour

and legitimacy of the field (Rosiek & Gleason, 2017). There have also been concerns about various aspects of its philosophical assumptions, especially relating to reality and the use of language (Denzin & Lincoln, 2011). One major criticism has focused on the difficulties of developing and translating its abstract concepts into a viable social and political theory (Burr, 2015). Similarly, there has been skepticism in relation to its conceptions of subjectivity, power and identity (Delamont, 2016). This study interrogated the influence of the post-structural discourse on the provision of services and goods to grade four learners with LDs.

3.1.4 INCLUSIVE EDUCATION DISCOURSE

There are several global human rights instruments that underpin inclusive education. The Universal Declaration of Human Rights (United Nations, 1948) mandates the rights of every human being to all domains of life, including education (UNESCO, 2006). The declaration laid the foundation for inclusive education, by highlighting the rights of children, education being one of them. Article 26 of the declaration states that everyone has the right to education and that primary school education is compulsory. Also, education should be free in the elementary and fundamental stages, and technical and tertiary education shall be made available, while higher education shall be equally accessible to all based on merit. Education shall be directed to the full development of the human personality and the strengthening of respect for human rights and fundamental freedoms. To further the activities of the United Nations for the maintenance of peace, education shall promote understanding, tolerance and friendship among all nations, racial and religious groups. Lastly, parents have a right to choose the kind of education that shall be given to their children (UNESCO, 2006).

The Convention on the Rights of the Child (United Nations, 1989) established the basic human rights for children everywhere and presented the right to education in terms of universality, participation, respect and inclusion. The convention commits to ensuring that children are recognised as active participants in their learning with education being specifically designed to promote and respect their rights and needs. In addition, children with disabilities should receive appropriate support and have access to education in a manner that supports social inclusion

(UNICEF, 2007). In Article 28, States Parties recognise the right of the child to education. The content of the article focuses on making primary education compulsory, available and accessible to all, and encourages the development of secondary, vocational and higher education. It urges the introduction of free education and financial assistance to those in need. In Article 29, the States Parties agree that the education of the child shall be directed to the development of the child's personality, talents and mental and physical abilities to their fullest potential and that education should promote lifelong learning and respect for human rights, without discrimination or prejudice against others (UNESCO, 1989).

The Centre for Studies in Inclusive Education (CSIE, 1989, 2002), an independent organisation in the United Kingdom published an inclusion charter. Developed upon a human rights platform, the inclusion charter set out six points in promoting inclusive education. The charter fully supports an end to all segregated education on the grounds of disability, as all learners share equal value and status. It views the exclusion of learners from mainstream based on disability as devaluating, discriminating and a major cause of society's prejudice against individuals with disabilities. It envisages the gradual transfer of resources, staff and learners from segregated special schools to mainstream schools with the appropriate support (CSIE, 2002).

The World Declaration on Education for All and Framework for Action to Meet Basic Learning Needs was adopted by the World Conference on Education for All in Jomtien, Thailand (UNESCO, 1990). This conference is considered a major milestone in the international inclusive education community as a consensus was reached to provide universal primary education by the year 2000. Article 3 focuses on universalising access and promoting equity in education. It states that basic education should be provided to all children, youth and adults and that all children, youth and adults must be provided with opportunities to learn. To achieve this, appropriate measures to dispel educational disparities must be taken, and education services should be expanded. It states that underserved groups should not be discriminated against in accessing of learning opportunities, and the learning needs of people with disabilities require special attention, and action needs to be taken to ensure equal access for individuals with disabilities (UNESCO, 1990).

In 1994, The World Conference on Special Needs Education: Assess and Quality (UNESCO, 1994) was held in Spain. Grounded upon a human rights perspective, the conference adopted the Salamanca Statement and Framework for Action on Special Needs Education (UNESCO, 1994). The statement informs policy and provides guidelines for action for governments on a national and regional level, as well as international organisations in implementing inclusive education (UNESCO, 1994). The Salamanca Statement and Framework for Action on Special Needs Education (UNESCO, 1994) proclaims that every child has a fundamental right to education, and must be provided with an opportunity to achieve and learn within a school environment regardless of their physical, intellectual, social, emotional, linguistic or other conditions. It urges that the educational systems and programmes should be specifically designed to be able to meet the diverse needs of all learners. Learners with special educational needs must have access to and be included in regular schools which can accommodate them. The Salamanca Statement and Framework for Action on Special Needs Education (UNESCO, 1994) reveals that regular, inclusive schools are the most effective means of combating discrimination and discriminatory attitudes while creating welcoming communities, building an inclusive society and ultimately achieving education for all efficiently and cost-effectively (UNESCO, 1994). The statement urges the international community to adopt the principles of inclusive education and governments to collaborate with their respective education departments to transform their schooling systems to become inclusive of all learners, irrespective of their individual differences or disabilities (Engelbrecht et al. 2015).

The World Education Forum: Dakar Framework for Action: Education for All (UNESCO, 2000) meeting took place in Senegal. The vision established by World Education Forum in Jomtien and the Salamanca Statement was reaffirmed at this forum. The forum participants demonstrated a collective commitment to action to achieve Education for All by 2015. Six specific, measurable goals were laid out, commonly termed the Millennium Development Goals (MDG's). Priority was placed on access for all learners to basic quality education, expansion of early childhood development care, gender equality and increased literacy levels (Walton, 2011). The sole target for Millennium Development Goal 2 (MDG2) was to achieve universal primary education where children everywhere will be able to complete a full course of primary schooling.

The United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006) achieved the highest number of signatories of a United Nations Convention (UNESCO, 2006). Article 7 focuses on children with disabilities, and states that all necessary measures must be taken to ensure the full enjoyment by children with disabilities of all human rights and fundamental freedoms on an equal basis with other children. (UNESCO, 2006). In Article 24, the convention recognises the right of persons with disabilities to education, without discrimination and based on equal opportunity. To ensure an inclusive education system at all levels and lifelong learning for persons with disabilities, it states that governments shall ensure that persons with disabilities are not excluded from the general education system, free and compulsory education or secondary education based on disability. (UNESCO, 2006).

The World Education Forum was held in Incheon, Korea. The Incheon Declaration: Education 2030: Framework for Action (UNESCO, 2015) proposed a new vision for education, going beyond the Education for All agenda and the Millennium Development Goals. Point 7 in the declaration recognises that inclusion and equity in education is the cornerstone of a transformative education system. The declaration commits to addressing all forms of exclusion and marginalisation, disparities and inequalities in access, participation and learning outcomes and commits to making the necessary changes in education policies and focuses their efforts on the most disadvantaged, especially those with disabilities, to ensure that no one is left behind (UNESCO, 2015).

The renewed vision for education is fully captured in Sustainable Development Goal 4 (SDG4), which is the education-related goal of the United Nations 2030: Agenda for Sustainable Development. SDG4 aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (UNESCO, 2015). The Education 2030: Framework for Action (UNESCO, 2015) provides guidance for governments to achieve the ten targets, which constitute SDG4. The fourth target focuses on inclusion and equity and states that all people, irrespective of sex, age, race, colour, ethnicity, language, religion, political or other opinion, national or social origin, property or birth, as well as persons with disabilities, migrants, indigenous peoples, and children and youth, especially those in vulnerable situations or other

status, should have access to inclusive, equitable quality education and lifelong learning opportunities (UNESCO, 2015).

Recently, the United Nations Disability Inclusion Strategy (United Nations, 2018) put forth an action plan and accountability framework to strengthen system-wide accessibility and mainstreaming of the rights of persons with disabilities. The policy embodies the United Nations vision on disability inclusion and reaffirms that the complete realisation of the human rights of all persons with disabilities is an integral part of all human rights and fundamental freedoms. The United Nation Disability Inclusion Strategy (United Nations, 2018) will closely consult with and actively involve all persons with disabilities, including women and children with disabilities and those most marginalised. This study examined the impact of global human rights instruments on the provision of support, particularly Brainology instruction, to learners with LDs.

3.2 JUSTIFICATION FOR INCLUSIVE EDUCATION

There are many benefits of inclusive education for learners, educators, parents and society. Inclusive education combats exclusion and promotes equal learning opportunities for all. Within an inclusive school environment, learners with and without disabilities interact with each other (Mahlo, 2013). Through these interactions, learners with disabilities are less stigmatised and more socially included, while children without disabilities learn tolerance and acceptance of differences (Hornby, 2014). Through inclusive education, learners with disabilities have the opportunity to be a part of the community, thus develop a sense of belonging (Mahlo, 2013). In the school environment, inclusive education fosters a culture of respect and brings about positive changes in attitudes of educators, management members and learners towards individual differences (Florian, 2010). Inclusive Education brings about increased opportunities for educators to learn and apply new strategies to meet the individual needs of learners, leading to improved job satisfaction and a higher sense of accomplishment and renewed motivation to teach (Walton & Nel, 2012). The collaborative nature of inclusive education affords educators valuable opportunities to communicate with members of external

support teams, colleagues from other schools, medical professionals, parents and community members (Hornby, 2015). Similarly, the collaborative and interactive nature of inclusive education enables the involvement of parents in the education of their children. Parents feel valued and consider themselves an integral part in providing quality learning opportunities for children (Florian & Linklater, 2010). Inclusive education ensures that learners with disabilities contribute to society rather than depend on it (De Boer et al. 2010). In turn, this leads to integrated communities that appreciate diversity and promote social justice and equality for all. This study interrogated the utility of Brainology instruction in the preparation of learners with LDs for placement in mainstream classrooms for inclusive education. The following section presents on LDs.

3.3 LEARNING DISABILITIES

There is much variation in the definition and classification of LDs. Although the term "learning disabilities" has been in use since 1962, there is no single universally accepted definition (Nel & Grosser, 2016). In the USA, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) uses the term "specific learning disabilities" (SLD). SLDs are seen as a neurodevelopmental disorder of biological origin which manifests in learning difficulties and problems in acquiring age-appropriate academic skills during the early school years, impacting the ability to learn and apply core academic skills such as reading, writing and mathematics (DSM-5, 2013). In the United Kingdom (UK) a learning disability refers to a significantly reduced ability to understand new or complex information or to learn new skills and a reduced ability to cope independently (Fletcher, Lyon, Fuchs & Barnes, 2018). The World Health Organization (WHO) defines learning disabilities as a state of arrested or incomplete development of mind. In Canada, learning disabilities refer to disorders which affect the acquisition, organisation, retention, understanding or use of verbal or nonverbal information. These disorders affect learning in individuals who otherwise demonstrate at least average abilities in thinking and reasoning (IDAC, 2015) Consistent with the international world, in South Africa, LDs are a range of difficulties in receiving, processing, expressing or retrieving information, which affects the

person's ability to function effectively in one or more learning areas (DoE, 2010). The following section presents the types of LDs.

3.3.1 TYPES OF LEARNING DISABILITIES

The most common types of LDs impact the areas of reading, mathematics and written expression (IDAC, 2015). LDs may co-exist with various conditions including attention disorders, such as Attention-Deficit-Disorder (ADD) or Attention-Deficit Hyperactivity Disorder (ADHD), behavioural and emotional disorders such as Opposition Defiant Disorder (ODD), sensory impairments or other medical conditions. LDs are usually classified into verbal and non-verbal categories (Mahdavi & Zkamkari, 2016). Verbal learning refers to the skills needed to listen, interpret, process and apply information in both an oral and written format. Learners with verbal learning disabilities are diagnosed with language disorders such as dyslexia, dysphasia and central auditory processing difficulties (CAPD). Dyslexia is one of the most prevalent and well-recognized learning disabilities. Non-verbal learning affects gross and fine motor development and visual-perceptual skills. Learners with non-verbal verbal learning disabilities are usually diagnosed with dysgraphia, which is when a learner exhibits extremely poor handwriting and dyspraxia, which is characterised by poor motor development (Fletcher et al. 2018). The table below depicts an overview of commonly diagnosed learning disabilities.

TABLE 4: OVERVIEW OF COMMON TYPES OF LEARNING DISABILITIES

OVERVIEW OF COMMON TYPES OF LEARNING DISABILITIES	
Dyslexia/Dysphasia	Language and reading disability
Dyscalculia	A mathematical disability. Struggles with concepts involving numbers, time and money
Dysgraphia	A writing disorder, poor handwriting, often illegible
Dyspraxia	A sensory integration disorder, poor fine and gross motor

	coordination
Auditory/Visual Processing Disorder	Difficulty in processing auditory and visual information
Attention Deficit Hyperactivity Disorder (ADHD) & Attention Deficit Disorder (ADD)	Difficulty in maintaining concentration during tasks, high levels of impulsivity. Difficulty in processing, application and retention of concepts.

Sourced from Fletcher et al. (2018)

3.3.2 CAUSES OF LEARNING DISABILITIES

LDs are due to neurobiological factors caused by a dysfunction in the central nervous system, affecting how the brain processes information (Frank, 2014). Other intrinsic factors include genetics, physiological factors such as brain injuries, and substance abuse during pregnancy or complications at birth (IDAC, 2015). LDs are not primarily hearing and vision problems, socio-economic factors, cultural or linguistic differences, lack of motivation or ineffective teaching (Fletcher et al. 2018). However, these extrinsic factors may further complicate the challenges faced by individuals with LDs. In South Africa, this is the case for many learners (Engelbrecht et al. 2015). It is the extrinsic factors that play a major role in the manifestation of learning disabilities (Nel & Grosser, 2016). See section 3.8 below for further details relating to these extrinsic factors.

3.4 TRENDS IN PROVISION OF INCLUSIVE EDUCATION

Many countries have embarked on a major global debate on how best to implement inclusive education. International literature has placed focus on many aspects related to Inclusive Education. These include defining inclusion, access, belonging, implications of organisations and school transformation (Walton & Nel, 2012). Internationally, the focus in inclusive education is on the role of policy and legislation and ways to close the gap between policy and practice.

Absence of support services and sufficient resources are seen as major obstacles in the implementation of inclusive education internationally (Ainscow & Sandill, 2010).

The implementation of inclusive education has diverse implications for different countries (Srivastava et al. 2013). In most Western countries, the focus is on the placement of learners with disabilities into regular schools, while in developing countries the focus is on ensuring that each child receives an education (Srivastava et al., 2013). In many developing countries, overcrowded classes exist with few teachers and little support with many learners not attending school- irrespective of what level of support they require. These include Zimbabwe (Majoko, 2019), Botswana (Molosiwa & Mpofu, 2017), Tanzania (Westbrook, Croft & Miles, 2018), Kenya (Adoyo, 2015) and Ghana (Deku, 2017). In Western countries, inclusive policies have sought to establish partnerships between special schools and mainstream schools (Florian & Linklater, 2010). These include Australia (Anderson & Boyle, 2015), the USA (Spring, 2017), China (Bang & Xi, 2017), Canada (McCrimmon, 2015), and Russia (Rubtcova & Pavenkov, 2018). Teacher training and ongoing professional development workshops are prioritised, with a particular focus on teaching strategies within an inclusive classroom context across countries (Pantic & Florian, 2015). Many schools employ occupational and speech therapists to form part of an interdisciplinary team to provide support for learners (Nel & Grosser, 2016). Teachers who are specialists in special needs education need to work collaboratively with regular mainstream teachers and make practical arrangements to implement the required support effectively (Srivastava et al., 2013).

Thus, the implementation of inclusive education is highly dependent on the context and developmental phase of each country. Thus, there is a discrepancy in the conceptualisation and implementation of inclusive education in both Western and developing countries (Pather & Slee, 2018). The discussion below investigates the support of learners with LDs in both developed and developing countries, namely the United States of America (USA), United Kingdom (UK) and Namibia.

3.4.1 SUPPORT OF LEARNERS WITH LDs IN USA

In the USA, the Individuals with Disabilities Education Act (IDEA, 2004) requires each state to develop procedures for educating each child in the least restrictive environment, (Woodcock et al. 2018). Learners with LDs are required to be educated alongside their typically developing peers in regular classes and receive the appropriate support to the extent possible (Ainscow, 2016). Individualised education programmes (IEPS) are an essential component in the teaching and learning of learners with disabilities, including LDs in regular classes in the USA. Much focus is placed on assessment and instructional modifications, as well as the adaptations and accommodations needed to support each learner (Hardy & Woodcock, 2015). Despite this, much emphasis is on standardised test scores as high scores are prioritised to demonstrate the ability of learners, including those with LDs (Hornby, 2015).

3.4.2 SUPPORT OF LEARNERS WITH LDs IN UK

The UK is one of the leading countries in the field of inclusive education. Legislation, such as the Special Educational Needs and Disability Act (2001) and more recently, the Equality Act (2010), outlines the responsibilities of schools to provide access to education for all learners including those with SLDs (Richards & Armstrong, 2015). Schools are encouraged to be pro-active in the development of inclusion and anti-discrimination (Ainscow, 2016). Learners with LDs are supported through a collaborative effort of the learner's family, educators and learning support specialists (Ainscow & Sandill, 2010). These determine the support that learners with LDs require and ensure that appropriate practices, services and facilities are put in place (Ainscow, 2016). A learning support coordinator manages collaboration of the stakeholders in the provision of support to learners with disabilities, including LDs in the UK. Reduced class sizes and permanent teacher aides support the teaching and learning of all learners, including those with LDs (Mintz & Wyse, 2015). Early identification which is realised through assessments underpins the teaching and learning of all learners, including those with LDs (Florian, 2012). Learners with disabilities, including those with LDs, are taught and supported in regular classrooms based on their assessment (Ainscow & Sandill, 2010). They are only educated in special schools in exceptional circumstances, particularly when they have a high level of

support needs that cannot be met in regular classes (Armstrong et al. 2016). Nevertheless, learners with disabilities are increasingly segregated, with an increased number of learners with severe learning disabilities attending state-funded "special schools" (Florian, 2012). Several schools also face a decreasing amount of resources against an array of challenging and varied needs of learners (Ainscow & Sandill, 2010).

3.4.3 SUPPORT OF LEARNERS WITH LDs IN NAMIBIA

In Namibia, the Sector Policy on Inclusive Education, the Child Care and Protection Act Number 3 of 2015 mandates the right of all learners including those with LDs to receive a quality education, irrespective of their circumstances. The act focuses on vulnerable learners and those with disabilities, including LDs (Namibian Ministry of Education's Sector Policy, 2013). However, several learners with disabilities, including those with LDs confront barriers in access and retention in education in Namibia (UNICEF, 2016). Several learners, including those with LDs lack access to basic schooling and many learners drop out of school at an early age (Amukugo, 2017). Comparable to several developing countries, inadequate human and financial resources, outdated teaching methods, non-conducive learning environments and negative attitudes towards disability interfere with the education of learners with disabilities including LDs in Namibia (Haihambo & Shiimi, 2019). This study examined the state of support for learners with LDs using Brainology instruction in South Africa. The following section presents a review of literature on learners' perception of themselves following Brainology instruction structured around the sub research questions of the study.

3.5 LEARNERS PERCEPTIONS OF THEIR INTELLIGENCE FOLLOWING BRAINOLOGY INSTRUCTION

Literature relating to learner's perceptions relating to their intelligence was varied. Saunders (2013) used a mixed methods research design, which combined a quasi-experimental pre-post test assessment and a focus group component to investigate the impact of Brainology

instruction on the reading performance of 30 low achieving learners in grade six. Although there was little impact on their reading performance, the qualitative findings showed a positive shift towards growth mindset behaviour in the experimental group. Seventeen learners expressed that they had acquired a new way of thinking about their intelligence, and sixteen learners felt that the harder they work, the smarter or more successful they could be. (Saunders, 2013). A qualitative case study by Boley (2016) used a sample of five primary school learners who struggled with reading to investigate how they understood themselves as learners following the Brainology programme. The findings indicated that learners understand themselves as learners from the whole-child frame of reference. Specifically, the study concluded that the learners understood themselves as learners in three main ways, namely intellectually, emotionally and physically. In addition, Brainology taught them about the brain, perseverance, how to self-reflect, how to calm themselves down, and that people have different strengths and weaknesses (Boley, 2016). Rhew & Piro (2018) recently undertook a quasi-experimental study which included a sample group of grade six, seven and eight learners who were receiving additional support in the area of reading. They aimed to investigate the effects of Brainology instruction on the learners' motivation. Results suggested that learners in the treatment group who had been exposed to Brainology had a "significant difference" in their motivation towards challenging tasks. Their study also found that the learners held an increased awareness relating to their intelligence (Rhew & Piro, 2018). This study explored the influence of Brainology on the motivation of learners with LDs towards challenging tasks.

Critics have doubted the longevity of mindset interventions and question the long-term impact and sustainability on learners' mindset and academic performance (Li & Bates, 2017). Donohoe et al. (2012) mixed-method pre-post intervention study strengthened this critique. The study examined the impact of the Brainology programme on high school learners. Using a sample group of 33 learners aged 13-14 years, it was found that the Brainology programme led to a significant increase in pre- to post-mindset scores for the intervention group. Qualitative data also indicated a shift towards a growth mindset following Brainology instruction. However, there was a significant decline at follow-up one year later. Qualitative responses suggested five learners had moved back towards a more fixed view of intelligence. One participant described

an intelligent person as one who was 'in a higher class than you'. Another learner added: 'If you ask them something, they answer quick,' indicating the initial impact of Brainology instruction was not sustained (Donohoe et al. 2012). This study examined the sustenance of the influence of Brainology on the view of learners with LDs on intelligence.

In turn, using a larger sample of 300 learners and 80 gifted learners, a quantitative study by Esparza, Shumow & Schmidt (2014) looked at the longer-term impact of Brainology and a follow-up phase was implemented. The study compared the impact of Brainology intervention between gifted learners and regular learners over 12 months. Their findings revealed that the gifted learners, compared to regular learners, are more likely to adopt a growth mindset. Compared to the general student population, gifted and talented students were more likely to endorse the idea that intelligence is malleable. Results from an ANOVA depicted a "large effect size" in the impact the Brainology intervention had among the gifted learners (Esparza et al. 2014). This study examined the influence of Brainology on grade four learners with LDs.

Majority of the Brainology studies focused on the correlation between learners' mindsets and academic achievement (Willkins, 2014; Paunesku et al. 2011; Romero et al. 2014; Wieland, 2011; Todd 2013). It was noted that no significant changes in mindset beliefs were found, although a positive increase in learners' grades was noted across all studies. Wilkins (2014) study was the largest Brainology study to date. Using a large sample group of 684 grade seven learners from five primary schools in North Carolina, Wilkin's (2014) mixed-method study measured the efficacy of the Brainology intervention, measuring academic achievement and motivational constructs, including mindset beliefs. Analysis of covariance (ANCOVA) was administered to determine if statistically significant changes occurred within the intervention group. Significant positive changes were seen in the learner's quarterly science grades. The qualitative component of the study indicated increased motivation and engagement towards academic content, although no significant difference in mindset beliefs was found with varied responses relating to beliefs about intelligence and effort beliefs being noted. A randomized-trial quantitative study by Romero et al. (2014) saw primary school learners in California achieve a 0.21 increase in their final year-end grades after completing the Brainology programme. Improved behaviour was also noted. A quantitative study by Paunesku et al. (2011)

found that primary school learners in Scotland that used Brainology achieved higher scores on a standardized reading assessment compared to learners in the control group. In addition, the learners showed greater persistence in challenging tasks and attributed their failure to lack of effort, and not a lack of ability – a typical characteristic of that of a growth mindset (Paunesku et al. 2011). A quantitative study by Wieland (2011) focused on learners' mindsets pre and post-intervention in relation to their mathematics grade, with a sample of 36 high school learners from an urban American high school. Results revealed a significant difference in the treatment groups mathematical grades, but like Wilkins (2014) study, no significant change in the learner's mindsets were noted. Similarly, a mixed-method study by Todd (2013) looked at the behavioural and academic effects following Brainology instruction on three senior primary school learners with emotional behavioural disorder (EBD). Results revealed possible effectiveness with one grade four learner and limited to no effects with the other two learners. Although a slight increase in learners' effort appeared to increase following the Brainology instruction, the overall results were limited, and no significant mindset changes were noted. (Todd, 2013). A mixed-method Brainology study by Koeppen (2016) investigated a blended summer school experience for learners. Brainology was implemented with grade four to six learners to determine if there was an increase in growth mindset scores. Results from the mindset assessment profile tool (MAP) reflected an overall increase in mindset scores and qualitative data. Interestingly, the results showed that learners in the older grades tended to have a fixed mindset compared to learners in the younger grades. Koeppen (2016) attributed this to the increase in pressure in the older grades, in the form of test results, homework, projects, and presentations. This study used a qualitative research approach to interrogate how learners with LDs understood themselves as learners following Brainology instruction.

Although not directly focused on Brainology, a study by Chao, Chen, Star, & Dede (2016) sought to explore the role that technology-based interventions played in motivating adolescent learners to learn mathematics. 88 American learners from grades five to eight participated in one of three different digital resources, including Brainology. The study was unable to establish a connection between Brainology and the learners' motivation in mathematics. However, comments made by the learners gave an insight into the learners' perceptions about

intelligence following Brainology instruction. More than a third of the learners were able to articulate their academic struggles and what characteristics of each mindset they held. This study directly focused on Brainology instruction.

3.6 LEARNERS PERCEPTIONS OF THEIR EMOTIONS AND LEARNING FOLLOWING BRAINOLOGY INSTRUCTION

To gain a sense of learners experiences of Brainology, Mindset Works pilot-tested Brainology in 20 New York City schools. Majority of the learners stated that they had enjoyed the programme and reported how Brainology had changed their ideas about learning and had had a positive impact on their learning and study habits (Mindset Works, 2011). This study examined the experiences of Brainology instruction of learners with LDs. On the Mindset Works website, grey literature highlighting testimonials and comments were plentiful (Brainology testimonials, 2018). Being a marketing platform, only positive comments of learner's experiences of Brainology were listed. Learner comments from these sources (idem, Brainology testimonials 1) include:

"I concentrate better on tests, as well as homework. I have also been very responsible in doing my written tasks, and I know I can do what I put my mind to."

"I used to give up easily, but now I keep on trying to master the skills that I have problems in."

"Brainology taught me that it is okay to feel anxious sometimes about doing well in school, but do not give up, just keep studying, and you could find your way through it."

Learners also reported that the image of their brain making new connections increased their engagement with learning. One learner reported her favourite part of Brainology was learning that the brain is able to make connections, which can grow continually. She said "I always picture the neurons when I'm in school," and "I imagine neurons making connections in my brain and I feel like I am learning something" (Mindset Works, 2011). This study explored the experiences of Brainology instruction of grade four learners with LDs.

Similarly, Saunders (2013) found that the learners' experiences of Brainology were mostly positive. All learners understood how to use the programme, and indicated that they liked the programme, besides two learners who felt that Brainology was boring. Sixteen stated that they would recommend Brainology to their friends. Qualitative data revealed that the sample group felt they learned much about the brain following Brainology. Learner comments relating to their experiences of Brainology instruction included "I enjoyed learning about the brain because it has a lot of interesting facts" and "Brainology helped the most on how the brain works", "I learnt the most important thing is to try new things" and "Brainology helped me because now I know why I don't pay attention in class" Another learner stated that Brainology "probably helped us to read better because it taught us how to remember easier things" (Saunders, 2013). This study examined learners with LDs experiences of Brainology instruction.

Chao et al. (2016) study highlighted how Brainology assisted the learner participants in combatting negative emotions when learning. One learner reflected on how Brainology has helped in combatting nervousness. "Brainology helped me to know to calm down, and how to use my brain, and that helps me do better." Similarly, another learner also felt that Brainology assisted her in managing her nervousness. "Before when I took tests I would get nervous, and my palms would get sweaty, and I'd get hot. But now I count up and then to count down." One learner reported that Brainology helped him with academic anxiety, specifically the breathing process that it teaches. Another commented, "I learned why I might be getting Ds and Cs, because I say bad things like, 'I'm going to fail the test, and I hope I'll do good', but I need to change those bad things to good things, like 'I'm going to pass the test, I'm going to do good" (Chao et al., 2016). A decrease of test fear and an increase in confidence as a result of Brainology instruction was cited in Wilkins (2014) study. In Boley's (2016) study, it was noted that pre-Brainology instruction, participants understood learning to be frightening. Learning created anxiety for learners and they felt fearful that they might not meet the required expectations. Following Brainology, learners reported having gained an understanding of the role emotions play in learning. This study examined the experiences of Brainology instruction of learners with LDs with respect to their emotions.

3.7 LEARNERS PERCEPTIONS OF THEIR PRACTICAL STRATEGIES TO ENHANCE LEARNING FOLLOWING BRAINOLOGY INSTRUCTION

Literature relating to practical strategies to enhance learners understanding of themselves following Brainology instruction drew varied findings (see Koeppen, 2016, Boley, 2016, Wilkins, 2014). A common theme however, was that following Brainology instruction, learners were able to relay practical strategies that they had learnt from the intervention. In Koeppen's (2016) study, learners commented on the practical strategies to enhance learning, commenting on the importance of eating your breakfast and getting a good night's sleep. In addition, two learners expressed the importance of placing effort into all that you do, including sports. "The harder I work, the more successful I will be" and "The harder I work the more playing time I will get. And then I'll end up starting every game because the harder I work, the more I get better" (Koeppen, 2016).

Similarly, in Boley's (2016) study, learners commented on practical strategies that they had learnt following Brainology instruction. One learner expressed that reading multiple times results in quicker processing and another focused on applying strategies to prepare the brain before reading. One learner commented on practical ways to keep your brain healthy, "you have to do enough sleep to rest your brain or recharge it, so when you wake up, you're feeling something good." Another learner commented, "it helped me in my hardest subject, science, and I got the test right from taking the advice." An additional comment was "I practised, I got enough sleep, and I ate healthy" (Boley, 2016).

In Wilkins (2014) study, learners also expressed practical strategies that they learnt from Brainology. Learners highlighted their enjoyment with learning the functioning of the brain and how that information helped them to study for tests. Getting a better understanding of long-term versus short-term memory was also cited by learners. Comments included: "Brainology helped me study, to practice things by saying them over and over and go over them a lot" and "I use repetition to memorize things." Notably, learners also noted that without teacher facilitation, it was harder for learners to gain an understanding of the clear purpose of Brainology instruction (Willkins, 2014).

Besides the Brainology implementation guide found on www.mindsetworks.com, there is no extant research on practical strategies to enhance learners understanding of themselves as learners which are directly related to Brainology instruction. Instead, much of the literature has focused on teaching strategies which encourage learners to adopt a growth mindset (Williams, 2018, Robinson, 2017). Teachers' mindsets, praise, feedback and goal-setting are among the most common strategies found in the literature (Cohen, Garcia & Goyer, 2017; Fraser, 2018).

Teachers have a significant impact on learners' academic progress, and thus they can influence their learners' mindsets (Burnette et al., 2013). A large portion of the research centres around the causal effect between educators' mindsets and learners' mindsets (Rattan, Good and Dweck, 2012). Thus, educators' mindsets are essential in translating a growth mindset onto their learners. According to Rattan et al. (2012), if a teacher has a fixed mindset, he or she may unintentionally communicate about learning in unproductive ways that encourage learners into thinking of their intelligence as fixed.

A prominent strategy that has seen to enhance a learner's mindset has been around the notion of praise and what kind of praise is useful for learners. Research has shown that process praise which centres around effort should be given, as opposed to performance praise which directly aims at a learner's intelligence (Dweck, 2012). When educators praise learners for their effort (namely process praise), rather than their abilities, it triggers growth mindset thinking and assists in the understanding the importance of their actions in achieving success (Gunderson et al. 2013, Mueller & Dweck, 1998). In addition, process praise leads learners to adopt characteristics of a growth mindset such as persisting in challenging tasks and viewing challenges as learning opportunities (Kamins & Dweck, 1999; Dweck, 2007). In contrast, praising learners' level of intelligence can lead to learners adopting fixed mindset characteristics such as avoidance of challenging tasks, giving up easily and decreased motivation (Rattan et al. 2012).

Many of the strategies promoting a growth mindset in the classroom are directed at feedback and goal-setting. Similar to delivering praise, educators should give feedback that focuses on process, such as effort, challenge-seeking, persistence, instead of personal traits or abilities

(Hymer & Gershon, 2014). Feedback should be transparent and clear and given at regular intervals which link up to realistic learning goals which have been set together by the teacher and learner (Ricci, 2018). An important aspect of feedback is that constructive criticism should be given tactfully and given with precise steps on how to improve (Dweck et al. 2014). Constructive criticism creates a classroom culture where success is perceived as possible, and challenges are attainable (Esparza et al. 2014). In saying this, however, it is important to provide learners with opportunities in which they come face to face with obstacles, as always providing learners with simple tasks is counter-intuitive in encouraging a growth mindset (Ricci, 2018). This study explored strategies of enhancing understanding of themselves as learners following Brainology instruction.

To conclude the review, the table below presents a summative review of Brainology specific studies.

TABLE 5: SUMMATIVE REVIEW OF BRAINOLOGY STUDIES

STUDY	SAMPLE GROUP	FINDINGS
Saunders (2013) *The Impact of a Growth Mindset Intervention on the Reading Achievement of At-Risk Adolescent Students*	30 low-achieving Grade 6 learners	Positive shift towards growth mindset behaviour. All liked the programme, 16 would recommend to friends, 2 found it boring,
Boley (2016) *How students who have difficulty with reading understand themselves as learning following Theories of Intelligence instruction: A Qualitative Case Study*	5 primary school learners	The findings concluded that the learners understood themselves as learners in three main ways, namely intellectually, emotionally and physically. Learners reported that Brainology taught them about the brain, perseverance, how to self-reflect, how to calm yourself down and that people have different strengths and weaknesses.
Esparza, Shumow & Schmidt (2014) *Growth Mindset of Gifted*	300 regular grade 7 learners and 80 gifted grade 7 learners (identified by standardised	"large effect size" in the impact the Brainology intervention had among the gifted learners

Seventh Grade Students in Science	test scores and grades)	
Chao, Chen, Star & Dede (2016) *Using Digital Resources for Motivation and Engagement in Learning Mathematics: Reflections from Teachers and Students*	88 learners from grades 5-8	More than a third of the learners were able to articulate their academic struggles and what characteristics of each mindset they held following Brainology.
Donohoe, Topping & Hannah (2012) *The impact of an online intervention (Brainology) on the mindset and resiliency of secondary school pupils: a preliminary mixed methods study*	33 high school learners (between 13-14 years of age)	Significant increase in growth mindset behaviour, but at follow up 5 learners reverted to fixed mindset beliefs. All learners responded that they had "learnt a lot from Brainology."
Mindset Works testimonials **www.mindsetworks.com**	Learners who have received Brainology instruction	Positive comments such as "I concentrate better on tests, as well as homework. I have also been very responsible in doing my written tasks, and I know I can do what I put my mind to." "I used to give up easily, but now I keep on trying to master the skills that I have problems in."
Romero, Master, Paunesku, Dweck & Gross (2010) *Preliminary Report: Crittenden Middle School Growth Mindset Study*	Primary school learners (amount of learners not specified)	Learners achieved a 0.21 increase in their final year-end grades following Brainology, decreased task avoidance behaviour noted.
Paunesku, Goldman, & Dweck (2011) *Preliminary Report: East Renfrewshire Growth Mindset Study*	Latino learners (amount of learners not specified)	Learners who received Brainology achieved higher scores on a standardised reading assessment compared to learners in the control group. Greater persistence in challenging tasks, and attributed their failure to lack of effort, and not a lack of ability.
Wilkins (2014) *Efficacy of a Growth Mindset Intervention to Increase Student*	684 Grade 7 learners from 5 urban primary schools in North Carolina	Significant changes were seen in the learner's quarterly science grades, and increased motivation and engagement towards academic content was noted, although no significant difference in mindset beliefs was found.

Achievement		
Todd (2013) *Behavioural and Academic Effects of Brainology*	3 senior primary learners with emotional behavioural disorder (EBD)	A slight increase in effort was noted. Overall, the results were limited, and no significant mindset changes were noted.
Wieland (2011) *Brainology and Mathematics achievement*	36 high school learners from an urban high school in America.	Results revealed a significant difference in the treatment groups mathematical grades, but no significant change in the learner's mindsets was noted.
Rhew & Piro (2018) *The effects of a growth mindset intervention on self-efficacy and motivation of adolescent special education students*	68 Grade six, seven and eight learners (40 in the treatment group and 28 in the comparison group) who were receiving additional support in the area of reading.	Results suggested that learners in the treatment group who had been exposed to Brainology displayed a "significant difference" in their motivation and enhanced awareness about their intelligence was also noted.
Koeppen (2016) *A Blended Summer School Experience for English Learners*	241 grade four to six learners	Results showed an increase in mindsets scores as evidenced from mindset assessment profile tool and learners responses from the qualitative data.

3.8 SOUTH AFRICAN PERSPECTIVE ON INCLUSIVE EDUCATION

South Africa's definition of inclusive education differs from that of the rest of the world. It hopes to reflect the international influences, shaped by the unique history and educational realities of the current phase of implementation (Walton & Nel, 2012). In a South African context, inclusion can be seen as a process to facilitate access and participation in regular schools for those learners previously taught in a separate special education system (Walton et al. 2009). It has been almost two decades since South Africa adopted an inclusive education system. Following the demise of Apartheid in 1994 and the election of a new democratic government, South Africa's new constitution marked a historic shift in the provision of basic education for all children, emphasizing values such as equity, respect, non-discrimination and social justice (Engelbrecht et al. 2015). The Bill of Rights, contained in chapter 2, Section 29(1)(a) of the Constitution guarantees the fundamental right for everyone to basic education, including adult basic education (Republic of South Africa, 1996). Section 28(2) of the

Constitution states that 'a child's best interests are of paramount importance in every matter concerning the child'. Section 9 of the Constitution provides that the state may not unfairly discriminate based on grounds such as race, gender and disability (Republic of South Africa, 1996).

Influenced by global movements and human rights instruments presented in section 2.8 above, several policies, legislation and guidelines underpin the implementation of inclusive education in South Africa. These include White Paper on Education and Training in a Democratic South Africa: First Steps to Develop a New System, (1995), which laid down the fundamental policy framework towards basic education for all learners in South Africa. The South African Schools Act, no. 84 of 1996 (SASA, 1996) unified the South African education system, promoting access, quality and democratic governance in the schooling system. The Act aims to redress past injustices, and sets out the duties and responsibilities of the State. It ensures that all learners have the right to access to quality education without discrimination, and makes schooling compulsory for children aged 7 to 15 (DoE, 2015). In addition, Section 5 and 12 promotes community involvement and formalises parental involvement in schools through the establishment of school governing bodies (SGBs), outlining their specific functions in the provision of education (DoE, 2015). The White Paper on an Integrated National Disability Strategy (INDS, 1997) represented a historical milestone in South Africa, shifting away from the medical model of disability to that of the social model of disability. Embedded upon a rights-based approach, the INDS focused on removing barriers faced by individuals with disabilities, envisioning a society for all, one in which people with disabilities are actively involved in the process of transformation towards inclusive education. To achieve this, the INDS emphasised the roles and responsibilities of the government departments, requiring integration of disability issues in all government development strategies, planning and programmes in building an inclusive society for individuals with disabilities (INDS, 1997).

The joint report findings and recommendations from The National Commission on Special Needs in Education and Training, (NCSNET, 1997) and the National Committee on Education Support Services (NCESS, 1997) stressed the importance of South Africa transforming the

education system so to meet the diverse needs of all learners (DoE, 1998). Their final report "Quality Education for All: Overcoming Barriers to Learning and Development" concluded that the separate systems of education need to be integrated into a single system, one which can recognise and respond to the diverse needs of all learners in South Africa (DoE, 1998). This conclusion led to the publication of The Education White Paper 6: Special Needs Education: Building an inclusive education and training system (WP6), which provided a framework for establishing a single education system for all learners in South Africa (DoE, 2001). The WP6 is designed to transform the South African educational system by building an integrated, education system that can systematically address barriers to learning. The WP6 is grounded in recognising and respecting learner diversity, and teachers as the primary resource in achieving inclusive education (DoE, 2001). It aims to equip teachers to address a wide range of learning needs. The overarching goal of the policy is to ensure that an inclusive and integrated approach to assisting learners is taken. It aims to achieve this through the establishment of full-service schools (FSS), the development of district-based support teams (DBST), converting special schools to resource centres and setting up a funding strategy (Donohue & Bornman, 2014).

In line with international trends, the WP6 embraces the shift from the medical model to the socio-ecological model by stressing the inequalities in all schools and banishing the concept of special needs education (Walton, 2011). It focuses on addressing barriers to learning, which refers to difficulties due to extrinsic or intrinsic factors, which hinder a child from learning (Engebrecht et al. 2015). Extrinsic factors relate to those 'outside' of the learner and include environmental, social and economic factors. Examples of extrinsic factors include dysfunctional family dynamics, violence, poverty, inflexible curriculum, poorly trained teachers, and unsafe school environments. Intrinsic factors relate to those 'inside' of the learner and are organic. Physical disabilities, chronic illness, traumatic experiences and developmental impairments are examples of intrinsic factors (Nel & Grosser, 2016). The interplay between intrinsic and extrinsic factors play a major role in the cause of LDs in South Africa.

Within the South African context, the prevalence of learning disabilities caused by socio-economic factors is substantial (Donohue & Bornman, 2014). Poverty is hugely detrimental to

the physical, social and emotional development of learners. Many children in South Africa live in overcrowded conditions without any access to basic services, are malnourished and are often exposed to high levels of crime and violence (Swart & Pettipher, 2016). The factors above have a severe impact on a child's learning process, contributing to the manifestation of learning disabilities. Pedagogical factors such as an inflexible curriculum, poorly trained educators, overcrowded classrooms and lack of learning support can severely affect the learning process (Meltz, Herman & Pillay, 2014). A lack of basic learning support material and resources, inaccessible environments, inadequate support services act as systemic barriers to learning, contributing to the increase to learners with learning disabilities (Nel & Grosser, 2016).

For success, individuals with learning disabilities require early identification and timely specialised assessments and interventions involving home, school, community and workplace settings (Mahlo, 2013). As set out in the SIAS (DoBE, 2014), the assessment process entails a systemic multi-dimensional approach, whereby learning disabilities are viewed holistically within a social-ecological paradigm. The goal of assessment is to establish the correct level of support required for the learner, and both diagnostic and curriculum-based perspectives must be used when assessing a child (Nel & Grosser, 2016). Revised in 2014, The National Strategy on Screening, Identification, Assessment and Support (SIAS, 2014) includes a specific protocol to assist teachers in the screening, identification and support of learners with barriers to learning. The SIAS includes information on individual support plans (ISP), various intervention strategies, assistive devices, collaborative learning and adaptations to the environment. Further to this, the SIAS document places emphasis on the collaboration between key role players such as teachers, parents, DBST, SGB and health professionals (Nel & Grosser, 2016). To further inform in the implementation process of inclusive education, various supporting guidelines have been rolled out in South Africa. These include The Guideline for Full-Service schools (DoE, 2009), which outlines an extensive criterion of roles and responsibilities of full-service schools equipped to support learners with a vast range of learning needs. The Guidelines for responding to Learner Diversity in the classroom through Curriculum and Assessment Policy Statements (DoE, 2011) aims to equip teachers with strategies further to best support all learners.

The WP6 recommends a continuum of support for learners who experience barriers to learning, which relies on the collaboration between different levels, namely national, provincial, district and school level. At a national level, the core duty of the Department of Basic Education is to formulate policies amongst educational stakeholders. The provincial education departments are then responsible for implementing these policies and developing district-based support teams (DBST) to support the policy implementation process. They are also responsible for matters such as resource development, the building of schools, financial matters and employment of teachers. The District-Based Support Team (DBST) comprises of highly-skilled professionals and is responsible for the coordination and provision of inclusive education training to schools within their district. This includes the distribution of resources, curriculum delivery, infrastructure development and addressing barriers to learning. The School-Based Support Team (SBST) comprises of teachers who work together with the DBST in the pursuit of an inclusive school environment (SIAS, 2014). Learners with low-intensive, moderate and high-intensive needs should receive support in separate institutions. Learners who require low-intensive support are placed in mainstream schools, learners with moderate needs are placed in full-service schools and those learners with high-intensive needs are placed in special schools or newly converted resource centres. Collaboration is an integral component of successful implementation of inclusive education. Aligned with the socio-ecological model, the assessment process is seen as multi-dimensional and holistic, and administered in a transparent, respectful manner which acknowledges the learner's particular context such as race, gender and home circumstances (DoBE, 2014).

Appropriate learning support is an essential component within an inclusive framework. Learning support can be viewed as the actions which increase the school's capacity to respond to barriers to learning (Walton et al., 2009). Learning support is aimed at preventing and minimizing barriers to learning, whilst mobilizing resources (Ainscow & Sandill, 2010). Learning support includes differentiation in instructional techniques strategies, extra lessons and academic mentoring (Engelbrecht, et al, 2016). Assistive devices, educational provisions and accommodations to accommodate the various needs of all learners are regarded as forms of learning support. Further to this, feeding schemes, psychological and medical services are

included (Engelbrecht, et al, 2016). The provision of Brainology instruction to learners with LDs is another form of support provided to learners with LDs in special schools in their preparation for placement in mainstream classrooms for inclusive education. In South Africa, the provision of the above mentioned examples of learning support is a collaborative effort and the success is contingent on the support at national, provincial, district and institutional levels (DoE, 2001).

3.9 SUCCESSES AND DIFFICULTIES

The Department of Education recognises the gains towards inclusive education in South Africa. The Progress Report in 2015 indicates that departments have exceeded the target of 500 full-service schools, with 793 full-service schools established across the country (DoE, 2015). The Stats SA General Household Survey findings from 2015 show that 99% of 7 to 15-year-old children were attending educational institutions. In addition, the establishment of 31 multi-disciplinary outreach teams across the nine provinces has been established. Each outreach teams consists of a psychologist, a speech therapist and social worker (DBE Revised Strategic Plan, DoE, 2015.)

Despite these successes, the stipulation for inclusive education to be implemented across schools in South Africa is hampered by a series of challenges. These challenges can be mostly attributed to the extreme inequality and unfair discrimination under the apartheid regime (Donohue & Bornman, 2014). Currently, exclusion and marginalisation is still taking place, especially for learners with learning disabilities (Shadaya & Mushoriwa, 2017). These learners either attend special schools or despite being part of a mainstream environment do not receive access to a full, quality education (Donohue & Bornman, 2014). This is largely due to lack of resources, inadequate funding, outdated teaching beliefs, overcrowded classrooms and negative attitudes towards inclusion (Walton, 2011). Further to this, the collaboration between the various support structures are not functioning as they should be. This has resulted in some schools using their own funds to employ private practitioners to assist learners (Meltz et al. 2016)

There is a lack of clarity, detail and structure in the policies is a major barrier in the successful implementation of inclusive education (Black-Hawkins, Florian & Rouse, 2016). There is a vast gap between policy and practice, and many discrepancies between the proposed vision for inclusion in schools and the actual reality of the current phase of implementation (Ainscow & Sandill, 2010). Based on the continuum of support recommended in the White Paper 6, teachers are orientated towards the medical approach in the identifying, diagnosing and supporting learners who experience barriers to learning (Swart & Pettipher, 2016),

The current curriculum and assessment policy (CAPS) being taught in South African schools goes against the flexibility that the inclusive framework requires to meet the diverse needs of learners (Walton, 2011). It is extremely rigid, content-loaded and leaves little time for consolidation. The quality of teaching is compromised, as teachers are forced to focus on meeting the curriculum requirements (Engelbrecht et al. 2015), instead of focusing on implementing diverse teaching strategies to meet the diverse needs of each learner.

While the notion of inclusive education appears to be an ideal model for South African education, many teachers have rejected the idea of inclusion in mainstream classrooms (Mahlo, 2013). This is especially true for those teachers trained under the deficit-medical model who believe that learners with disabilities should be taught separately. Although many teachers agree with the idea of inclusion, many feel that they do not possess the required knowledge to meet the diverse needs of the learners (Donohue & Bornman, 2014). This is compounded by the current standard of contemporary teacher training, which despite covering the essential aspects of inclusive education, it lacks practical strategies and vital skills in planning and executing lessons to effectively support learners with diverse needs (Engelbrecht et al. 2015). It is within this context that this study explored Brainology instruction in supporting learners with LDs. Specifically, the study addressed how learners with LDs understood themselves as learners following Brainology instruction at a specific primary school in Kwa-Zulu Natal.

3.10 CONCLUSION

This chapter presented on discourses informing inclusive education, support of learners with LDs in selected developed and developing countries and a review of literature structured around the sub research questions of the study. This included learners' perceptions of intelligence following Brainology instruction, learners' perceptions of their emotions and learning following Brainology instruction and learners' perceptions of their practical strategies to enhance learning following Brainology instruction. The following chapter presents the research methodology and design of the current study.

CHAPTER FOUR

RESEARCH METHODOLOGY AND DESIGN

4.0 INTRODUCTION

The current study sought to explore how grade four learners with learning disabilities in KwaZulu-Natal understand themselves following Brainology instruction. The previous chapter presented on discourses informing inclusive education, support of learners with LDs in selected developed and developing countries and a review of literature on the focus of the study structured around the sub research questions of the study. This chapter presents the research methodology and design. It covers the research paradigm, research approach, research design, setting, population, sampling, data collection, data analysis and ethical considerations, including trustworthiness. The research paradigm for the current study is discussed below.

4.1 RESEARCH PARADIGM

Research paradigms are perspectives or ways of looking at reality; they are the frames of reference researchers use to organise their observations and reasoning (Babbie, 2007). A research paradigm is often adjoined to terms such as philosophical worldviews (Mertens, 2010), broadly conceived research methodologies (Lincoln, Lynham & Guba, 2011) or as a whole system of thinking (Neuman, Assaf & Cohen 2012). Rubin & Babbie (2016) suggest that paradigms reflect the researcher's beliefs about the nature of reality, development of knowledge and their ethics and values. Therefore, a paradigm can be seen as the foundation of a study from which the researcher builds on. There are various research paradigms. These include the positivist paradigm, which is associated with quantitative research and is based on precise observation and measurement that is verifiable to obtain an objective truth (Rubin & Babbie, 2016). Critical realism is a subtype of positivism and involves looking at power in society

and also relies primarily on quantitative data. The emancipatory/transformative paradigm is associated with mixed methods and is shaped by social, political, cultural, economic, race, ethnic, gender and disability values (Lincoln et al. 2011).

The current study is explored through an interprevist paradigm. Interprevists seek to understand and interpret everyday events, experiences and social structures and the values that people attach to these phenomena (Rubin & Babbie, 2016). A central part of the study was to glean learners' perceptions of how they understood themselves as learners following the support of the Brainology Programme. The interprevist research paradigm, often referred to as the emic perspective or the 'inside' perspective seeks to understand peoples' living experience from the perspective of people themselves, (Hennink, Hutter & Bailey, 2011). Thus, the interprevist paradigm allowed for the learners' perceptions of how they understood themselves as learners to be prioritised.

The methodological assumption of the interpretivism is that the chosen methodology can express the assumptions of the interpretivist researcher in being able to satisfy the purpose of the study, which is an attempt to understand and explore human experiences (Rubin & Babbie, 2010). The multiple realities of interpretivism inform the research process. Thus, the approach tends to be qualitative, and common research designs include ethnography, phenomenology, case study and grounded theory (Creswell, 2012). The researcher plays the central role in the implementation of the study and collects most of the data, research questions are open-ended, data collection is done in the participant's natural settings, analysis is inductive and data collection tools such as interviews, focus groups and observation are used. Ethical considerations are of high importance alongside the interprevist assumption related to the subjective nature of research (Merriam & Tisdell, 2015). The current study employed a qualitative single case study design using focus group interviews and participant observation to collect data in the learners' classroom. Thematic analysis was employed, and ethical considerations were of high priority during the study.

The epistemological assumption of interpretivism is that knowledge is built through developing ideas from observed and interpreted social constructions (Rubin & Babbie, 2016). I was able to

engage with developing data by observing and interpreting the learner's responses from the participant observation data and focus group interview data to gain an in-depth understanding of how the learners understood themselves as learners following Brainology instruction.

The ontological assumption of the interprevist paradigm is that there are multiple realities which are shaped and nuanced by participant views, values and aims of the researcher (Creswell, 2012). Multiple subjective realities were socially constructed through the focus group interviews between myself and the learners during the implementation of the Brainology Programme. I was able to draw and interpret meaning from their "realities" as a group and how they understood themselves as learners through these focus group sessions.

The axiological assumption of the interprevist paradigm is that data is value-bound and subjective, and the researcher's interpretation reflects his/her motives and beliefs (Savin-Baden & Major, 2013). I embraced the subjectivity of the learners' experience of the Brainology programme by acknowledging that my motives, inherent bias and beliefs were socially constructed and would ultimately reflect in the interpreted data.

4.2 RESEARCH APPROACH

There are different research approaches. These include the quantitative approach, qualitative and mixed-method approach. The quantitative approach is associated with a positivist paradigm, which assumes a single, objective reality and seeks to establish relationships between measured variables with the researcher remaining detached to avoid bias (McMillan & Schumacher, 2010). In contrast, the qualitative approach is associated with the interprevist paradigm assumes multiple, subjective realities and seeks to gain an understanding of a particular social situation with the researcher usually becoming immersed in the setting (Merriam & Tisdell, 2015). The mixed-method approach combines both qualitative and quantitative features (Creswell, 2012). The current study employed the qualitative research approach to fulfil the main research question.

The qualitative research approach aims to discover how people make sense of their world and the meanings that individuals attach to situations, processes and relationships (McMillan & Schumacher, 2010). The qualitative approach enabled me to gain insight into the learners' world and the meanings they attached to their understanding as learners before, during and after Brainology instruction. Qualitative research usually occurs in the participants' natural settings (Madrigal & McClain, 2012), where the focus is on the participants' perceptions and interpretations (Merriam & Tisdall, 2015). Employing the qualitative approach enabled me to immerse myself in the learners' natural setting, their classroom, and allowed me to focus on their perceptions and interpretations throughout the implementation of the Brainology programme.

Qualitative data is the product of a process of interpretation through the use of open-ended data collection methods and inductive analysis methods (Merriam & Tisdall, 2015). The data was gathered through participant observation and focus group interviews and analysed using thematic analysis. In qualitative research, the researcher is seen to play an active role and is a key instrument in the study (Creswell, 2014). As the researcher, I was an active participant in the implementation of the study, being the key instrument in all phases, including the collection and analysis of the data. Qualitative research is inherently subjective where the researcher aims to present an in-depth detailed narrative of the phenomenon under investigation (Patton, 2015). As the researcher/educator of the learners participating in the Brainology programme, the qualitative approach allowed me to acknowledge and embrace my inherently subjective input, and present the findings in a narrative, detailed format with this awareness explicitly outlined from the outset of the study. My understanding and generalisations were grounded in the data that was collected and analysed. Data took the form of words rather than numbers.

The current study acknowledged the disadvantages of qualitative research, including the lack of transferability, low reliability and researcher inherent bias, (Creswell, 2014). Despite these disadvantages, the qualitative approach was deemed most suitable and necessary in gaining an understanding of how learners understand themselves as learners following Brainology instruction. Further to this, many of these disadvantages were combatted through triangulation

of data collection methods and through the use of a reflective journal (see section 4.10 on Trustworthiness).

4.3 RESEARCH DESIGN

Research design refers to the way a research study is planned and conducted (McMillan & Schumacher, 2010). A research design can therefore be viewed as a holistic and systematic plan which details the conditions and methods for carrying out a research study. There are various research designs commonly associated with the qualitative approach. These include ethnography, which focuses on a particular culture or social system; phenomenology, which describes lived experiences and grounded theory; which examines a phenomenon related to theory (Patton, 2015). The current study was planned and conducted based on a single case study design.

A single case study research design is an analysis of a single case intended for an in-depth exploration of an individual, a group, an activity, event or programme (Creswell, 2012). This study intended to understand how a single group of grade four learners with learning disabilities in KwaZulu-Natal understand themselves as learners following Brainology instruction. Similarly, Yin (2017) describes a case study as an in-depth exploration which seeks to explore, describe, or explain events or phenomena in a real-world context. The study sought to explore, describe and explain how a group of grade four learners understand themselves as learners following Brainology instruction within their natural setting, their classroom. A single case study can therefore be perceived as a research design that allows researchers to explore certain phenomena within an authentic context using a variety of data collection strategies.

In a case study research design, the case or unit of analysis refers to a phenomenon under investigation within a bounded context (Miles & Huberman, 1994). In this study, the phenomenon under investigation was how learners understand themselves as learners following Brainology instruction. A single case study research design is often bound by time and activity (Denzin & Lincoln, 2011). The current study was bound by the time of 6 weeks and was bound by the activity of the Brainology programme. The setting of the study can also bind a

case (Yin, 2017). Data collection was bound to a primary school in KwaZulu-Natal, which focuses on learning support in preparation for learners returning to mainstream/inclusive schooling. A single case study research design collects detailed information using a variety of data collection procedures over a sustained period (Miles & Huberman, 1994). Data collection was implemented through the use of participant observation, focus group interviews and a reflective journal over the six-week Brainology programme.

Qualitative researchers should openly acknowledge both the strengths and weaknesses of a single case study research design (Yin, 2017). Considering both the strengths such as empirically-rich, context-specific, holistic accounts, as well as the weaknesses such as methodological rigour, related to researcher bias, generalizability and external validity (Merriam & Tisdell, 2015), the use of a case study design for the current study was deemed a sufficient method to gain an in-depth understanding of how learners understood themselves following Brainology instruction.

4.4 SETTING

The current study took place at a Co-educational Government Primary School in KwaZulu-Natal, South Africa. The school constitutes 892 learners and 114 staff members, which includes teachers, interns, therapists, administration and maintenance staff. The school is planned as a short-term learning support centre (previously known as remedial education) from Grade R through to Grade 7 where learners with LDs are taught by specialised staff trained in employing learning support strategies in the classroom. Learners that attend this school require learning support in various learning areas and have been formally diagnosed with one or more learning disability. Learners attend this school for 2-3 years before returning to the inclusive classroom context. The school follows the South African curriculum (CAPS) whereby a high level of learning support is provided to assist the learners with learning disabilities. Class sizes are no more than fourteen per class, providing an optimal teacher-learner ratio where learning disabilities can be addressed efficiently. Each classroom is fitted with a computer connected to the internet – which is utilised by both educators and learners. Learners attend both speech

therapy and occupational therapy on-site, and internal counselling support is offered for emotional difficulties.

Brainology was introduced to the school at a workshop in May 2016 as a form of additional support to encourage grade four to seven learners to adopt a growth mindset. This transpired after the principal had attended a growth mindset conference in Cape Town in early 2016. Each educator received a Brainology guidelines pack and attended a 1hour training session on how best to implement Brainology in the classroom. Most of the educators felt inspired by the programme. Since the learner participants in the current study were in grade four, this was the first time that they had received the support of the Brainology programme.

4.5 POPULATION

In research, population refers to all the people or subjects about whom the study is meant to generalise (Jackson & Mazzei, 2008). All individuals or objects of a chosen population usually have a common, binding characteristic or trait (Mertens, 2014). A research population can therefore be seen as a group of people of which a study seeks to apply to its findings. The population of this study is grade four learners with LDs in South Africa.

4.6 SAMPLING

In qualitative research, purposive or non-probability sampling is employed. Purposive sampling relies on the researcher's judgement when selecting the sample group, as researchers intentionally select individuals from the population to allow for an in-depth understanding of the phenomenon (Patton, 2015). Sampling can therefore be seen as the process of selecting individuals from the chosen population that will best inform the research question in a study. To do this, a sampling technique is used. Various purposive sampling techniques include extreme sampling, snowball sampling and theory-based sampling (Savin-Baden & Major, 2013).

The current study utilised the homogeneous sampling strategy to select the learners. In homogeneous sampling, the researcher selects participants that have similar and defining

characteristics such as age, gender or background (Patton, 2015), and is often used when the research question is specific to the characteristics of the particular group of individuals (Creswell, 2012). Also, researchers employ the homogeneous sampling technique when they want to gain an in-depth understanding of a particular group (Savin-Baden & Major, 2013). The research question of the study focused on the age, grade and location of participants and set out to gain an in-depth understanding of how grade four learners with learning disabilities understood themselves as learners following Brainology instruction. An additional feature of the homogeneous sampling technique is that it is often used in focus group research (Patton, 2010). Focus group interviews were used in the current study. According to (Creswell, 2012) homogeneous samples tend to be small. This study used a small sample of thirteen learners (nine males and four females) in grade four who attend a primary school in Kwa-Zulu Natal, are between 9 and 10 years of age and had been diagnosed with one or more learning disability by a professional. Learners in the sample group speak English as their first language. Two learners made the transition from mainstream schools to learning support this year, while the rest are currently in their second year at the school. Learners in the sample group have been diagnosed with varied learning disabilities. These include Attention-Deficit Disorder (ADD), Attention–Deficit-Hyperactive Disorder (ADHD) and Dyslexia.

4.7 DATA COLLECTION INSTRUMENTS

Data collection instruments are the tools that allow researchers to collect the data that they require (Savin-Baden & Major, 2013). There are various data collection instruments, including questionnaires, formal interviews, observation, and focus groups. This study made use of participant observation and focus group interviews. A reflective journal was also used (see section 4.10.4). These instruments are discussed below.

4.7.1 PARTICIPANT OBSERVATION

Observation has been used in a variety of disciplines as a tool for collecting data about people, processes, and cultures in qualitative research (Merriam & Tisdell, 2015). The current study

utilised participant observation as its primary data collection tool in gaining an understanding of how learners with learning disabilities understand themselves following Brainology instruction. Participant observation can provide the researcher with "inside" viewpoints and authentic data (McMillan & Schumacher, 2010). Participant observation enabled me to gain first-hand responses from the learners on how they understood themselves as learners following Brainology instruction. In participant observation, the researcher records observations whilst immersed in the participants' natural setting (Jorgenson, 2015). I became fully immersed with the learners as they proceeded through each interactive Brainology session. During the Brainology sessions, I sat with the learners, and I was able to record my observations (see below for information on the observation schedule that was used). Observational roles depend upon rapport with the participants, their level of comfort at the site, and how the data can be best collected to satisfy the research question (Conrad & Serlin, 2011). Due to my dual role of researcher/educator, the learners felt comfortable in their own classroom and in voicing their thoughts to me, a familiar face.

An observation schedule was used in the current study (see Appendix A). An observation schedule is prepared before data collection and is usually structured around the various behaviour and or/responses to be observed and recorded (McMillan & Schumacher, 2010). I prepared the schedule beforehand. An observation schedule should contain practical details relating to the date, site, length of observation, and the main focus of the observation session (Creswell, 2012). As there were 6 Brainology sessions in total, including the pre-Brainology and post-Brainology sessions, six schedules were prepared. Each schedule contained the details relating to the date, classroom setting and length of session and the main topic for the particular Brainology session. Observation schedules serve to highlight the key points of observation, with associated topics of interest (Merriam & Tisdell, 2015). To best gain an understanding of how learners understood themselves as learners following Brainology, each schedule was structured in a grid format which contained Dweck's (2012) characteristics of a growth and a fixed mindset, which align with the theoretical framework of this study, the theories of intelligence. These included beliefs about intelligence, effort, goal setting and response to challenges.

4.7.2 FOCUS GROUP INTERVIEWS

The current study used focus group interviews to gain an understanding of how grade four learners with learning disabilities in KwaZulu-Natal understand themselves following Brainology instruction. There were six focus group interviews in total. These included the pre and post Brainology interviews.

Focus group interviews are used to gain a better understanding of an assessment of a problem, new programme, product or idea (McMillan & Schumacher, 2010) and used to collect data on a specific topic. Mertens (2014) suggests that focus group interviews look to collect shared responses from a group of homogeneous individuals, which help to understand a specific problem from the viewpoint of the participants. In the current study, the focus group interviews took place in the learners' classroom, and I was able to draw the collective responses from the learners as a class and individual learners' opinions relating to how they understood themselves as learners. Focus group interviews allow members of the group to be stimulated by one another's ideas and opinions, which enables the researcher to gather rich data (McMillan & Schumacher, 2010). Learners were engaged in conversation, similar to that of a class discussion, allowing me to gather data relating to how they understood themselves as learners following Brainology instruction. Creswell (2012) notes that reserved or anxious individuals may be intimidated by assertive, more confident individuals resulting in one person dominating the discussion. To combat this, I exercised my skills as an experienced educator to manage and facilitate the discussion where I ensured that the quieter members of the group were able to voice their opinions. In focus group interviews, unexpected conflicts, power struggles, and other unforeseen group dynamics may inhibit discussion (Patton, 2015). To ensure the focus groups ran smoothly, at the start of each focus group interview, the rules were discussed beforehand so that each learner was aware of the boundaries. These included putting up your hand to speak and respecting each other's opinions. Majority of the learners found it easy to abide by these ground rules, as the same rules apply in a classroom environment.

Focus group interviews tend to be informal, whereby the questions are open-ended and sequenced in a natural flow (Creswell, 2012). The interview protocol included open-ended, semi-structured questions that focused on how learners understood themselves as learners following Brainology instruction. Focus group interviews usually revolve around a prompt/stimulus to focus the discussion (Denscombe, 2014). In this study, the main topic of the Brainology unit served as the stimulus. Focus group interviews are noted for techniques such as probing, clarification and paraphrasing than structured question formats (McMillan & Schumacher, 2010). I used open-ended questions such as "What was your favourite part of that Brainology unit?" or "How did that unit make you feel?" I was able to pose follow up questions and probe for further information from these types of questions. In addition, I sought clarification by paraphrasing what learners had said.

An interview guide (Appendix B) was used in the implementation of the focus group interviews. In the pre-Brainology session, I based the questions on Dweck's (2012) main characteristics of a fixed and growth mindset. These included intelligence, challenges, effort, emotions, mistakes and failure. I intentionally did not write any questions down, but instead noted these key characteristics, as I did not want the learners to feel as if they were being formally assessed in any way. Questions such as the following were used in the pre and post Brainology focus group interviews:

- What is your favourite part about school?

- What does it mean to be intelligent? Can intelligence change? What if you are born "smart" – can you get "smarter?"

- When you see a slightly difficult task, how do you feel?

- When a teacher points out your mistakes – how do you feel?

- What do you do when a task requires a lot of work?

In the four sessions following the introductory session, I relayed questions about the Brainology Unit. The questions were open-ended and were aimed at eliciting responses relating to the learners' feelings, ideas and opinions related to the concept that was covered during the

Brainology unit. I wanted to glean information about how learners understood themselves as learners. In the post Brainology session, I once again based questions related to Dweck's (2012) mindset characteristics so that I could gain an understanding of how learners understood themselves as learners following Brainology instruction.

Additional details relating to each focus group interview, including the pre and post Brainology focus group interviews are presented in the following chapter.

4.7.3 REFLECTIVE JOURNAL

The current study used a reflective journal to gain an understanding of how grade four learners with learning disabilities in KwaZulu-Natal understand themselves following Brainology instruction. A reflective journal contains an ongoing record of the researcher's experiences, reactions, and emerging awareness of any assumptions or biases, which are then consciously incorporated into the analysis (Hammersley & Traianou, 2012). In my reflective journal, I was able to generate data by including details relating to the learner participant's responses and behaviour. In addition, I included any inherent bias, assumptions and justifications for decisions made during the study, including the analysis of the findings (see Appendix C).

The table below presents an overview of data collection.

TABLE 6: DATA COLLECTION OVERVIEW

DATA COLLECTION METHOD	DATA COLLECTION PERIOD		
Participant Observation	Ongoing throughout Brainology 03/10/16 – 18/11/16		
Focus Group Interviews (6 in total)	Pre Brainology	03/10/16	12:30pm
	Post Brainology	18/11/16	12:30pm
	Brainology session 1	14/10/16	12:10pm
	Brainology session 2	21/10/16	12:10pm
	Brainology session 3	28/10/16	12:10 pm
	Brainology session 4	04/11/16	12:10pm
Reflective Journal	Ongoing throughout Brainology 03/10/16- 18/11/16		

4.8 DATA ANALYSIS

In qualitative research, data analysis is an ongoing process that involves breaking data into meaningful parts to communicate to the reader what has been learned (Savin-Baden & Major, 2013). According to Conrad & Serlin (2011), data analysis is a systematic search for meaning – one that involves organising and interrogating the data into categories, themes, patterns and codes. Data analysis can therefore be seen as the beginning of becoming immersed in the data that has been collected in pursuit of satisfying the research question. Thematic analysis to understand how learners understand themselves following the support offered by the Brainology programme. Guided by Braun & Clarke's (2006) six-phase framework, thematic analysis was carried out concurrently with the data collection process.

Table 7 sets outs out the thematic analysis procedure as recommended by Braun & Clarke (2006) alongside the actions that were carried out during the current study.

TABLE 7: THEMATIC ANALYSIS PROCEDURE

Phase	Description	Action
PHASE ONE	**Familiarisation with the data**	To begin, I read and re-read the collected data from the observations, focus group interviews and my reflexive journal. I made two photocopies of the entire set of handwritten data. This first initial phase took place over two weeks, where I immersed myself in the data. This helped me to get a good "sense" of the data. I took a holistic view as I wanted to gain a glimpse into the "bigger picture" of what my data could reveal. I jotted side notes and highlighted aspects of the data that aligned with the research question. In a notepad, I jotted down two broad themes, namely learning support strategies and learners' enthusiasm towards Brainology.
PHASE TWO	**Generate Codes**	In the second phase I aimed to generate codes. Coding assists researchers in searching for data, making comparisons and identifying patterns (Creswell, 2012). To start the coding process, I kept the pre-Brainology data separate from the Brainology sessions and Post Brainology. I did this so that I would be able to present any changes in the learners' comments and behaviour following Brainology. Codes tend to relate to themes, topics, ideas, phrases and keywords. I underlined phrases and keywords in relation to my research question and the theories of intelligence framework. I also kept an eye out for learners' responses typical to that of a growth and fixed mindset based on Dweck (2012). Once I had reduced the data, I started to

		highlight words of similar meaning and words that came up often. I noticed that many of the codes correlated with the content of the Brainology sessions. These included words relating to intelligence (red), practice/effort beliefs (green), emotions (blue) and practical strategies to learn (yellow). I then transcribed each set of "colours" and continued my analysis from my laptop.
PHASE THREE	**Searching for themes**	From my laptop, I actively searched for patterns within each of the five coded groups. With the research question in mind - I sorted these codes into three broad themes, each with their respective sub-themes. 1. <u>Intellectually Equipped</u> • Dynamism of Intelligence • Practice Beliefs • Interest Level 2. <u>Emotionally Equipped</u> • Emotions and Learning • Management of Emotions 3. <u>Practically equipped</u> • Practical Strategies to Enhance Learning • Brain Health
PHASE FOUR	**Reviewing themes**	I reflected and reviewed the themes based on the main research question and its sub research questions. To ensure dependability was achieved, I applied the code-recode procedure (Savin-Baden & Major, 2013) in which I started the coding process from the beginning with a new set of data – which I printed out. I began the cycle again and used the same colour coding system. I found this to be extremely valuable as I was able to get an increased sense of the data as a whole. I was able to generate more initial, detailed segments that fitted into the code groups. After that was complete, the themes were reviewed once again.
PHASE FIVE	**Defining themes**	I further investigated the themes by identifying their essence and purpose in relation to my research question. I began to visualise how best to report my findings. I began to see how the three main themes would be presented in a Pre Brainology section and a Post Brainology section. This was done to present the changes in the learners' responses and behaviour before and after the intervention. This would aid for a clear and concise presentation of the interpreted data.
PHASE	**Reporting the**	In the final phase, the analysed data was presented in a report separated

SIX	findings	into Pre and Post Brainology sections, and anchored by existing literature (see next chapter). Finally, limitations and recommendations for future research were presented.

4.9 ETHICAL CONSIDERATIONS

Ethical considerations embody good research practice and should always be taken into account when carrying out research (Savin-Baden & Major, 2013). Ethical considerations embody the "truth" of the researcher's actions and decisions and therefore are an essential part in the research process. The ethical considerations relating to permission, informed consent, confidentiality and anonymity, protection from harm and trustworthiness are discussed below.

4.9.1 PERMISSION

Researchers need to secure the approval of the gatekeepers and participants before the study commences (Ary et al. 2018). I sought written ethical clearance from the Ethics committee of the University of South Africa. To do this, I completed an ethical clearance application whereby ethical clearance was granted (see Appendix J). Next, I sought and secured written approval from the KwaZulu-Natal Department of Education via email communication (see Appendix F). Lastly, I sought permission from the principal of the institution who was identified as the gatekeeper. To do this, I made an appointment with the principal in her office. Key factors that were discussed included the length of study and practicalities relating to Brainology Programme. The meeting went well, and official written clearance to use the research site was secured (see Appendix G).

4.9.2 INFORMED CONSENT

Informed consent demands that the researcher informs the participants of all possible risks and benefits that may arise before their participation in a study (Conrad & Serlin, 2011). Parents/legal guardians of the learners were made fully aware of the possible risks and

benefits. A potential risk was that because it was a group activity- some learners may feel hesitant in sharing their thoughts. Similarly, some learners may not gain the full impact of the Brainology Programme due to it being a group activity as opposed to an individual one. The benefits included learners adopting a growth mindset, (this term was explained in detail to the parents), learning practical study tools and learning how to deal with negative emotions such as anxiety when faced with difficult tasks.

Informed consent demands that participation in the study is strictly voluntary, and participants may withdraw at any time (McMillan & Schumacher, 2010). The parents and the learners were made aware of the voluntary nature of the study and that they could withdraw at any time. Informed consent demands that the purpose of the research be clearly explained, and any objections to participating in the study must be respected (Creswell, 2014). The parents each received a "Brainology Pack" – which explained the programme and the procedure of the study. The website address (www.mindsetworks.com) was also given to them, and they were encouraged to look online. Included were details relating to when the learners would be participating in the Brainology sessions and the length of the study. The parents showed a genuine interest in the details of the Brainology Programme. The parents were pleased to hear that the Brainology encourages a growth mindset in learners, and were pleased that the programme might equip their child in tackling difficult tasks. There were no objections and informed consent was given by the parents, and child assent was given by the learners (see Appendices H and I for parent consent and learner assent letters).

4.9.3 CONFIDENTIALITY AND ANONYMITY

Confidentiality relates to the protection of the data being collected, stored and reported (Patton, 2015). In the current study, the collected data was stored in a secure cupboard both in my classroom and in my home. Electronic data was stored on a password-protected laptop. Anonymity refers to the practice of not associating participants' names or any other information that could reveal their identity (Ary et al. 2018). Since the purpose of the study was to gain a sense of how a group of grade four learners with learning disabilities in KwaZulu-Natal

understand themselves as learners following Brainology instruction, learner's names were not used in the data collection or the analysis process. Instead, pseudonyms 'learner one' through to 'learner thirteen' were used. For efficiency, 'L1' through to 'L13' were used when collecting data.

4.9.4 PROTECTION FROM HARM

In research, participants should never be exposed to physical or psychological harm (Leedy & Omrod, 2013). In addition, it should be conveyed to participants that their safety is of paramount importance to the researcher (Patton, 2015). I conveyed this message to the learners and ensured that they understood that both physical and emotional safety was important to me. During the Brainology sessions, I encouraged them to speak to me if at any time they felt uncomfortable. In the current study, the learners were not exposed to harm, nor did the topic of the study require sensitive or personal information.

4.9.5 HONESTY WITH PROFESSIONAL COLLEAGUES

Researchers should strive to report their research with complete honesty, and under no circumstances should data be fabricated or misrepresented to support a particular conclusion (Leedy & Ormrod, 2015). Further to this, researchers should not deceive colleagues, granting agencies, or the public (Patton, 2015). I undertook each phase of the study with complete honesty and integrity. In addition, the four pillars of trustworthiness (Lincoln & Guba, 2005) were employed. These are discussed below.

4.10 TRUSTWORTHINESS

Trustworthiness is a method of ensuring rigour in qualitative research (Silverman, 2011). Trustworthiness is when the research can be trusted and that it is conveyed appropriately in a truthful manner. According to Lincoln & Guba (2005), there are four main criteria that underpin

trustworthiness in qualitative research, namely credibility, dependability, transferability and conformability. To uphold trustworthiness in the current study, the following strategies were put in place.

4.10.1 CREDIBILITY

Credibility is concerned with the confidence that can be placed in the research findings (Hammersley & Traianou, 2012). Readers should feel assured and not feel doubtful about the findings of a study. Triangulation is a technique used to enhance the plausibility of the findings, which involves collecting data from multiple sources of information, individuals or methods of data collection (McMillan & Schumacher, 2010). Triangulation was employed whereby data was collected through participant observation, focus group interviews and my reflective journal. Member checking can assist in enhancing the credibility of the findings and involves asking the participants to check the accuracy of the data (Creswell, 2012). Before and after each focus group interview session, I administered a feedback session whereby I repeated the analysed data to ensure that I had correctly interpreted the learner's responses before drawing up my final report. Prolonged engagement is another strategy to enhance credibility, and involves the researcher and participants spending an extended amount of time at the research setting (Lincoln & Guba, 2005). I was able to invest sufficient time in the setting, which allowed me to deepen my understanding of the learner support classroom context and to build further trust with the learners.

4.10.2 DEPENDABILITY

Dependability refers to the consistency and stability of the findings (Ary et al. 2018). To achieve dependability in a study, the research processes should be reported in detail, thus enabling another researcher to replicate the study (Lincoln & Guba, 2005). Details relating to the research design, and the implementation of data collection methods are presented (See above and Chapter 1). Emphasis was placed on the particular classroom setting and intricate details

relating to the procedure of the Brainology Programme. All components of the research process from the identification of the research questions leading up to the final reporting of the findings were presented clearly and concisely.

4.10.3 TRANSFERABILITY

Transferability refers to the extent to which researchers would be able to apply the findings of the study to their research (Ary et al. 2018). To achieve transferability in a study, a full description of the context must be presented so that readers may compare the findings to another setting (Lincoln & Guba, 2005). In the current study, a detailed description of the classroom context in which the research was carried out was presented. Included was information detailing the sample, sample size, sample strategy, demographics, inclusion criteria, participant observation strategy, focus group interview procedure and topics for each Brainology session. According to Creswell (2012), it is important that the phenomenon under investigation is presented so that readers may gain a sufficient understanding of the phenomenon and be able to compare it to other studies. In the current study, learner behaviour and responses are presented in a pre-Brainology and post-Brainology format to aid understanding (see chapter five). Particular emphasis was placed on how the grade four learners with LDs understand themselves following Brainology instruction.

4.10.4 CONFORMABILITY

Conformability relates to the concern of objectivity and neutrality in the data (Ary et al. 2018). The interpreted data must be grounded in the data and not the researcher's opinion. To ensure confirmability in a study, qualitative researchers must practice reflexivity throughout the research process (Tracy, 2010). Reflexivity refers to rigorous self-scrutiny by the researcher and is concerned with inherent bias, values and assumptions of the researcher, the text and the participants (Leedy & Ormrod, 2014). One way to practice reflexivity is to use a reflective journal (Marshall and Rossman, 2011). A reflective journal contains an ongoing record of the researcher's experiences, reactions, and emerging awareness of any assumptions or biases,

which are then consciously incorporated into the analysis (Hammersley & Traianou, 2012). In my reflective journal, I included details relating to the learner participant's responses and behaviour, my inherent bias, assumptions and justifications for decisions made during the study, including the analysis of the findings (see Appendix C).

4.11 CONCLUSION

This chapter has outlined and justified the chosen research methodology and design, which was implemented in the current study. This included the research paradigm, research approach, research design, setting, population, sampling, data collection, data analysis and ethical considerations, including trustworthiness. The subsequent chapter presents the data presentation and analysis.

CHAPTER FIVE

DATA PRESENTATION AND ANALYSIS

5.0 INTRODUCTION

The current mini-dissertation sought to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction. The previous chapter presented the research methodology and design of the present study. The current chapter presents and analyses data collected using pre-intervention and post-intervention focus group interviews, reflective journal and participant observations of a sample of 13 grade four learners with LDs purposively selected from a special primary school in KwaZulu-Natal that provides various interventions including Brainology instruction to these learners. The provision of various interventions to learners with LDs at the institution is founded on learner support that underpins the implementation of inclusive education in South Africa and globally. Data analysis was thematic (Braun & Clarke, 2006) and was carried out concurrently with data collection. Specifically, this study addressed the following main research question and its sub research questions:

MAIN RESEARCH QUESTION

How do grade four learners with learning disabilities at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction?

SUB RESEARCH QUESTION

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu-Natal perceive their intelligence following Brainology instruction?

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their emotions and learning following Brainology instruction?

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their practical strategies to enhance learning following Brainology instruction?

The following section presents and analyses the biographical details of individual participants drawing from the above-mentioned data collection instruments used in the study. Thereafter, the themes and sub-themes around which data is presented and analysed are organised, using the sub research questions of the study as the organising framework and presented. The three themes are: Intellectually: I can develop my intelligence; Emotionally: I know how to manage my emotions and Practically: I know how to enhance my learning.

5.1 BIOGRAPHICAL DATA OF THE PARTICIPANTS

This section constitutes profiles of the individual participants to assist the reader in understanding each learner as an individual. The information was drawn from the focus group interviews, reflective journal and participant observations that were used to collect data. Following is a presentation of each learner using their pseudonyms (L1- L13) to ensure their anonymity and confidentiality.

L1 was a male grade four learner with LDs. He was seen to have excellent general knowledge and a love for reading. He was an active participant in the Brainology sessions and appeared to engage with the content, although during the focus group interviews, he sometimes tended to appear hesitant in sharing his opinion. When probed, he became flustered. Upon reflection, it appeared that he wanted to get the answer "correct." It was noted in my reflection journal that L1 struggled to focus, and found it difficult to sit still during the Brainology sessions.

L2 was a male grade four learner with LDs. He was seen to sit quietly at the back and preferred other learners to "take the lead." Although, during the focus group interviews, he was confident in sharing his thoughts with the other learners. He engaged with the Brainology

sessions, although it was observed during the interactive component of Brainology that his reading was extremely weak. It was noted in my reflection journal that L2 was seen to be extremely aware of his learning difficulties and seemed to shy away from all reading-related activities.

L3 was a male grade four learner with LDs who was seen to take an active role in the Brainology sessions and the focus group interviews. During the duration of the study, he was eager for the Brainology session to begin and appeared sad when the session was over. He was comfortable being vulnerable in front of his peers and sharing what he struggled with. His peers seemed to respect his opinion and listened when he spoke. It was noted in my reflection journal that L3 appeared motivated to succeed in the interactive Brainology activities.

L4 was a male grade four learner with LDs who exhibited unpredictable behaviour throughout the Brainology programme. At times, he appeared engaged with the programme and seemed to enjoy the interactive nature of Brainology, while at other times he appeared bored, disinterested in the topic, asking "How much time is left?" His attention span was short, and at times he distracted his peers. It was noted in my reflection journal that L4 struggled to persist through the challenging activities that Brainology offered, and did not work well in pair or group activities.

L5 was a male grade four learner with LDs who appeared to enjoy both the Brainology sessions and the focus group interviews. He appeared well-liked by his peers, cheerful, optimistic and a keen participant in sharing his ideas and thoughts. He experienced difficulty in reading and processing auditory instructions. It was noted in my reflection journal that L5 often had to be re-directed to the task at hand, as he often spoke of unrelated events such as his sister's birthday party or a mosquito bite that he had acquired the night before.

L6 was a female grade four learner with LDs who exhibited signs of being highly anxious. She was seen to constantly pull her hair during the Brainology sessions and did not willingly offer her opinion during the focus group interviews. Once prompted, however, she shared some insightful comments. She struggled to retain an adequate level of focus, and thus at times did

not engage with the interactive Brainology activities. Notes in my reflective journal reflected L6's high levels of anxiety throughout the intervention.

L7 was a female grade four learner with LDs who quietly engaged with the Brainology programme. It was noted that she seemed to enjoy pair work as opposed to individual work or group work. During the focus group interviews, she appeared anxious when she spoke and spoke in a very low voice. She was seen to give her best when asked to participate, although required reassurance and encouragement throughout the Brainology programme. Notes from my reflective journal were directed at L7's willingness to learn and conscientious approach.

L8 was a male grade four learner with LDs who displayed perseverance throughout the Brainology programme, despite it being evident that he experienced difficulties in his learning, particularly in language activities. His spoken language was exceptionally weak. During the focus group interviews, he appeared aware of this difficulty and behaved in a hesitant manner, requiring reassurance and encouragement. My reflective journal highlighted L8's clear intention of wanting to learn more, despite the challenges that he faced.

L9 was a female grade four learner with LDs. She wore thick glasses and wore a personal FM system to assist her with auditory processing difficulties. It was noted that she struggled to concentrate for extended periods. She was an excitable, curious learner who appeared to enjoy working together with her peers. During the focus group interviews, she was confident in expressing her thoughts on the Brainology topic, although she often had to be re-directed towards the topic of the discussion. My reflective journal notes depicted L9 to hold strong leadership qualities and be popular among her peers.

Learner 10 was a female grade four learner with LDs who was an active participant during the Brainology programme. It was noted that she was an avid reader with a book always by her side. At times, she appeared bored and a little distracted. During the focus group interviews, she displayed erratic focus. It was noted in my reflective journal that L10 required encouragement to participate in the Brainology activities, as she would have preferred to be reading.

L11 was a male grade four learner with LDs who was eager to please and get the "correct" answer – often trying to quote word for word what Brainology had covered in that particular session. It was noted that he appeared intrigued by the Brainology sessions and looked forward to each session. He was an active participant during the focus group interviews and appeared confident in sharing his academic struggles, particularly mathematics. Notes from my reflective journal highlighted L11's steadfast interest in learning more about the brain, despite his obvious difficulties when learning new concepts.

L12 was a male grade four learner with LDs who was exceptionally motivated to learn everything he could. Although when asked to share his opinion during the focus group discussions, he became flustered and a little tearful and at times chose not to comment. Notes from my reflective journal reflected L12 to be exceptionally helpful as he appeared to enjoy the digital aspect of the Brainology sessions and often asked to assist in setting up the projector/laptop equipment.

L13 was a female grade four learner with LDs who initially appeared to have little confidence in her abilities. Although it was noted that as the Brainology sessions progressed, she showed increased confidence during the focus group discussions and appeared to enjoy sharing her opinion with her peers. It was noted in my reflective journal that L13 was a keen participant in the interactive Brainology activities, especially in the later sessions.

5.2 PRE- AND POST-INTERVENTION FINDINGS

This section constitutes a presentation of pre and post-intervention findings. Data presentation and analysis revealed three major ways that the participants of the study understood themselves as learners following Brainology instruction. This section will demonstrate that the learners understood themselves as being intellectually equipped; learners understood themselves as being emotionally equipped, and learners understood themselves as being better practically equipped, as illustrated in Figure 4 below.

Brainology Instruction   **Learner Understanding**

Intelligence is malleable   I can develop my intelligence

Emotions impact on learning   I know how to manage my emotions

The performance of the brain can be   I know how to enhance my learning
optimised

FIGURE 4: OVERVIEW OF FINDINGS

5.2.1 THEME 1. Intellectually: I can develop my intelligence

The first sub-research question explored how grade four learners with LDS understood their intelligence following Brainology instruction. This constitutes the first theme of the findings of the study. It emerged that following Brainology instruction, learners with LDs reported that they understood themselves as having gained an understanding of themselves in relation to their beliefs about intelligence. Data is presented under this theme in three subsequent sub-themes. The first sub-theme, dynamism of intelligence illustrates how the learner participants in this study revealed their beliefs that intelligence is malleable. The second sub-theme expresses the learners' views of how practice can improve intelligence. The third sub-theme reveals the learners' interest levels and that intellectual engagement is important in learning. This sub-theme is mainly reflected in the learners' behaviour rather than their responses. The summative pre and post-intervention findings of the present study on learners' understanding of themselves following Brainology instruction are presented below.

TABLE 8:

SUMMARY OF PRE-AND POST-FINDINGS ON LEARNER PARTICIPANTS' VIEWS OF INTELLIGENCE

		Dynamism of Intelligence	Practice Beliefs	Interest levels
L1	Pre	Correlated intelligence	Practice is difficult to	Low Interest, especially in

		with talents	implement	challenging tasks
	Post	Intelligence is malleable	Practice can enhance intelligence (through effort)	Increased interest
L2	Pre	Unsure	Practice is difficult to implement	Low interest, especially in challenging tasks
	Post	Intelligence is malleable	Practice can improve intelligence (perseverance)	Interest helps learning
L3	Pre	Intelligence is talent	Practice can be difficult to implement	Low interest, especially in challenging tasks
	Post	Intelligence is malleable	Practice can improve intelligence (perseverance)	Interest is important for learning
L4	Pre	Intelligence is talent	Practice can enhance intelligence	Low interest, especially in challenging tasks
	Post	Intelligence is malleable	Practice can enhance intelligence	Erratic interest level
L5	Pre	Intelligence is malleable	Practice can improve intelligence	Medium interest
	Post	Intelligence is malleable	Practice can improve intelligence	Erratic interest level
L6	Pre	Intelligence is malleable	Practice can be difficult to implement	Medium interest
	Post	Intelligence is malleable	Practice can enhance intelligence (mistakes are valuable)	Erratic interest level
L7	Pre	Intelligence is talent	Practice can be difficult to implement	Low interest, especially in challenging tasks
	Post	Intelligence is malleable	Practice can improve intelligence	Increased interest level
L8	Pre	Doubted own intelligence	Practice can be difficult to implement	Low interest, especially in challenging tasks
	Post	Intelligence is malleable	Practice can enhance intelligence (through effort)	Increased interest level
L9	Pre	Intelligence varies	Practice can be difficult to implement	Low to medium interest, erratic interest level
	Post	Intelligence is malleable	Practice can improve intelligence (mistakes are valuable)	Interest is important for learning

L10	Pre	Intelligence is malleable	Practice can enhance intelligence	Medium interest
	Post	Intelligence is malleable	Practice can improve intelligence	Interest is important for learning
L11	Pre	Unsure	Unsure	Low interest, especially in challenging tasks
	Post	Intelligence is malleable	Practice can improve intelligence (perseverance)	Interest is important for learning
L12	Pre	Intelligence is malleable	Practice can enhance intelligence	Medium interest
	Post	Intelligence is malleable	Practice can enhance intelligence (mistakes)	Interest is important for learning
L13	Pre	Intelligence is malleable	Practice can be difficult to implement	Medium interest
	Post	Intelligence is malleable	Practice can improve intelligence (through effort)	Increased interest level

Table 8 above shows that following Brainology instruction, the majority of grade four learners with LDs understood themselves as being intellectually equipped for learning. While the data presentation and discussion follows in more detail below, an overview of the findings indicates that following Brainology instruction, learners felt that intelligence is malleable, portraying characteristics aligned to a growth mindset. The current study revealed that 69% of the sample group referred to intelligence "growing," while 31% referred to the brains activity when learning.

The present study also revealed that all learners felt that practice, effort and perseverance leads to enhanced/improved intelligence. Specifically, 38% referred to practice, 23% referred to effort, 15% referred to perseverance and 23% referred to the necessity of mistakes.

Lastly, it emerged that 10 learners showed positive behaviour concerning their interest levels and being intellectually engaged. Specifically, 46% displayed that interest is important for learning, 31% revealed an increased level of interest and 23% were seen to be erratic in their behaviour in relation to their interest levels.

To understand this in more detail, Table 9 presents individual learners' responses and reflect the learner participant's views of intelligence following Brainology instruction.

TABLE 9: BREAKDOWN OF LEARNER PARTICIPANTS' VIEWS OF INTELLIGENCE FOLLOWING BRAINOLOGY INSTRUCTION

Learner Pseudonym	Dynamism of intelligence level (Beliefs about intelligence)	Practice Beliefs (Beliefs about practice, including effort & perseverance)	Interest level (Beliefs about being intellectually engaged for effective learning)
L1	Intelligence can change, particularly, improve as a result of learning and hard work, which can activate growth of brains. *"When we learn and work hard, the neurons fire and connect and make patterns and our brains grow."*	Practice can enhance intelligence *"Learning new things is hard, but you must keep on practising – and they become easier and easier."*	Increased interest. Active participant, although was seen to avoid challenging tasks.
L2	Intelligence can change, specifically, improve, as a result of the hard work *"Yes, intelligence can grow, especially if you work hard."*	Effort, specifically hard work improves intelligence *"Yes, intelligence can grow, especially when you work hard."*	Interest is important for learning. Anxiety appeared to decrease as intervention went on.
L3	Intelligence grows, specifically, its improvement is open-ended, and its growth is continuous, *"I can fill my brain as much as it wants and it will just keep growing"*	Practice improves intelligence. Specifically, perseverance is essential for learning *"We must not give up, even when we do badly in our test."*	Interest is important for learning. Displayed an active interest and increased motivation
L4	Intelligence can grow, particularly, improve through using the brain *"I can't wait to exercise my brain so that it can get bigger than my older sisters*	Practice enhances intelligence *"If we practice hard stuff, it gets easier, and our brains grow!"*	Erratic interest level. Disinterested and distracted at times

L5	Intelligence can grow as our brains grow "Your brain grows with your intelligence."	Practice improves intelligence *"We must practice hard so that our brains get lots of little paths."*	Erratic interest level. Disinterested and distracted at times
L6	Intelligence grows, namely, improves, when an individual invests effort *"You improve in the things you put effort into, and that is when your intelligence grows."*	Practice improves intelligence. Specifically, mistakes are valuable in learning *"Everyone makes mistakes and mistakes are actually good for you*	Erratic interest level. Disinterested and distracted at times.
L7	Intelligence grows and is malleable *"Intelligence can grow."*	Practice improves intelligence *"Practice helps in my learning, especially with the hard things like maths."*	Increased interest level, specifically increased motivation to participate in interactive Brainology tasks.
L8	Intelligence grows when an individual learns complicated mathematics *"When I learn hard maths, my brain shoots little waves."*	Practice enhances intelligence, specifically putting effort into tasks is crucial in learning *"I know now that if I keep on trying in school, then I will be able to do better in school."*	Increased interest level. Specifically perseverance during challenging tasks.
L9	Intelligence grows, and is malleable *"It's so cool that our brains actually grow."*	Practice improves intelligence. Specifically, mistakes are valuable in learning *"If I make a mistake, it is fine – it is not okay if I just give up."*	Interest is important for learning. Curious, confident and responsible behaviour.
L10	Intelligence grows, particularly, as a result of the learning of unknown issues of an individual *"I definitely believe intelligence can develop, especially when you learn new things."*	Practice improves intelligence *"If I practice my reading- I will get better."*	Interest is important for learning. An active participant in own learning. Motivated to achieve in her learning.
L11	Intelligence grows, specifically, improves, when individuals use their brain *"When you use your brain, your intelligence gets bigger and bigger."*	Practice improves intelligence. Specifically, perseverance is essential in learning *"You must be tough in challenges! (He curled his biceps when saying this statement)*	Interest is important for learning. Confident participant in own learning.

L12	Intelligence grows, particularly, improves over a long period *"It can take a long time for you to improve, but your intelligence can improve."*	Practice enhances intelligence. Specifically, mistakes are valuable in learning *"When I am stuck and even if I make some mistakes – it doesn't matter."*	Interest is important for learning. Displayed high interest and motivation in own learning.
L13	Intelligence grows, specifically, improves *"I hope my brain gets as big as my dad's arm muscle."*	Practice improves intelligence, specifically putting effort in tasks is crucial for learning *"If you want big brain muscles, you must try your best."*	Increased interest level, as Brainology intervention went on.

Based on the information presented in the above table, this first sub-theme presents how participants of the study expressed their beliefs about intelligence.

Sub Theme 1: Dynamism of Intelligence

Brainology instruction is improvement-oriented. In the current study, participants were taught that intelligence is malleable. An entity theorist or an individual with a fixed mindset postulates that intelligence is static/fixed, while an incremental theorist or an individual with a growth mindset postulates that intelligence is malleable and can be developed.

Before Brainology instruction, L1 appeared frustrated and related intelligence to what one is good at, "Some people are just intelligent and good at everything." Post-Brainology, L1 felt that intelligence was malleable, and was able to explain the plasticity of the brain using scientific terms, "when we learn and work hard, the neurons fire and connect and make patterns and our brains grow."

Pre-Brainology, L2 related his feelings towards his intelligence. He stated, "I am not sure if I will go to university because I always do badly in my tests." Post-Brainology, he held a belief that intelligence can develop. "Yes, intelligence can grow, especially if you work hard."

Before Brainology instruction, L3 appeared despondent in his response, as he related intelligence to one's talent/what one is good at, "I think if you are not good at maths now, you

will never be." Post-Brainology, L3 expressed a firm belief that intelligence is malleable "I can fill my brain as much as it wants, and it will just keep growing."

Pre-Brainology instruction, L4 felt that some people have been given natural talents. He appeared agitated "some kids are born good at everything, schoolwork, sports, everything!" Post-Brainology, L4 was excited to state "I can't wait to exercise my brain so that it can get bigger than my sisters" indicating that he believed that intelligence is malleable.

Pre-Brainology, L5 expressed a belief that intelligence develops as one learns, "I believe that intelligence changes as I learn and practice new things." Similarly, post-Brainology instruction, he was able to extend his opinion on the malleability of intelligence, "Your brain grows with your intelligence."

Before Brainology instruction, L6 believed that intelligence could develop, particularly in one's areas one is good at "Everyone is good at something, and that is where your intelligence grows." Post-Brainology, she related the malleability of intelligence to effort "You improve in the things that you put effort into and that is when your intelligence grows."

Pre-Brainology, L7 related her belief of intelligence to one's talent, "Intelligence can change, but only at the things you are good at". Post-Brainology, she very confidently stated, "Intelligence can grow." When probed, she did not provide any further details.

Before Brainology instruction, L8 doubted his own intelligence "I don't know if I will ever be able to read big books like the Grade 7's do, as I am not good at reading". Post-Brainology, he spoke of the brain's activity when learning, "When I learn hard maths, my brain shoots little waves" – indicating a belief that intelligence is malleable.

Pre-Brainology instruction, L9 believed that all people have varying degrees of intelligence, "Some people have a lot of intelligence and others only have a little bit of intelligence". Post-Brainology, L9 was visibly excited and indicated a belief that intelligence is malleable, "It is so cool that our brains actually grow!"

Before Brainology instruction, L10 believed that intelligence is malleable "If you work hard, you get intelligent". Post-Brainology, her belief appeared entrenched as she firmly stated "I definitely believe intelligence can develop, especially when you develop new things."

Pre-Brainology instruction L11 appeared unsure and when probed, shrugged his shoulders and said "I don't know what I think about intelligence" Post-Brainology, he spoke of intelligence being malleable, specifically relating to brain plasticity "When you use your brain, your intelligence gets bigger and bigger."

Before Brainology instruction, L12 related intelligence to effort, indicating a belief that intelligence is malleable, "Your intelligence gets better when you try hard at school." Post-Brainology, L12 firmly believed intelligence could develop, "It can take a long time for you to improve, but your intelligence can improve."

Pre-Brainology, L13 felt that intelligence is malleable by simply stating, "Intelligence is something that grows and grows." Post-Brainology, she comically expressed "I hope my brain gets as big as my dad's arm muscle," indicating her belief that intelligence is malleable had remained the same.

Upon reflection, it was evident from the learners with LDs responses and behaviour that many of them had gained an awareness of their brains and about the concept of intelligence. It was encouraging to note that the majority of learners looked forward to the Brainology sessions (Reflection Journal, 2016).

ANALYSIS OF FINDINGS: Dynamism of Intelligence

The above findings show that prior to Brainology instruction, 5 learners (38%) believed that intelligence was malleable. It also shows that 4 learners (31%) equated intelligence with talent prior to Brainology instruction. Table 8 further reveals that prior to Brainology instruction, 2 learners (15%) were unsure about the state of intelligence. Pre-Brainology instruction, 1 learner (8%) doubted their own intelligence. It also shows that prior to Brainology instruction 1 learner

(8%) perceived that intelligence is varied. Table 9 shows that 13 learners (100%) believed that intelligence is malleable following Brainology instruction.

The following subsection presents how participants of the study expressed their beliefs about practice, including effort, perseverance and the value of mistakes following Brainology instruction.

Sub Theme 2: Practice Beliefs

Brainology instruction guides learners to explore concepts of effort and resilience by engaging them in various interactive activities. An entity theorist or an individual with a fixed mindset postulates that smart individuals do not need to practice, persevere or place much effort into their tasks. The lack of the need to practice for academic tasks makes them smart or gifted. An incremental theorist or an individual with a growth mindset postulates that practice, perseverance, making mistakes and placing effort into tasks are essential components in the learning process. Brainology instruction taught the participants of the current study the importance of practice, effort and resilience. Learners were conditioned that success entails many stages of improvement.

Before Brainology instruction, L1 felt that perseverance is important for learning, "Try, try again and you will succeed." Post-Brainology, he built on these beliefs and voiced that practice produces positive outcomes, indicating he saw value in practice, "Learning new things are hard, but you must keep on practising – and they become easier and easier."

Pre-Brainology instruction, L2 expressed difficulty in placing effort into his tasks, "I know I must work hard and make an effort, but I get tired easily". Post-Brainology, his beliefs had shifted as he expressed that intelligence develops through hard work, "Yes, intelligence can grow, especially when you work hard."

Similarly, pre-Brainology instruction, L3 expressed difficulty in placing effort into his tasks, "Practice helps you improve, but I find it boring doing the same thing over and over again." Post-Brainology, his views had shifted as he focused on persevering, despite not always achieving the best results, "We must not give up, even when we do badly in our tests."

Before Brainology instruction, L4 believed that hard work is an essential component in learning and related this to his own experience, "When I repeated Grade 1, my mom said I must work hard so now I am in grade four." Post-Brainology, he appeared to build on these beliefs, "If we practice hard stuff, it gets easier and our brains grow!"

Pre-Brainology instruction, L5 believed that practice is an essential component in learning, "Intelligence changes as we practice and practice." Post-Brainology instruction, he appeared to build on these beliefs, "We must practice hard so that our brains get lots of little paths."

Pre-Brainology instruction, L6 expressed difficulty in persevering in challenging tasks "If a task is easy, I can do it nicely, but when a task is hard I want to stop and do something else." Post-Brainology, she acknowledged that mistakes are inevitable and necessary when learning, "Everyone makes mistakes and mistakes are actually good for you."

Pre-Brainology instruction, L7 related intelligence to one's talents, "It is fun doing the things you are good at, I don't like hard things." Post-Brainology, she described the relationship between practice and success in learning, "Practice helps learning, especially with the hard things like maths."

Before Brainology instruction, L8 preferred tasks with minimal effort, "I love easy work." Post-Brainology, he focused on the aspects of persevering in order to improve, "I know now that if I keep on trying in school, then I will be able to do better in school."

Pre-Brainology, L9 doubted her own abilities, and expressed difficulty in persevering in challenging tasks, "When I find something difficult, I know I must not give up – but I feel like giving up because I know I am going to be wrong." Post-Brainology, her response indicated that her belief had shifted as she shared the importance of persevering after making a mistake, "If I make a mistake, it is fine – it is not okay if I just give up."

Before Brainology instruction, L10 believed that hard work and placing effort in tasks improves intelligence, "If you work hard, you get intelligent." Post-Brainology, L10 built on her pre

Brainology beliefs, focusing on a positive outcome of practice, "If I practice my reading- I will get better."

Pre-Brainology, L11 did not make a comment about effort, practice and perseverance. He appeared disinterested and bored. Post-Brainology, he spoke with excitement the importance of being resilient when one finds a task challenging, "You must be tough in challenges!" L11 curled his biceps when saying this statement.

Before Brainology instruction, L12 believed that hard work is essential for learning "If you work hard, it helps in your learning". Post-Brainology, he expressed that mistakes are okay to make and appeared relieved when stating "When I am stuck and even if I make some mistakes – it doesn't matter."

Pre-Brainology instruction, L13 preferred tasks with little effort "The easy tasks are the best, because you finish them quickly and get full marks." Post-Brainology, he reported the relationship between brain malleability and placing effort in one's tasks, placing much emphasis on his brain physically growing, "If you want big brain muscles, you must try your best."

It was noted that there was a definite shift in the class environment following the focus group discussion on practice and effort beliefs. Many of the learners appeared eager to practice their work and give of their best during class. In saying this, I was acutely aware of my inherent bias as a researcher/educator (Reflection Journal, 2016).

ANALYSIS OF FINDINGS: Beliefs about Practice

The above findings show that prior to Brainology instruction, 8 learners (62%) believed that practice is difficult to implement. Table 8 further reveals that prior to Brainology instruction, 4 learners (31%) felt practice enhances/improves learning. Pre-Brainology instruction, 1 learner (8%) was unsure about the role of practice, placing effort into tasks. Table 9 shows that 13 learners (100%) believed that 13 learners believed practice improves/enhances intelligence following Brainology instruction. Specifically, 5 learners (38%) referred to the importance of

practice), 3 learners (23%) referred to hard work/effort, 2 learners (15%) referred to perseverance, and 3 learners (23%) referred to necessity of mistakes.

The following subsection presents the level of interest shown by the learner participants of the study, as intellectual engagement is important for learning.

Sub-Theme 3: Interest Level

Although Brainology instruction does not explicitly teach participants about interest in learning, it encourages learners to take responsibility for their learning and to be curious about the world around them. Brainology instruction lends itself to the fact that if learners are intellectually engaged and interested in the content, effective learning will take place. These findings are based on the observations and reflective journal entries on the learners' behaviour, rather than their responses.

Before Brainology instruction, L1 was seen to present a low level of interest, avoiding challenging tasks. Post-Brainology, an increased level of interest was observed as he became an active participant during the intervention.

Pre-Brainology instruction, L2 displayed a low interest towards learning, showing anxiety and a deep awareness of his learning difficulties. Post-Brainology, his behaviour revealed a decrease in his anxiety levels and an increased interest in his own learning, as he became an active participant, willing to share his thoughts during the focus group discussions.

Pre-Brainology instruction, L3 was seen to present an active interest towards learning. Post-Brainology, his behaviour revealed a further interest in his own learning, as he was an active participant who appeared motivated and curious to learn.

Before Brainology instruction, L4 displayed an erratic interest towards learning. Post-Brainology, this behaviour remained as he continued to appear distracted and disinterested, and had to be prompted for any response during the focus group discussions.

Similarly, pre-Brainology instruction, L5 was seen to display an erratic interest towards learning. Post-Brainology, he continued to appear distracted and disinterested, and also had to be prompted for any response during the focus group discussions.

Pre-Brainology instruction, L6's behaviour revealed an erratic interest towards learning. At times, she was highly engaged in the content, and at other times she displayed slightly anxious behaviour. Post-Brainology, her behaviour remained highly erratic, often distracted by her peers around her.

Pre-Brainology instruction, L7 presented with a low interest towards learning, mostly keeping to herself. Post-Brainology, she was seen to display an increase in her interest level. Notably, she was seen to enjoy working in pairs.

Before Brainology instruction, L8 preferred tasks with minimal effort, displaying a low interest in learning. Post-Brainology, he revealed an increased level of interest, particularly towards the aspect of persevering during challenging tasks.

Pre-Brainology, although distracted at times, L9 was seen to take a fair amount of responsibility for learning, indicating a medium level of interest. Post-Brainology, her behaviour revealed that interest is important for learning as she was an active, curious participant, keen to reveal what she had learnt from Brainology.

Before Brainology instruction, L10 was seen to show a fairly keen interest in learning, indicating a medium level of interest. Post-Brainology, she built on her pre-Brainology beliefs as she showed motivation and responsibility in learning all about the various Brainology concepts, revealing that interest is important for learning.

Pre-Brainology, L11 displayed a low interest in learning, appearing distracted and bored. Post-Brainology, his behaviour had shifted as he appeared confident to share his thoughts, indicating that interest is important for learning.

Before Brainology instruction, L12 revealed a fair level of interest in learning, despite being tearful at times. Post-Brainology, he appeared to be exceptionally motivated and confident in his approach, indicating that interest is important for learning.

Pre-Brainology instruction, L13 was seen to display a fair amount of interest in learning. Post-Brainology, it was observed that as the intervention developed, so did his enthusiasm and motivation to learn, indicating an increased level of interest.

Upon reflection, the dual role of educator and researcher was challenging at times. However, it was encouraging to note that many learners who prior to Brainology reflected a low level of interest appeared to show an increased interest in their learning. I reflected on the sustainability of this increased interest and ways on how to maintain this in the classroom (Reflection Journal, 2016).

ANALYSIS OF FINDINGS: Interest Level

The above findings show that prior to Brainology instruction, 7 learners (54%) displayed a low level of interest towards learning, especially towards challenging tasks. Table 8 further reveals that prior to Brainology instruction, 5 learners (38%) displayed a medium level of interest towards learning, while 1 learner (8%) displayed an erratic level of interest. Table 9 shows that following Brainology instruction, 10 learners (77%) showed positive behaviours towards interest in their own learning. Specifically, 6 learners (46%) referred to interest being important for learning, 4 learners (46%) displayed behaviour that showed an increase in interest level. The table also shows the remaining 3 learners (23%) displayed an erratic behaviour in relation to interest in own learning.

The following subsection presents a summary of Theme 1 findings.

SUMMARY OF FINDINGS: THEME 1

The current study found that learners understand themselves as being intellectually equipped following Brainology instruction. The first sub-theme revealed that all 13 learners with LDs believed that intelligence is malleable. Specifically, 9 learners (69%) referred to the intelligence

growing, and 4 learners (31%) referred to the brains physical growth when learning. The second sub-theme revealed that 13 learners with LDs believed practice improves/enhances intelligence. Specifically, 5 learners (38%) referred to the importance of practice, 3 learners (23%) referred to hard work and effort, 2 learners (15%) referred to perseverance, and 3 learners (23%) referred to the necessity of mistakes. The third sub-theme revealed that 10 learners with LDs showed positive behaviours towards an interest in their learning following Brainology instruction. Specifically, 6 learners (46%) referred to interest being important for learning, 4 learners (31%) displayed behaviour that showed an increase in interest level, whilst 3 learners (23%) displayed erratic behaviour in relation to their interest in learning.

The table below presents a summary of the findings from Theme 1.

TABLE 10: SUMMARY OF FINDINGS: THEME 1: Intellectually: I can develop my intelligence

Beliefs about Intelligence Following Brainology Instruction		
Dynamism of Intelligence	**Practice Beliefs**	**Interest level**
13 learners felt intelligence is malleable • 9 learners referred to intelligence growing (69%) • 4 learners referred to brains physical growth when learning (31%)	13 learners believed practice improves/enhances intelligence • 5 learners referred to the importance of practice (38%) • 3 learners referred to hard work/effort (23%) • 2 learners referred to perseverance (15%) • 3 learners referred to the necessity of mistakes (23%)	10 learners showed positive behaviours towards interest in their learning • 6 learners referred to interest being important for learning (46%) • 4 learners displayed behaviour that showed an increased interest level (31%) • 3 learners displayed erratic behaviour in relation to interest in their learning (23%)

5.2.2 THEME 2. Emotionally: I know how to manage my emotions

The second sub-research question explored how grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their emotions and learning following Brainology instruction. This constitutes the second theme of the findings of the study. It

emerged that following Brainology instruction, learners' reported that, firstly, they understood themselves as having gained an increased awareness of themselves in relation to their emotions as learners, and secondly that strategies could be used to regulate those emotions. Data is presented in this section in two subsequent sub-themes. The first sub-theme illustrates how the learners in this study identified the crucial role emotions play in their learning. The second sub-theme expresses learners' views related to regulating one's emotions, particularly negative emotions such as anger and anxiety, which hinder learning. In the following section, the summative pre and post-intervention findings relating to the learner's experiences of Brainology instruction, with a particular focus on the role of emotions in learning.

SUMMATIVE PRE AND POST FINDINGS OF LEARNERS' PERCEPTIONS OF THEIR EMOTIONS AND LEARNING FOLLOWING BRAINOLOGY INSTRUCTION

TABLE 11: **EMOTIONAL INFLUENCES OF BRAINOLOGY INSTRUCTION**

		Emotions and learning	**Managing Emotions**
L1	Pre	Did not comment	Emotions can be managed (self-talk)
	Post	Unsure	Emotions can be managed (self-talk)
L2	Pre	Learning means nervousness/anxiety	Emotions can be managed (counting)
	Post	Emotions and learning go together	Emotions can be managed (teacher assistance)
L3	Pre	Learning means anger (challenging tasks)	Unsure
	Post	Unsure	Emotions can be managed
L4	Pre	Learning means sadness (challenging tasks)	Emotions can be managed (remembering concepts)
	Post	Emotions and learning go together	Emotions can be managed (breathing)
L5	Pre	Learning means worry	Unsure
	Post	Negative emotions hinder learning	Unsure
L6	Pre	Learning means worry	Unsure
	Post	Unsure	Recognized brains role in controlling emotions
L7	Pre	Learning means worried	Unsure

	Post	Negative emotions hinder learning	Focused on the importance on emotions in learning
L8	Pre	Did not comment, appeared hesitant	Unsure
	Post	Negative emotions hinder learning	Emotions can be managed (self-talk)
L9	Pre	Learning means nervousness (Stomach hurting)	Suggested discussing with a teacher)
	Post	Unsure, appeared distracted	Emotions can be managed (breathing)
L10	Pre	Learning means anxiety (hands sweating)	Emotions can be managed (breathing)
	Post	Unsure, appeared bored	Unsure
L11	Pre	Learning means frustration	Unsure
	Post	Negative emotions hinder learning	Emotions can be managed (Teacher assistance)
L12	Pre	Learning means happiness and sadness	Emotions can be managed (clenching fists)
	Post	Emotions and learning go together	Unsure
L13	Pre	Did not comment, appeared nervous	Unsure
	Post	Negative emotions hinder learning	Unsure

In the present study, although the response was varied, the above table shows that following Brainology instruction, the majority of grade four learners with LDs understood themselves as being emotionally equipped for learning.

While the data presentation follows in more detail below, an overview of the findings indicates that following Brainology instruction, learners' expressed various ways in which to manage their emotions. It was found that 61% of the learners reported that they had acquired an understanding of the essential role emotions play in successful learning. Specifically, 38% of the learners felt that negative emotions hinder the learning process and 23% of the learners acknowledged the role of emotions in their learning. 38% of the learners were unsure of the role of emotions in their learning following Brainology instruction.

It further emerged that following Brainology, majority of the learner participants expressed various strategies on how to combat and manage negative emotions such as anger and anxiety. 76% of the sample group suggested various ways in which emotions (particularly anger and anxiety) can be managed in challenging learning situations. Specifically, 23% suggested implementing calming breathing techniques, 15% suggested positive self-talk as a way to lessen anxiety; 15% felt it was best to ask the teacher for assistance when feeling anxious or angry, while 8% suggested reflection on the Brainology programme. In addition, 15% of the learners expressed an awareness of the importance of emotions and the role of the brain in learning, while 23% were unsure of how to manage their emotions when learning.

Table 12 below presents the learners' shared responses and provides excerpts of their comments. The table reflects the changes that took place following Brainology instruction and how these participants of the study understood themselves as learners from an emotional standpoint, specifically the role of emotions in their learning and management of emotions.

TABLE 12: **BREAKDOWN OF LEARNERS' PERCEPTIONS OF EMOTIONS AND LEARNING FOLLOWING BRAINOLOGY INSTRUCTION**

Learner	Emotions and learning	Managing Emotions
L1	Unsure	Emotions can be managed through positive thinking, particularly can help as a calming technique. *"We can think of our best things to help us calm down."*
L2	Emotions and learning go together and must work in unison for successful learning. *"The brain and heart have to work together or else learning won't happen."*	Emotions can be managed by asking the teacher for assistance. *"We can ask the teacher if we haven't learnt it properly yet."*
L3	Unsure	Emotions can be managed through breathing techniques, particularly with lessening anxiety levels. *"When I feel nervousness in my stomach – I know how to make it go away - just breathe slowly!"*
L4	Emotions and learning go together, where the brain regulates emotions, specifically anger. *"Our brain can help us not be angry."*	Emotions can be managed by remembering that emotions are a choice, particularly focusing on feeling calm and using breathing techniques helps in the management of negative emotions. *"We can choose*

		how to feel, but we need to act calm and breathe nicely."
L5	Emotions and learning go together; specifically, it is important to remain calm during a flustered/fearful state of mind. *"My brain can fight or flight, I don't want to do either. I need to act calm instead."*	Did not comment.
L6	Unsure	Emotions and learning go together. Specifically, our brains are essential for managing emotions. *"We must use our brains to control our brains."*
L7	Negative emotions hinder learning, specifically nervousness/anxiety *"When we get nervous, it makes it hard to learn, so we must not be nervous."*	Emotions and learning go together. Specifically, to learn effectively, an individual must be experiencing positive emotions. *"The brain needs good emotions to learn."*
L8	Negative emotions hinder learning. *"If our heart is not right, learning won't happen."*	Emotions can be managed by directing one's thoughts to one's pets, specifically to combat sadness during formal assessments. *"I will think of my cute puppies instead of feeling sad during a test."*
L9	Unsure	Emotions can be managed through breathing techniques. *"We can breathe nice and slowly."*
L10	Unsure	Did not comment
L11	Negative emotions hinder learning. Specifically, during stressful times the brain is unable to function. *"Our brain freezes and we can't learn."*	Emotions can be managed by taking a short break during class, particularly to combat anger. *"You should ask the teacher if you could take a short break not to be so angry."*
L12	Emotions and learning go together, Specifically, an individual's state of mind should be in a serene state for successful learning to take place. *"We must make our brains calm and steady."*	Did not comment
L13	Negative emotions hinder learning. Specifically, the impact of negative emotions upon the brain is unpleasant. "*I hate it when my brain freezes!"*	Emotions can be managed by reflecting on the content of Brainology. "*I will think of what Brainology taught me."*

Based on the information presented in the above table, this first sub-theme presents how participants of the study expressed their views about emotions and learning.

Sub-Theme 1: Emotions and Learning

Brainology instruction focuses on how the brain processes emotion and the role of emotions when learning. Learners in the current study were taught how emotions influence the brain, the neural structure of the brain, and how the brain functions by sending chemical messages through nerve cells.

Before Brainology instruction, L1 identified nervousness and anxiety as emotions felt during learning, "I can hear my heart beating in a test." Post-Brainology, he did not comment. When probed, he shrugged and said: "I don't know."

Pre-Brainology instruction, L2 also identified nervousness/anxiety when it comes to learning, "My cheeks get red and they feel hot in a test." Post-Brainology, he recognised the relationship between the brain and emotions, "the brain and heart have to work together or else learning won't happen."

Pre-Brainology, L3 expressed he felt anger during challenging tasks, "I feel angry, especially during maths tests when the sums are too hard." Post-Brainology, L3 recognised the ability of the brain to regulate emotions such as anger, "Our brain can help us not be angry."

Pre-Brainology, L4 expressed that he felt sad during challenging tasks and doubted his capabilities, "I feel sad because I think I am going to fail." Post-Brainology, he focused on the importance of remaining calm, "My brain can fight or flight, I don't want to do either. I need to act calm instead."

Pre-Brainology, L5 identified worry and fear as emotions that he felt when it came to learning, "I feel worried about the reading tests." Post-Brainology, he did not comment, appeared distracted.

Before Brainology instruction, L6 identified angry as an emotion. Post-Brainology, L6 did not comment, appeared distracted.

Pre-Brainology, L7 identified worried as an emotion. Post-Brainology, L7 acknowledged that nerves might hinder learning, "When we get nervous, it makes it hard to learn so we must not be nervous."

Before Brainology instruction, L8 did not comment, appeared hesitant to share on the topic of emotions. Post-Brainology, L8 acknowledged the power of negative emotions when it comes to learning, "If our heart is not right, learning won't happen."

Before Brainology instruction, L9 identified the impact of nerves on the body, "I feel nervous, and my tummy starts to hurt." Post-Brainology, L9 did not comment, appeared distracted.

Pre-Brainology, L10 identified impact of fear/worry on the body, "My hands start to sweat." Post-Brainology, L10 did not comment, appeared a little bored.

Pre-Brainology, L11 identified irritated as an emotion. Post-Brainology, L11 spoke about how the brain reacts during stressful times, "Our brain freezes and we can't learn."

Before Brainology instruction, L12 identified sadness and happiness as emotions. Post-Brainology, L12 focused on what the state of our brains should be like for learning, "We must make our brains calm and steady."

Pre-Brainology, L13 did not comment. Post-Brainology, L13 expressed a strong dislike for when she feels flustered or fearful, "I hate it when my brain freezes!"

Upon reflection, it was clear that prior to Brainology, the learners with LDs had not explored the emotions that they feel when they learn. It was noted that as the intervention went on, learners appeared to have a heightened awareness of their feelings and were also more confident about sharing how they feel in front of their peers (Reflection Journal, 2016).

ANALYSIS OF FINDINGS: Emotions and Learning

The above findings show that prior to Brainology instruction, 3 learners (23%) did not comment relating to the subject of emotions and learning. Table 11 further reveals that prior to

Brainology instruction, 6 learners (46%) correlated anxiety and nervousness with learning, 3 learners (23%) expressed emotions of anger and frustration when it came to learning. The table also shows that 1 learner (8%) commented that he felt sadness when learning, while another learner (8%) expressed the emotions of happiness and sadness when learning. Table 12 shows following Brainology instruction, 5 learners (38%) expressed that negative emotions hinder learning, 3 learners (23%) acknowledged that learning and emotions go together and 5 learners (38%) were unsure of the role of emotions in learning.

The following subsection presents how participants of the study expressed their thoughts relating to the management of negative emotions, especially anger and anxiety.

Sub-Theme 2: Managing Emotions

Brainology instruction focuses on the role of emotions in learning. Learners in the current study were taught various ways to focus on positive emotions, and manage negative emotions, particularly those that hinder learning, such as anxiety and anger.

Before Brainology, instruction, L1 suggested asking the teacher for assistance, "You can ask the teacher for help." Post-Brainology, he provided self-talk as a strategy for controlling emotions, "We can think of our best things to help us calm down."

Pre-Brainology, L2 suggested counting to 10, "When I feel angry, my mom said I must count to 10." Post-Brainology, L2 suggested asking a teacher for assistance, "We can ask the teacher if we haven't learnt it properly yet."

Before Brainology instruction, L3 did not comment and appeared reserved when discussing one's emotions. Post-Brainology, L3 suggested using a breathing technique to regulate emotions, particularly anxiety, "When I feel nervousness in my stomach – I know how to make it go away - just breathe slowly!"

Pre-Brainology, L4 appeared frustrated and in a matter of fact manner stated: "Just remember what you have learnt." Post-Brainology, L4 recognised that we can control of our emotions and

focused on feeling calm and using breath as a technique to do so, "We can choose how to feel, but we need to act calm and breathe nicely."

Before Brainology instruction, L5 suggested of zoning in on the answer, "Think of what the answer could be." Post-Brainology, L5 did not comment.

Pre-Brainology, L6 did not comment, appeared to lose interest and became distracted. Post-Brainology, L6 focused on our brains essential for controlling our emotions, "We must use our brains to control our emotions."

Before Brainology instruction, L7 was unsure how to deal with/control emotions, "I don't know how to make the sad feelings go away." Post-Brainology, L7 focused on the importance of emotions in learning, "The brain needs good emotions to learn."

Pre-Brainology, L8 did not comment, appeared reserved when discussing one's emotions. Post-Brainology, L8 suggested that thinking of one's pets will assist during an assessment, "I will think of my cute puppies instead of feeling sad during a test."

Before Brainology, L9 suggested discussing emotions with a teacher, "You must tell the teacher how you are feeling." Post-Brainology, L9 focused on a breathing strategy to regulate emotions, "We can breathe nice and slowly."

Pre-Brainology, L10 suggested a strategy he had learnt from his father, "My dad says I must count to 100!" Post-Brainology, L10 did not comment.

Before Brainology instruction, L11 did not comment, appeared reserved when discussing one's emotions. Post-Brainology, L11 suggested a short break to combat negative emotions such as anger, "You should ask the teacher if you could take a short break not to be so angry."

Pre-Brainology, L12 suggested clenching one's fists to combat anger, "You can hold your fists like this" (action of clenched fists). Post-Brainology, L12 did not comment. He appeared flustered and did not want to comment.

Before Brainology instruction, L13 did not comment, appeared disinterested in the discussion. Post-Brainology, L13 reflected on the content of Brainology to assist in regulating his emotions, "I will think of what Brainology taught me."

It was noted that learners were enthusiastic and confident about sharing strategies to manage emotions when learning. Many of them described the same examples that Brainology had used. I also reflected on ways to maintain these strategies that Brainology had successfully taught to many of the learner participants (Reflection Journal, 2016).

ANALYSIS OF FINDINGS: Management of Emotions

The above findings show that prior to Brainology instruction, 7 learners (54%) were unsure of how to manage their emotions when learning, particularly in stressful learning situations. The table also shows that 6 learners (46%) felt that emotions can be managed. Table 12 shows following Brainology instruction, 10 (76%) learners felt emotions can be managed, whilst 3 learners (23%) were unsure of how to manage their emotions in learning.

SUMMARY OF FINDINGS

The current study found that learners with LDs understand themselves as being emotionally equipped following Brainology instruction. Specifically, 5 learners (38%) felt that negative emotions hinder the learning process, 5 learners (38%) were unsure of the role of emotions in their learning, and 3 learners (23%) acknowledged the role of emotions in their learning. With regards to the management of emotions, 10 learners (77%) suggested various ways in which emotions (particularly anger and anxiety) can be managed in stressful learning situations. Specifically, 3 learners (23%) suggested implementing calming breathing techniques, 2 learners (15%) suggested positive self-talk as a way to lessen anxiety. 2 learners (15%) felt it was best to ask the teacher for assistance when feeling anxious or angry, while one learner (8%) suggested reflection on the Brainology programme. 2 learners (15%) expressed an awareness of the importance of emotions and the role of the brain in learning. The remaining 3 learners (23%) were unsure of how to manage their emotions when learning.

The following table presents a summary of the findings from Theme 2.

TABLE 13: SUMMARY OF FINDINGS: THEME 2: Emotionally: I know how to manage my emotions

Learners Experiences of Brainology Instruction	
Emotions and Learning	**Management of Emotions**
5 learners expressed that negative emotions hinder learning (38%)	10 learners felt emotions can be managed (77%) Breathing techniques (3 learners/23%) Self-talk (2 learners/15%) Teacher assistance (2 learners/15%) Reflection on Brainology (1 learner/8%) Awareness of emotion (1 learner/8%) Awareness of brains role (1 learner/8%)
3 learners acknowledged that learning and emotions go together (23%)	3 learners were unsure of how to manage emotions (23%)
5 learners were unsure of the role of emotions in learning (38%)	

5.2.3 MAIN THEME 3. Practically: I know how to enhance my learning

The third sub-research question explored how grade four learners with learning disabilities at a selected primary school in KwaZulu-Natal perceive their practical strategies to enhance learning following Brainology instruction. This constitutes the third theme of the findings of this study. It emerged that following Brainology instruction, learners' reported that they had gained an understanding of how they can apply practical strategies to enhance their learning. Secondly, it was found that various learning support accommodations were necessary for the implementation of Brainology with learners with LDs.

Data is presented in this section in relation to two subsequent sub-themes. The first sub-theme theme relates to practical strategies the learners learnt from Brainology instruction in relation to concentration and memory. The second sub theme relates to practical strategies learners learnt from Brainology instruction in relation to their brains healthy. The fourth theme relates to the practicalities of implementing Brainology intervention with grade four learners with LDs. This sub theme emerged from my reflective journal. The following section presents the summative pre and post intervention findings of the present study on practical considerations.

TABLE 14: SUMMATIVE FINDINGS ON LEARNERS' SUGGESTIONS ON PRACTICAL STRATEGIES FOR ENHANCED LEARNING

		Practical strategies to enhance concentration and memory	Brain Health
L1	Pre	Poor concentration (boredom)	Brains are small
	Post	Did not comment, appeared bored	Brains can be strengthened with good nutrition
L2	Pre	Doubted own capabilities	Brains are responsible for thinking
	Post	Self-talk can improve concentration	Brains are important
L3	Pre	Poor concentration inhibits learning	Brains are small
	Post	Suggested looking after your brain, but did not specify	Brains can be strengthened by keeping them safe
L4	Pre	Doubted own capabilities (multiple instructions)	Brains are small
	Post	Short breaks improve concentration and memory	Brains grow when we learn
L5	Pre	Poor concentration inhibits learning	Brains are responsible for thinking
	Post	Study skills improve memory	Brains have different parts
L6	Pre	Poor concentration inhibits learning	Brains are pink
	Post	Study skills enhance memory	Brains can be strengthened with a good amount of sleep
L7	Pre	Poor memory skills inhibit learning	Brains are responsible for thinking
	Post	Did not comment	Brains need good nutrition
L8	Pre	Poor concentration inhibits learning	Brains are responsible for thinking
	Post	Study skills enhance memory	Brains need good nutrition (vitamins)
L9	Pre	Poor memory skills inhibit learning	Brains are small
	Post	Study skills enhance learning	Brains grow when we learn
L10	Pre	Poor organizational skills inhibit learning	Brains are important
	Post	Playing games enhances memory	Brains need sleep
L11	Pre	Poor concentration inhibit learning	Brains are important

	Post	Study skills improve memory	Brains need good nutrition
L12	Pre	Poor concentration inhibits learning	Brains are responsible for thinking
	Post	Did not comment	Did not comment
L13	Pre	Poor memory inhibits learning	Brains are responsible for thinking
	Post	Self-talk improves concentration and memory	Brains need sleep

In the present study, although the response was varied, the above table shows that following Brainology instruction, the majority of grade four learners with LDs understood themselves as being practically equipped for learning.

While the data presentation and discussion follows in more detail below, it was found that learners' felt that they could apply practical strategies in their learning that could strengthen their brain. Majority of the learners (76%) relayed various study skill strategies that Brainology instruction had suggested, with a specific focus on the enhancement of memory and concentration. These included taking short breaks while studying, practice/repetition of concepts, playing games, drawing pictures alongside notes and highlighting the key ideas. Positive self-talk and simply taking care of your brain were additional suggestions in relation to practical learning strategies. A small number of learners (23%) appeared bored, distracted and chose not to comment.

The present study also revealed that following Brainology, 69% of learners were able to report practical ways to enhance brain health. Notably, all learners suggested strategies that Brainology had suggested, indicating a successful transference of strategies relating to the enhancement of learning. Suggested strategies included following a nutritious diet (31%) and the importance of getting a good nights sleep (23%) and continuous learning (15%). A small group of learners acknowledged the importance of the brain (23%) but did not specify on ways to maintain brain health, while one learner appeared distracted and did not comment.

Table 15 below presents learner's shared responses and reflect the changes that took place since Brainology instruction and how these participants of the study understood themselves as

learners from a practical standpoint, specifically related to practical strategies to enhance learning and brain health.

TABLE 15: BREAKDOWN OF LEARNERS' PRACTICAL SUGGESTIONS TO ENHANCE LEARNING

Learner	Practical strategies to enhance learning (particularly concentration and memory)	Brain Health
L1	Did not comment	Good nutrition keeps our brains and bodies healthy. *"Our brain needs healthy food like fruit and vegetables to be healthy and fit."*
L2	Self-talk improves concentration. *"I know that I can talk to my brain to make me concentrate better."*	Our brains are our most important asset. *"We must look after our brain because it is the most important thing we have."*
L3	Looking after our brain improves concentration. *"I can concentrate better if I look after my brain."*	Brains must be looked after as they help us function in every way. *"The brain helps with everything so we must keep it safe."*
L4	*"When my brain feels tired or when I daydream, I should ask my teacher if I can take a short break or go to the bathroom because it helps my body and my brain to get oxygen."*	Brains are malleable when healthy. *"If our brain is healthy, then it gets very big muscles."*
L5	Provided a strategy on how to improve memory. She used the word "memory bank" as used in Brainology. *"We can repeat a word or sentence a lot of times until it is in our memory bank in our brain."*	The brain has many different parts, and therefore it must be kept in good health. *"The brain has lots of parts – so I need to look after it."*
L6	Provided a strategy taught by Brainology to enhance concentration and memory. *"We can play memory games at home with our parents."*	Our brain must get enough sleep. Brainology highlighted this aspect of Brain Health. *"We must make sure we go to bed early enough so that we can wake up to a fresh brain."*
L7	Did not comment, appeared distracted and bored.	Good nutrition keeps our brain healthy. *"If we eat junk food – our brain feels sick and can't learn properly."*
L8	Focused on a practical strategy that Brainology taught. *"We can take down short notes and draw pictures."*	Good nutrition keeps our brain healthy. *"We must take our vitamins every day."*

L9	Related memory to practice. *"We must practice our tables so we can remember them off by heart."*	Healthy brains ensure that our brains continue to grow from strength to strength. *"We must keep our brain healthy, so it gets stronger and stronger."*
L10	Provided a strategy that Brainology suggested to do at home. *"We can play cards with our brothers and sisters."*	Sleep keeps our brain healthy, specifically so that work can be done at school. *"Our brain needs to sleep that it can work properly at school."*
L11	Focused on a specific study skill which Brainology taught. *"We can highlight the keyword with our highlighter."*	Healthy, nutritious food, instead of less nutritious food keeps our brain healthy. *"We mustn't eat too much junk food from the tuck shop."*
L12	Did not comment	Did not comment on brain health
L13	Focused on the aspect of self-talk. *"I must tell my brain to concentrate when it is not concentrating."*	Sleep keeps our brain healthy. *"We must go to bed at eight every night."*

Based on the information presented in the above table, this first sub-theme presents how participants of the study expressed practical strategies to enhance learning.

Sub Theme 1: Practical Strategies to Enhance Learning (Concentration and Memory)

Brainology instruction encourages learners to explore their feelings about concentration and memory in relation to their learning. Learners in the current study were taught about how the brain concentrates and how it functions. Emphasis was placed on practical strategies that learners can implement both at school and home. The two main strategies focused on how to improve concentration and long and short term memory.

Before Brainology instruction, L1 attributed boredom to poor concentration, "I get bored so easily." Post-Brainology, L1 did not comment.

Pre-Brainology, L2 doubted his capabilities, "I am not good at it so I would rather think about something else." Post-Brainology, L2 acknowledged the power of self-talk, "I know that I can talk to my brain to make me concentrate better."

Before Brainology instruction, L3 expressed that he had poor concentration, "I know I have bad concentration." Post-Brainology, L3 suggested looking after our brain – but did not comment on ways to do so, "I can concentrate better if I look after my brain."

Pre-Brainology, L4 expressed that he had difficulty with multiple instructions, "Too many instructions make me lose track." Post-Brainology, L4 provided a strategy to enhance concentration/memory and gave a reason as to why this strategy is necessary, "When my brain feels tired or when I daydream, I should ask my teacher if I can take a short break or go to the bathroom because it helps my body and my brain to get oxygen."

Before Brainology, L5 felt her concentration was poor, "I can't concentrate on things for a long time, so I just give up and guess the answers." Post-Brainology, L5 provided a strategy on how to improve memory. She used the word "memory bank" as used in Brainology, "We can repeat a word or sentence a lot of times until it is in our memory bank in our brain."

Pre-Brainology, L6 felt she had poor memory/organisational skills, "I always forget to pack my sports kit, and my dad gets so cross." Post-Brainology, L6 provided a strategy suggested by Brainology to enhance concentration and memory, "We can play memory games at home with our parents."

Before Brainology instruction, L7 expressed that her memory skills were erratic and not sustained, "I remember everything, but then I get stuck and go blank." Post-Brainology, L7 did not comment, appeared distracted and bored.

Pre-Brainology, L8 attributed lack of concentration to the writing demands placed on him at school, "Sometimes I feel tired when I have to write so much, so I lose my concentration." Post-Brainology, L8 focused on a practical strategy that Brainology taught, "We can take down short notes and draw pictures."

Before Brainology instruction, L9 expressed that she experienced difficulty with memory, "I remember and then it is gone from my brain." Post-Brainology, L9 related memory to practice, "We must practice our tables so we can remember them off by heart."

Pre-Brainology, L10 expressed a lack of memory skills, "I forget to pack my cricket stuff all the time." Post-Brainology, L10 provided a strategy that Brainology suggested to do at home, "We can play cards with our brothers and sisters."

Before Brainology instruction, L11 attributed lack of concentration to difficulty in mathematics, "I am not good at maths, so I quickly lose concentration." Post-Brainology, L11 focused on a specific study skill which Brainology taught, "We can highlight the keyword with our highlighter."

Pre-Brainology, L12 expressed a lack of concentration according to his mother, "My mom says I have the concentration span of ten seconds." Post-Brainology, L12 did not comment.

Before Brainology instruction, L13 expressed lack of memory, "In orals, I go blank, and in tests I forget everything." Post-Brainology, L13 focused on the aspect of self-talk, "I must tell my brain to concentrate when it is not concentrating."

It was fascinating to observe learner participants listening in earnest to their peers and working together during the intervention to complete the challenges. It was noted that the learners with LDs really enjoyed the interactive nature of the Brainology programme (Reflective Journal, 2016).

ANALYSIS OF FINDINGS: Strategies to Enhance Learning

The above findings show that prior to Brainology instruction, the majority of the learners with LDs (85%) focused on various factors that hinder learning. Specifically, 7 learners (54%) cited concentration as an obstacle for successful learning. 3 learners (23%) cited poor memory as a hindrance to their learning, while 1 learner (8%) felt that being disorganised was a hindrance to learning taking place. Table 14 also shows that 2 learners (15%) doubted their capabilities. Table 15 shows that following Brainology instruction, 7 learners with LDs (76%) relayed various study skills with a specific focus on the enhancement of memory and concentration. These included taking short breaks while studying (8%), practice/repetition of concepts (15%), playing games (15%), drawing pictures alongside notes (8%) and highlighting the key ideas (8%).

Positive self-talk and taking care of your brain (23%) were additional suggestions in relation to practical learning strategies. Three learners (23%) appeared bored, distracted and chose not to comment.

The following subsection presents how participants of the study expressed their thoughts relating to practical strategies for a healthy brain.

Sub Theme 2: Practical Strategies for a Healthy Brain

Brainology instruction aims to teach learners practical ways to ensure that their brain is healthy. Learners in the current study were taught about the importance of the brain being one of the most important organs in our body. Emphasis was placed on nutrition and sleep concerning brain health.

Pre-Brainology, L1 reported on the size (small) of the brain, "The brain is actually quite small – like the size of your fist." Post-Brainology, L1 focused on the aspect of nutrition and diet to keep our brains healthy. "Our brain needs healthy food like fruit and vegetables to be healthy and fit."

Before Brainology instruction, L2 expressed that the brain is used for processing information, "The brain helps us to think." Post-Brainology, L2 highlighted the importance of our brains, "We must look after our brain because it is the most important thing we have."

Pre-Brainology, L3 commented on the size of the brain "The brain can't change size or grow because then it would pop out of your head." Post-Brainology, L3 highlighted the value of the function of the brain, "The brain helps with everything so we must keep it safe."

Before Brainology, L4 reported on the size of the brain, "The brain is actually quite small." Post-Brainology, L4 focused on the neuroplasticity of the brain in relation to brain health, "If our brain is healthy, then it gets very big muscles."

Pre-Brainology, L5 commented, "It helps us think." Post-Brainology, L5 highlighted the need to look after our brains due to the many functions (parts), "The brain has lots of parts – so I need to look after it."

Before Brainology, L6 commented on the colour of the brain, "I know that the brain is pink." Post-Brainology, L6 focused on the aspect of getting enough sleep. Brainology highlighted this aspect of Brain Health, "We must make sure we go to bed early enough so that we can wake up to a fresh brain."

Pre-Brainology, L7 commented on the basic function of the brain, "It makes us think." Post-Brainology, L7 expressed how important nutrition is for Brain health and learning, "If we eat junk food – our brain feels sick and can't do learn properly."

Before Brainology, L8 commented broadly on the function of the brain, "It helps us with everything we do." Post-Brainology, L8 focused on the aspect of vitamins (possibly influenced by parents as Brainology did not mention this), "We must take our vitamins every day."

Pre-Brainology, L9 was restless and unable to focus. She excitedly exclaimed, "The brain changes size every day, depending on what you eat," causing the other learners to giggle. Post-Brainology, L9 focused on the neuroplasticity/development of the brain, "We must keep our brain healthy so it gets stronger and stronger."

Before Brainology, L10 commented on the importance of the brain, "It is very important for us." When probed, she did not specify why the brain is important. Post-Brainology, L10 focused on the aspect of sleep and getting enough of it so to learn, "Our brain needs to sleep that it can work properly at school."

Pre-Brainology, L11 saw the brain as a smart organ, "The brain is very clever." Post-Brainology, L11 encouraged fellow learners to focus on healthy food, instead of less nutritious food, "We mustn't eat too much junk food from the tuck shop."

Before Brainology, L12 commented on the basic function of the brain, "It makes us think." Post-Brainology, L12 did not comment on brain health. He appeared bored and distracted.

Pre-Brainology, L13 "The brain is inside our head and tells us what to do." Post-Brainology, L13 focused on getting enough sleep, as Brainology suggested, "We must go to bed at 8 every night."

Upon reflection, the learners with LDs appeared to have gained confidence in speaking about themselves as learners, their strengths and their weaknesses. Further to this, it was noted that there was a heightened awareness about the brain (Reflective Journal, 2016).

ANALYSIS OF FINDINGS: Strategies to keep your brain healthy

The above findings show that prior to Brainology instruction, 6 learners (46%) believed that the brain is responsible for thinking. Table 14 reveals that prior to Brainology instruction, 2 learners (15%) cited the importance of the brain, while 5 learners (38%) commented on the size and appearance of the brain. Table 15 shows that following Brainology instruction, 4 learners (31%) felt that good nutrition keeps your brain healthy, 3 learners (31%) felt that getting a good amount of sleep keeps your brain healthy. The table also shows that 3 learners (23%) acknowledged the importance of the brain, but did not specify ways to maintain brain health. 2 learners (15%) felt that one must continue to learn to ensure a healthy brain, while 1 learner (8%) did not comment.

SUMMARY OF FINDINGS

The current study found that learners with LDs understand themselves as being practically equipped following Brainology instruction. 7 learners with LDs (76%) relayed various study skills with a specific focus on the enhancement of memory and concentration. These included taking short breaks while studying (8%), practice/repetition of concepts (15%), playing games (15%), drawing pictures alongside notes (8%) and highlighting the key ideas (8%). Positive self-talk and taking care of your brain (23%) were additional suggestions in relation to practical learning strategies. 3 learners (23%) appeared bored, distracted and chose not to comment. In relation to brain health, 4 learners (31%) suggested following a nutritious diet. 3 learners (23%) commented on the importance of getting a good night sleep, while 2 learners (15%) focused on continuous learning to ensure a healthy brain. 3 learners (23%) acknowledged the importance

of the brain (but did not specify ways to maintain brain health, while 1 learner (8%) appeared distracted and did not comment.

The table below presents the findings from Theme 3.

TABLE 16: SUMMARY OF FINDINGS: Practically: I know how to enhance my learning

Practical Strategies for Enhanced Learning Following Brainology Instruction	
Strategies to enhance learning	**Strategies to keep your brain healthy**
7 learners related to study skills (54%) Short breaks (1 learner/8%) Repetition/practice (2 learners/15%) Playing games (2 learners/15%) Draw pictures (1 learner/8%) Highlight key ideas (1 learner/8%)	4 learners felt that good nutrition keeps your brain healthy (31%)
3 learners did not comment (23%)	3 learners felt that getting a good amount of sleep keeps your brain healthy (23%)
2 learners suggested positive self-talk (15%)	3 learners acknowledged the importance of the brain but did not specify on ways to maintain brain health (23%)
1 learner suggested looking after your brain (8%)	2 learners felt that one must continue to learn to ensure a healthy brain (15%)
	1 learner did not comment (8%)

Sub Theme 4: Practical Considerations for the Implementation of Brainology Instruction

The present study found that various learning support accommodations were necessary for the implementation of Brainology with learners with LDs (Reflective Journal, 2016).

In this study, learners were supported through the use of various learning accommodations during the implementation of Brainology instruction. These included pausing during the sessions, giving the learners multiple 'mini-breaks' to enable them to regain focus, assisting with some of the questions in the challenges, carrying out consolidation discussions before and after each Brainology session, and pairing up participants to discuss the more difficult concepts.

These learning support accommodations greatly assisted the learners during the implementation of Brainology instruction.

Perhaps the biggest adaptation was implementing the Brainology intervention as a group, instead of participants individually completing the programme. It would not have been possible to successfully implement the Brainology programme with the learners working individually, as a high level of one-on-one teacher assistance is needed to assist learners with the various challenge and scientific concepts. It was found that the adaptation of the learners working together (as opposed to individually) through the Brainology programme worked very well in the learning support classroom context, due to the small class size. The learners could work together, and they did not feel as though they were under pressure to perform, as they were working together as a team towards a unified goal.

5.3 CONCLUSION

This chapter presented and summarised the findings on how grade four learners with LDs understand themselves as learners following Brainology instruction. Guided by thematic analysis (Braun & Clarke, 2006), the analysis was underpinned by the theories of intelligence framework and revealed three themes. The three themes were: Intellectually: I can develop my intelligence; Emotionally: I know how to manage my emotions and Practically: I can apply practical strategies in my learning. The three findings revealed that learners are able to understand themselves as being intellectually, emotionally and practically equipped following Brainology instruction. An additional finding was that learning support accommodations and adaptations were required for enhanced implementation of Brainology instruction. The discussion of these findings is recorded in the next chapter.

CHAPTER SIX

DISCUSSION OF FINDINGS

6.0 INTRODUCTION

The current study sought to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction in preparation for inclusive education. The previous chapter presented and analysed data of the present study, revealing pre- and post-Brainology findings. The three major findings of the study were that following Brainology instruction, learners with LDs understand themselves as intellectually, emotionally and practically equipped. Specifically, following Brainology instruction learners with LDs felt that their intelligence can be developed, that they were aware of how to better manage their emotions and that they could apply practical strategies to strengthen their brain for learning. An additional finding was that various learning support accommodations were necessary for the implementation of Brainology with learners with LDs. This chapter presents a discussion of these findings in relation to reviewed literature and the theoretical framework that underpinned the study, particularly, the theories of intelligence framework. In the first sub-section, the findings relating to the learner participants' perceptions of intelligence following Brainology instruction are discussed.

6.1 Learners' perceptions of intelligence following Brainology instruction

The present section is a discussion of the learner participant perceptions of intelligence following Brainology instruction as revealed by the findings of the current study. Specifically, the present section addresses the first sub-research question: How do grade four learners with learning disabilities at a selected primary school in KwaZulu-Natal perceive their intelligence following Brainology instruction?

Dynamism of Intelligence

The current study revealed that learners with LDs had divergent views about their intelligence prior to Brainology instruction. The theories of intelligence framework advances that individuals have different views on their own intelligence (Dweck, 2012). Similarly, Boley's (2016) study found that prior to Brainology instruction, learners have unique views about their intelligence. The divergent views of learners with LDs on their intelligence can be attributed to each learner's unique experiences in the school and home environment, especially about their abilities and what others have told them about intelligence.

It also emerged from this study that, prior to Brainology instruction, 5 learners with LDs (38%) had the view that intelligence is malleable. This finding resonates with Chao et al., (2016) study which found that prior to Brainology a third of the participants viewed intelligence as something that can be developed. The view of the learners with LDs that intelligence is malleable is consistent with the incremental theory, embedded in the theories of intelligence framework which postulates that incremental theorists believe intelligence is malleable and are said to have a growth mindset (Paunesku et al. 2011). The view of the learners with LDs that intelligence is malleable could be a result of their own positive personal learning experiences, or they have been exposed to comments/behaviours which portray that intelligence can be developed through hard work and perseverance.

Consistent with Romero et al. (2014), this study found that before Brainology instruction, 4 learners with LDs (31%) correlated intelligence with talent and what one is good at, comments which typify characteristics of a fixed mindset. Similarly, Dweck et al. (2010) established that learners with LDs equate intelligence to talent because they believe that skills and abilities are fixed and that their performance is a consequence of that stability (Hong et al. 1999). In the same vein, the theories of intelligence framework postulates that learners with a fixed mindset view intelligence as static and talent as something one is born with (Dweck, 2012). Learner participants' correlation of intelligence with talent can be attributed to their experiences of only being recognised for their abilities, instead of their efforts. Further to this, the tradition of schools recognising only the talented top achievers may have also attributed to this response.

This study revealed that pre-Brainology instruction, some learners with LDs were uncertain about the state of intelligence. This finding is consistent with Rhew & Piro's (2018) study, which established that learners had not thought much about their intelligence prior to Brainology instruction. The uncertainty of learners with LDs about the state of intelligence prior to Brainology instruction can be due to a lack of exposure about intelligence. It could also be attributed to a lack of confidence in sharing their thoughts with their peers.

This study established that, following Brainology instruction, all learners with LDs viewed intelligence as being malleable. This finding resonates with the theories of intelligence, specifically the incremental theory, which postulates that individuals with a growth mindset believe intelligence is malleable and can be developed (Paunesku et al. 2011). The view of all learners with LDs that intelligence is malleable after Brainology instruction can be due to the successful transference of the main aim of Brainology instruction, which is to encourage learners to adopt the belief that intelligence is malleable.

This finding aligns with four Brainology studies, namely Boley (2016), Saunders (2013), Donohoe et al. (2012) and Espraza et al. (2014). Boley's (2016) qualitative case study established that following Brainology instruction, learners with LDs felt that intelligence was malleable. Specifically, learners' opinions had shifted from expressing comments aligned with a fixed mindset to that of comments that aligned with a growth mindset. Participants from Boley's (2016) study reported having new ways to think about themselves as learners about how they viewed their intelligence. Saunder's (2013) study established a positive shift in the 18 grade six learners' beliefs about intelligence, particularly that intelligence is malleable and could be developed. Similarly, Donohoe's et al. (2012) study found that post Brainology instruction, a majority of the 33 junior high learners behaviour aligned with that of a belief that intelligence is malleable. Lastly, Espraza et al. (2014) study reflected that following Brainology instruction, the majority of participants believed that intelligence was malleable. Results from the ANOVA reflected that a Brainology had a "significant impact" and a "large size effect" on the gifted learners' beliefs about their intelligence. It is worth mentioning however that besides Boley's (2016) study, the studies mentioned above utilised older participants, and focused on learners

without LDs, which contrasts with the current study sample, which solely focused on learners with LDs.

In contrast to the above finding, Wilkins (2014) large study with 684 grade seven learners saw no significant differences in learners' mindsets, particularly, beliefs about intelligence. Although significantly smaller in sample size, Todd's (2013) study also found that following Brainology instruction; there was little impact on the three learners' beliefs directly relating to intelligence. Chao et al. (2016) study revealed that following Brainology, a third of the sample group held a belief that intelligence was malleable, while the rest of the sample were either unaffected or believed intelligence was a fixed attribute.

Practice Beliefs

This study established that prior to Brainology instruction, 62% of the learners with LDs expressed difficulty in placing effort in tasks, and preferred tasks that did not require practice, thus exhibiting fixed mindset characteristics. This finding is in alignment with Baird et al. (2009) study that found that learners with LDs tend to exhibit fixed mindset characteristics. Specifically, Boone's (2017) study found that learners with LDs interpret the exertion of effort to possessing low levels of ability. In the same vein, the theories of intelligence framework postulates that an individual with a fixed mindset believes practice is fruitless and will not amount to any progress; effort is also seen as an indicator of low ability, whereas an individual with a growth mindset values practice and sees it as a worthwhile, necessary endeavour for success in learning (Blackwell et al., 2007). The belief of learners with LDs that practice was difficult could have been a result of situations where they experience much difficulty when learning new concepts and specifically when practising a concept is difficult.

This study found that before Brainology instruction, 4 learners with LDs (31%) felt that practice could improve/enhance learning. Boley's (2016) study found that prior to Brainology instruction, learner participants felt that they could improve their intelligence through practice. In accordance with this finding, the theories of intelligence framework postulates that

incremental theorists or individuals with a growth mindset believe that practice is necessary for improvement (Dweck, 2012). Learner participants' correlation of practice with improvement and enhancement of learning can be attributed to the influence of teachers and parents encouraging their learners/children to practice and place effort into what they do. These learners may have also been exposed to the old saying of "practice makes perfect" either at home or school.

It emerged from the present study that following Brainology instruction, all of the learners with LDs (100%) viewed practice as having the ability to improve and enhance their intelligence so that they could improve in areas that they experienced difficulty. Notably, 2 learners spoke of persevering and the value in making mistakes, both of which align to the theories of intelligence framework (Dweck, 2012), and which typify the incremental theory and are characteristic of an individual with a growth mindset.

Brainology testimonials sourced from www.mindsetworks.com concur with the above findings related to practice beliefs and persevering through challenging tasks. Examples of learner testimonials include "I am using that the more you practice, the more your brain makes more connections and increases your intelligence" and "I used to give up easily, but now I keep on trying to master the skills that I have problems in." Both of these comments were made from learners in grade six, slightly older than the sample group in the current study.

This finding is also consistent with Romero et al. (2014) and Paunesku et al. (2011). However, significant differences, such as sample groups and study focus must be noted. Romero et al. (2014) study was focused on learners' end of year grades, and their findings included decreased task avoidance and in turn, increased effort/motivation following Brainology instruction. Similarly, Paunesku et al. (2011) study was mainly focused on learners' reading skills following Brainology instruction. Their qualitative findings revealed that following Brainology, learners were attributing failures to the amount of practice and effort they had put in, rather than their lack of ability – a characteristic typical to that of a growth mindset (Burnette et al., 2013). Although Wilkin's (2014) study does not align with the findings related to the malleability of intelligence, results relating to practice do. In Wilkins (2014) large sample study of 684 grade

seven learners, it was found that increased effort and motivation in tasks was noted following Brainology instruction. A study by Rhew & Piro (2018) found that learners in the treatment group who had been exposed to Brainology displayed a "significant difference" in their motivation and the amount of effort they began to place in their tasks. Similar to the current study, although slightly older, the sample group consisted of learners who experienced learning difficulties associated with reading.

Interest Level

The above findings show that prior to Brainology instruction, 54% of the learners with LDs displayed a low level of interest towards learning, whilst 8% of the learners with LDs displayed an erratic level of interest. These two findings are consistent with the theories of intelligence framework, and specifically, the entity theory, which postulates that individuals with a fixed mindset tend to display a low level of engagement towards learning, especially towards challenging tasks (Dweck, 2012).

The current study revealed that following Brainology instruction, the majority of learners with LDs (77%) were seen to exhibit active levels of engagement towards learning. Specifically, 6 learners (46%) referred to interest being important for learning, 4 learners (31%) displayed behaviour that showed an increase in interest level. This finding resonates with the theories of intelligence framework, and specifically, the incremental theory, as it postulates that an incremental theorist or an individual with a growth mindset is actively engaged in their learning (Burnette et al., 2013). This is also consistent with Boley's (2016) study, which found that post Brainology instruction, the majority of the learner participants reported an increased level of intellectual engagement in their learning.

Overall, the current study found that Brainology instruction had varied influences on grade four learners with LDS in relation to their beliefs surrounding intelligence, practice beliefs and interest levels in learning. It emerged that Brainology instruction positively influenced some learners, while other learners with LDs were not influenced in any way. It was found that the majority of grade four learners with LDs understood themselves as being intellectually

equipped. Specifically, learners felt that intelligence could be developed. The present study also revealed that learners believed that practice, placing effort in tasks, persevering in challenges and making mistakes were important factors in the improvement and enhancement of intelligence. Lastly, it emerged that following Brainology instruction, the majority of learner participants displayed increased levels of engagement towards learning.

6.2 Learners' perceptions of their emotions and learning following Brainology instruction

The current sub-section discusses the learner participant experiences of Brainology instruction as revealed by the findings of the present study. It addresses the second sub-research: How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their emotions and learning following Brainology instruction? In the discussion, reference is made to the available literature with a particular emphasis on learners' view of the role of emotions in learning following Brainology instruction.

Emotions and Learning

The current study revealed that pre-Brainology instruction, a total of 9 learners (69%) related the experience of learning to negative emotions such as worry, sadness, anger and frustration. One learner indicted a mixture of happiness and sadness. This finding is consistent with Boley's (2016) study; as pre-Brainology instruction, participants understood learning to be frightening. It was found that learning created anxiety for learners, and they felt fearful and might not meet the required expectations. This finding was not entirely unexpected, as much literature indicates that learners with LDs often disengage themselves from the learning process due to lack of confidence in their abilities and past negative experiences related to learning (Pandy, 2012, Gurney, 2018).

A small number of learners (23%) chose not to comment. It was observed that they appeared hesitant and unsure. This could be a result of learners with LDs feeling vulnerable talking about their emotions, especially in a group setting. This finding aligns itself with Fletcher et al., (2018)

study that established that learners with LDs typically do not feel confident in talking about their abilities and emotions, especially about their own emotions that they feel when learning, due to painful past experiences related to their capabilities and learning.

It was found in this study that following Brainology instruction, learners with LDs responses were varied in relation to emotions and learning. The current study revealed that just over a third of the learners (38%) acknowledged that negative emotions are a hindrance to learning. In accordance with this finding, a testimonial found on a home school website (www.homeschoolbuyerco-op.org) indicated that after following Brainology instruction, a parent felt the programme had equipped her son to deal appropriately with the emotion of anger. "I have a son who was angry all of the time, especially when he was asked to do school work, the Brainology programme has helped us a great deal as my son understands how his brain grows and how he learns."

It also emerged from this study that 23% of learners with LDs acknowledged the essential role that emotions have on learning and made reference to the brains' role in combatting negative emotions. In alignment with this finding, the theories of intelligence postulates that individuals with a fixed mindset tend to view learning in a negative light, and favour negative or distressing emotions, which results in disengaged learning. This typically occurs when an individual is faced with a task that appears challenging and unattainable. Individuals with a growth mindset tend to view learning as an opportunity to increase their knowledge, tending to favour positive emotions, which leads to active, effective learning (Paunesku et al., 2011).

The current study found that following Brainology instruction, 38% of learners were unsure of the role of emotions in learning. It was observed that these learners appeared apprehensive. In contrast to this finding, on the Brainology website (www.mindsetworks.com), a learner testimonial reads "Brainology taught me that it is okay to feel anxious sometimes about not doing well in school," indicating an awareness of anxiety in learning and that it is an inevitable emotion to sometimes feel during learning. The uncertainty revealed may be attributed to learners with LDs not being comfortable in discussing emotions (as discussed above in section

6.2.1), especially about their own emotions that they feel when learning, due to painful past experiences related to their capabilities and learning.

Management of Emotions

It emerged from the study that pre-Brainology instruction, the majority of the learners with LDs (54%) were unsure of how to manage emotions during learning. This finding resonates with Chao et al. (2016) study, which highlighted the uncertainty relating to the learner participants' emotions prior to Brainology instruction. The uncertainty of the learners with LDs could be a result of learners not being taught about strategies to best manage negative emotions such as anger, sadness and anxiety.

The present study established that prior to Brainology instruction, 46% of learners with LDs expressed various suggestions on how best to manage their emotions, particularly in stressful learning situations. Similarly, Boley's (2016) study found that prior to Brainology instruction, learners were aware of some basic techniques such as breathing and asking the teacher for assistance. This finding can be attributed to parents, counsellors and teachers facilitating the awareness of emotions and how to best to manage and combat negative emotions such as anger, sadness and anxiety.

It emerged from the current study that following Brainology instruction, majority of the learners with LDs (76%) expressed that emotions, especially those such as anger and anxiety, can be managed through various techniques. These techniques included breathing techniques, positive self-talk, and asking the teacher for assistance – all of which were recommended by the Brainology programme, indicating a successful transference of learning. Further to this, 1 learner made reference to reflecting on the Brainology programme when feeling stressed. Chao et. al (2016) study echoed this finding. In the study, a learner shared how Brainology helped him deal with his anxiety, reporting, "I get all wound up at home, and I have the hardest time with my homework, so I found that Brainology helped a lot, in how to use the breathing process". Another participant from Chao et al. (2016) study shared how positive self-talk has assisted in learning "I learnt why I might be getting Ds and Cs, because I say bad things like, I'm

going to fail the test and I hope I'll do good, but I need to change those bad things to good things, like I'm going to pass the test, I'm going to do good."

In contrast to the above finding, 3 learners (23%) from the current study appeared distracted and bored. This could be attributed to a range of factors, including poor concentration, lack of interest in the content and/or lack of understanding of the content. Wilkin's (2014) reported similar findings in that 2 learners reported to have found Brainology boring, and lacked purpose. In addition, Brainology testimonials from learners that had received Brainology instruction indicated that they found some of the aspects of Brainology boring. These were not presented on the Brainology website, but rather on a home school forum (www.welltrainedmind.com) from disgruntled parents. Comments indicate that their children did not benefit from Brainology and were bored.

The current study found that although learners' experiences of Brainology instruction was varied, a commonality was in relation to how they viewed the role of emotions in their learning. Overall, it was found that the majority of grade four learners with LDs understood themselves as being emotionally equipped. Specifically, learners understood how to manage their emotions. Following Brainology, learners reported that they had acquired an understanding of the essential role emotions play in successful learning. In addition, the present study revealed that following Brainology, learners could express various strategies on how to combat and manage negative emotions such as anger and anxiety.

6.3 Learners' perceptions of practical strategies to enhance learning following Brainology instruction

The current sub-section discusses practical ways to enhance learners with LDs understanding of themselves as revealed by the findings of the present study. The present section addresses the third sub-research question that guided the current study and reads: How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their

practical strategies to enhance learning following Brainology instruction? In the discussion, reference is made to the available literature on learners suggested strategies for enhanced learning and practical considerations on the implementation of Brainology.

Strategies for Learning

The above findings show that prior to Brainology instruction, the majority of the learners with LDs (77%) focused on various factors that hinder learning. Specifically, 7 learners (54%) cited concentration as an obstacle for successful learning, 3 learners (23%) cited poor memory as a hindrance to their learning, whilst 1 learner (8%) felt that being disorganised was a hindrance to learning taking place. This finding aligns with literature that learners with LDs (especially those who have been diagnosed with ADHD) experience difficulty in maintaining concentration during tasks and in the processing, application and retention of concepts (Fletcher et al. 2018). See Table 3 in section 3.3.1.

It also emerged from the current study that 2 learners (15%) doubted their capabilities. This finding is consistent with Zheng (2014) study which established that learners who experience LDs are susceptible to low self-confidence, due to the difficulties that they experience when learning. The lack of self-confidence exhibited by learners with LDs can be due to painful past experiences related to their capabilities and learning (as mentioned above in section 6.2.1).

In the current study, it emerged that following Brainology instruction, over half of the learners (54%) suggested various practical study skills that could enhance learning, particularly ways to improve their concentration and memory. The findings of the current study revealed that Brainology had successfully transferred practical strategies to the learners. Learners' suggestions included short breaks, repetition/practice, playing card games, drawing pictures and highlighting key ideas, all of which Brainology had recommended. Consistent with this finding, online Brainology testimonials mentioned in the literature review, section 2.13.3, revealed similar statements. One comment included "I concentrate better on my tests, as well as homework because I know I can do what I put my mind to." Similarly, Boley's (2016) study

reaffirms this finding. A participant relayed the strategy of repetition to enhance memory, "If you repeat a word, you will memorise it soon enough." Another learner expressed that reading multiple times results in quicker processing, while another participant focused on applying strategies to prepare the brain before reading. In Wilkins (2014) study, learners also expressed practical ways in which to enhance their learning following Brainology. Specifically, one learner reported that Brainology assisted them in gaining a better understanding of long-term versus short-term memory. Comments included: "Brainology helped me study, to practice things by saying them over and over and go over them a lot" and "I use repetition to memorise things."

It further emerged that 23% of learners with LDs did not comment, and based on summative observations throughout the Brainology intervention appeared bored and distracted. This finding is consistent with Wilkins (2014) study and Chao et. Al (2016), (as mentioned above in section 6.2.2) where some learners were found to be generally disengaged in the Brainology intervention.

Brain Health

The current study revealed that learners with LDs had divergent views about brain health prior to Brainology instruction. It was found that 46% of the learners reported that the brain is responsible for thinking, and a small number of learners (15%) cited the importance of the brain. It was also found in the current study that 5 learners (38%) commented on the size and appearance of the brain. The divergent views of learners with LDs on brain health can be attributed to the basic facts that are taught in primary school pertaining to the brains function, importance and appearance. This finding is in alignment with Boley's (2016) study, where it was established that learners displayed a basic awareness about the brain before Brainology instruction.

In the current study, it was found that following Brainology, 54% of learners with LDs suggested various ways in which to maintain good brain health. The response was varied with 31% of learners suggesting good nutrition and 23% of learners suggesting a good nights rest. These responses were aligned with what Brainology had recommended, indicating a successful transference of learning. Learner participants from Boley's (2016) study also reflected on sleep and nutrition to maintain brain health, "you have to do enough sleep to rest your brain or recharge it, so when you wake up you're feeling something good." Another included "It helped me in my hardest subject, science, and I got the test right from taking the advice." One learner commented, "I practised, I got enough sleep, and I ate healthy" (Boley, 2016). Similarly, in Koeppen's (2016) study, learners commented on the practical strategies to enhance learning, commenting on the importance of eating your breakfast and getting a good night's sleep.

The current study found that following Brainology, 38% of the learners reported on the importance of the brain in relation to learning, and subsequently an awareness of the cognitive and physiological functions of the brain. Specifically, 3 learners (23%) commented on the above, although did not specify ways to maintain brain health. 2 learners (15%) focused on neuroplasticity in relation to learning. Specifically, they felt that for the brain to keep growing; learning must occur. This finding aligns itself with Brainology's main focus in relation to encouraging learners to adopt growth mindset thinking through awareness of the brains functioning. Similar learner comments (although not directly related to brain health) include "I imagine neurons making connections in my brain, and I feel like I am learning something" (Dweck, 2008), and "I like to think how my brains thinks when it learns, and this helps me to learn" (Boley, 2016) However, although these kinds of comments suggest that using the Brainology programme increased learners' awareness of the malleability of intelligence and in turn assisted them in developing strategies for learning, studies such as Donohoe et al. (2012) suggest that this positive impact towards a growth mindset may significantly decline shortly after the intervention. Thus, evaluation studies are needed to assess whether the positive effects of Brainology instruction are sustained.

Overall, the current study found that Brainology instruction had varied influences on grade four learners with LDS in relation to the practical strategies. Brainology instruction positively influenced some learners with LDs, while other learners with LDs were not influenced in any way. The current study found that the majority of grade four learners with LDs understood themselves as being practically equipped for learning. Specifically, following Brainology instruction, learners' felt that they could apply practical strategies in their learning. The current study also revealed that following Brainology instruction, learners reported practical ways to strengthen and to keep their brains healthy.

Learning Support Accommodations

The present study found that various learning support accommodations were necessary for the implementation of Brainology with learners with LDs. These included pausing during the sessions, giving the learners multiple 'mini-breaks' to enable them to regain focus, assisting with some of the questions in the challenges, carrying out consolidation discussions before and after each Brainology session, and pairing up learner participants to discuss the more difficult concepts, especially those related to neuroscience. It also emerged that the adaptation of the learner participants working together (as opposed to individually) through the Brainology programme worked very well in the learning support classroom context, due to the small class size.

These findings relating to learning support accommodations are in alignment with the recommendations found in The National Strategy on Screening, Identification, Assessment and Support document (SIAS, 2014), which includes a specific protocol to assist teachers in the screening, identification and support of learners with barriers to learning. This includes the use of individual support plans (ISP), various intervention strategies, assistive devices, collaborative learning and adaptations to the environment (SIAS, 2014). See section 3.8 for further information.

6.4 CONCLUSION

This chapter discussed the findings on how grade four learners with LDs understand themselves as learners following Brainology instruction. Specifically, learners' perceptions of intelligence following Brainology instruction; learners' perceptions of their emotions and learning following Brainology instruction and learners' perceptions of practical strategies to enhance learning following Brainology instruction was discussed. The discussion was underpinned by the theories of intelligence framework and available literature. The subsequent chapter presents the summary, conclusions and recommendations of the study.

CHAPTER SEVEN

SUMMARY, CONCLUSION AND RECOMMENDATIONS

7.0 INTRODUCTION

The current study sought to explore how grade four learners with LDs at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction. The study serves as a context for proposing strategies to enhance these learners' understanding of themselves as learners following Brainology instruction. In this chapter, a review of the current study is presented. A summary of the findings of the study on each sub-research question is presented. Lastly, the chapter presents contributions of the study, recommendations for future research, implications in a South African context and final comments.

7.1 REVIEW OF THE CURRENT STUDY

The first chapter introduced the study by presenting the background of the study alongside the aims and objectives. It revealed that inclusive education is a developing movement with a complex history (Walton, 2011). Further to this, despite the benefits of inclusive education, there are several challenges to its implementation (Florian, 2012). In addition, there are various barriers to learning, including learning disabilities (Donohue & Bornman, 2014). To support learners with learning disabilities, many interventions aim to assist these learners in overcoming their difficulties. Based on decades of research by Dr Dweck, Brainology is an online intervention programme that focuses on cognitive neuroscience and aims to encourage learners to adopt a growth mindset, a belief that intelligence can be developed through hard work and perseverance (Orosz et al. 2017). Learners' mindsets can be transformed through intentional instruction, resulting in increased motivation, greater self-confidence and improved grades (Aronson et al. 2002, Blackwell et al. 2007). However, mindset interventions which make use of the Brainology programme are limited and yield inconsistent results. It also revealed that there have been no other studies conducted on Brainology instruction in South Africa. Thus, the

current study aimed to increase the knowledge of how Brainology instruction supports learners with LDs and specifically how they better understand themselves following Brainology instruction.

Chapter two presented the theoretical framework that underpinned the study, namely the theories of intelligence framework. The entity theory and incremental theory were highlighted alongside the typical characteristics that portray the fixed mindset and the growth mindset.

Chapter three presented a review of related international literature on the support of learners with LDs. Various discourses informing inclusive education were presented, including the medical deficit model of disability, the social constructionist discourse and the social model of disability. An exposition of learning disabilities was discussed, included the types and causes of learning disabilities. Trends in the provision of inclusive education were presented, which included the support of learners with LDs in selected developed and developing countries. Lastly, a review of literature structured around the sub-research questions of the study was presented. Specifically, the review focused on learners' perceptions of intelligence following Brainology instruction, learners' perceptions of their emotions and learning following Brainology instruction and learners' perceptions of practical strategies to enhance learning following Brainology instruction.

The fourth chapter focused on the design and methodology of the study. Based within an interprevist paradigm, the study was qualitative and used a single case study design. The study took place in a co-educational primary school in KwaZulu-Natal, which is planned as a short-term learning support centre. The sample group was purposively chosen, using the homogeneous sampling technique and consisted of 13 grade four learners who experience learning disabilities. Participant observation, focus group interviews, and a reflective journal served as the data collection methods, and Braun & Clarke's (2006) model of thematic analysis was implemented.

Chapter five presented the findings and analysis of the current study. It highlighted the three main themes that emerged from learners' responses and behaviour following Brainology

instruction, namely learners understand themselves as intellectually, emotionally and practically equipped. Specifically, Intellectually: I can develop my intelligence; Emotionally: I know how to manage my emotions and Practically: I can strengthen my brain. The fourth theme was that various learning support accommodations were necessary in the implementation of Brainology with learners with LDs.

The previous chapter discussed the above-mentioned findings of the study. These findings were discussed in relation to the theories of intelligence framework and available literature.

The following section will use the data from chapter six in conjunction with the reviewed literature. The summarised findings are presented first, followed by the sub-questions and concludes with the concluding comments.

Specifically, this study addressed the following main research question and its sub research questions:

MAIN RESEARCH QUESTION

How do grade four learners with learning disabilities at a primary school in KwaZulu-Natal understand themselves as learners following Brainology instruction?

SUB-RESEARCH QUESTIONS

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu-Natal perceive their intelligence following Brainology instruction?

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their emotions and learning following Brainology instruction?

- How do grade four learners with learning disabilities at a selected primary school in KwaZulu- Natal perceive their practical strategies to enhance learning following Brainology instruction?

7.2 SUMMARY OF THE FINDINGS

The heart of the current study was to investigate how grade four learners with LDs understand themselves as learners following Brainology instruction. Based on the findings of the current study, it can be concluded that grade four learners with LDs are able to understand themselves as being intellectually, emotionally and practically equipped following Brainology instruction. Firstly, learners felt that intelligence can be developed. Secondly, learners were aware of how to manage their emotions. Thirdly, learners were able to suggest practical strategies so to strengthen their brain for learning. An additional finding was that various learning support accommodations were necessary for the implementation of Brainology instruction with learners with LDs. These findings were guided by the sub-research questions to fulfil the primary research question of how learners understand themselves as learners following the support of Brainology instruction.

7.2.1. Sub-research question 1: Learners perceptions of intelligence following Brainology instruction

In the present study, although the response was varied, it was found that majority of grade four learners with LDs understood themselves as being intellectually equipped for learning. Specifically, learners' believed intelligence could be developed. The present study revealed that following Brainology instruction, the majority of grade four learners with LDs held a belief that intelligence is malleable and can be developed. The present study also revealed that learners believed that practice, placing effort in tasks and persevering in challenges were important factors in the improvement and enhancement of intelligence. Lastly, it emerged that following Brainology instruction, majority of learner participants were seen to exhibit active levels of engagement towards learning.

7.2.2 Sub-research question 2: Learners perceptions of their emotions and learning following Brainology instruction

In the present study, although the response was varied, it was found that the majority of grade four learners with LDs understood themselves as being emotionally equipped for learning. Specifically, learners' were aware of how to manage their emotions. Following Brainology, learners reported that they had acquired an understanding of the essential role emotions play in successful learning. In addition, the present study revealed that following Brainology, learners could express various strategies on how to combat and manage negative emotions such as anger and anxiety.

7.2.3 Sub-research question 3: Learners perceptions of practical strategies to enhance learning following Brainology instruction

In the present study, although the response was varied, it was found that the majority of grade four learners with LDs understood themselves as being practically equipped for learning. Learners felt that they could apply practical strategies in their learning that could strengthen their brain. It further emerged that following Brainology instruction, learners reported on various ways that they could strengthen their brain. Specifically, learners commented on practical strategies to enhance concentration and memory. The present study also revealed that following Brainology, learners were able to report practical ways to enhance brain health. All of the strategies made by the learners were recommended in the Brainology programme, indicating a successful transference of strategies relating to the enhancement of learning. An additional finding was that various learning support accommodations were necessary for the implementation of Brainology with learners with LDs.

7.3 CONTRIBUTION OF THE STUDY

Despite the increased attention towards the promotion of a growth mindset in classrooms around the world, the current study is the first Brainology study to be implemented in South Africa. Further to this, this is the first study related to the concept of mindset and the role of non-cognitive factors implemented in South Africa.

The current study extends the body of knowledge, attitudes, skills and understanding relating to how learners understand themselves as learners, particularly on an intellectual, emotional and practical level.

This study serves as a springboard for future studies relating to the influences of Brainology instruction, mindset intervention studies and, in a broader sense, studies relating to the concept of growth mindset and the role it plays in an inclusive classroom context.

Further to this, this body of knowledge will assist individuals and groups such as school management teams, parents, educators, counsellors and learners with LDs in the inclusion of teaching non-cognitive skills to learners. Further to this, the current study will aid in raising awareness relating to the facilitation of growth mindset oriented thinking in learners.

7.4 RECOMMENDATIONS FOR FUTURE RESEARCH

Although there is much literature related to mindset and mindset interventions, there is a paucity of literature relating to the mindsets of primary school learners, especially those in lower primary school grades who experience LDs. Furthermore, Brainology specific studies are limited, especially those which are qualitative. In addition, there are no Brainology studies which have been carried out in South Africa. Thus, further research within a South African inclusive classroom context would be fruitful. Additional studies that incorporate the Brainology programme and other supportive materials like videos, games, other interactive mediums could be used to add valuable data related to the impact of such programmes that target non-cognitive factors.

The current study was confined to a small sample group of 13 learners from a single school. A more comprehensive study implemented with large sample groups on a national level could establish the role and the impact of Brainology instruction on learners. A more comprehensive study could also provide a baseline on whether Brainology is an effective programme that promotes successful learning.

In the present study, data was only collected from grade four learners with learning disabilities. Further research from diverse sample groups differing in age and ability could reveal diverse perspectives and provide comprehensive data. In addition, increasing the population involved in the study could be of great benefit to further diversify and increase the quantity of data relating to how learners understand themselves as learners following Brainology instruction.

The current study reviewed the learners understanding of themselves as learners directly after the Brainology programme. Whether the various influences on the learners would be sustained was beyond the scope of this study. Therefore, it is recommended that future research should investigate the longer-term effectiveness of growth mindset interventions, (such as Brainology) in a South African inclusive classroom context.

7.5 PROPOSED STRATEGIES TO ENHANCE LEARNERS UNDERSTANDING OF THEMSELVES

In this section, proposed strategies to enhance learners understanding of themselves will be presented. This section is aimed at how classroom teachers can encourage learners to adopt a growth mindset. These strategies are based on the main findings of the present study. Following this, recommendations are presented in relation to the practicalities surrounding the implementation of Brainology instruction with grade four learners with LDs.

The main findings of the present study indicate that grade four learners with LDs understand themselves as being intellectually, emotionally and practically equipped following Brainology instruction. These findings suggest that it is essential that various strategies are implemented in the classroom to create a growth mindset culture. Below are the proposed strategies on how this can be achieved:

- Teachers should incorporate process praise into their teaching. This would include praising learner's effort and learner's progress rather than the final product, outcome, or natural ability.

- Teachers should incorporate the Brainology strategies which aim to reduce learners' stress and anxiety. Reminding learners of the coping skills and relaxation strategies to combat negative emotions will encourage learners to feel emotionally safe, and equipped in combatting negative emotions such as anger and anxiety.

- Teachers should incorporate basic neuroscience into their lessons. This can be done through brainteasers, riddles and puzzles that challenge the brain while teaching learners about how their brains work.

- Teachers should incorporate the practical Brainology strategies which aim to enhance learning. Reminding learners of study skills strategies and the importance of maintaining good brain health may result in increased achievement.

The provision of various interventions to learners with LDs at the institution is founded on learner support that underpins the implementation of inclusive education in South Africa and globally. Drawing from section 6.3.3 above, recommendations in relation to the practical implementation of Brainology with learners with LDs are presented below. These recommendations are aimed at teachers when implementing the Brainology intervention programme with learners with LDs.

- Pause the Brainology programme to allow learners to process information
- Allow learners to have short movement breaks (+- 2 minutes) during sessions
- Consolidate previous Brainology sessions before moving onto the next unit
- Allow learners to work as a group or in pairs

7.6 IMPLICATIONS IN A SOUTH AFRICAN CONTEXT

From a South African perspective, realistic implementation factors will need to be considered in ascertaining whether the support of Brainology could be useful in a South African context,

particularly in mainstream and full-service schools where the class sizes are bigger. As there is a cost involved, not all schools will be able to acquire the Brainology programme due to limited resources and finances. Furthermore, access to the Brainology programme expires after a year, making long-term implementation a costly endeavour. The programme is only available in English and Spanish, and therefore not applicable to the diverse nature of South African dialect. These are the realistic limitations of the Brainology Programme as a support programme in South Africa. Access to the programme will vary according to each school, which goes against the essence of inclusive education. Therefore, whether Brainology (or a similar intervention programme) is suitable as a support programme within the South African inclusive education framework remains to be seen.

7.7 FINAL COMMENTS

The current study investigated and established how grade four learners with LDs at a primary school in Kwa-Zulu Natal understand themselves as learners following Brainology instruction. This was achieved by gaining insights from the learner participants responses and behaviour following Brainology instruction. Based on the findings of the study, it can be concluded that Brainology instruction enhanced the participants understanding of themselves as learners – intellectually, emotionally and practically. An additional finding was that the Brainology intervention could include additional accommodations to improve its efficacy with learners who experience LDs. It was encouraging to note that an intervention support programme such as Brainology has the ability to impact positively on learner's understanding of themselves as learners. Despite the limitations of the study and the limitations of the Brainology programme in a South African context, this study reveals that programmes which focus on the subtle, non-cognitive development of learners, instead of rigid cognitive knowledge and quantifiable results may have a place in South African inclusive classrooms.

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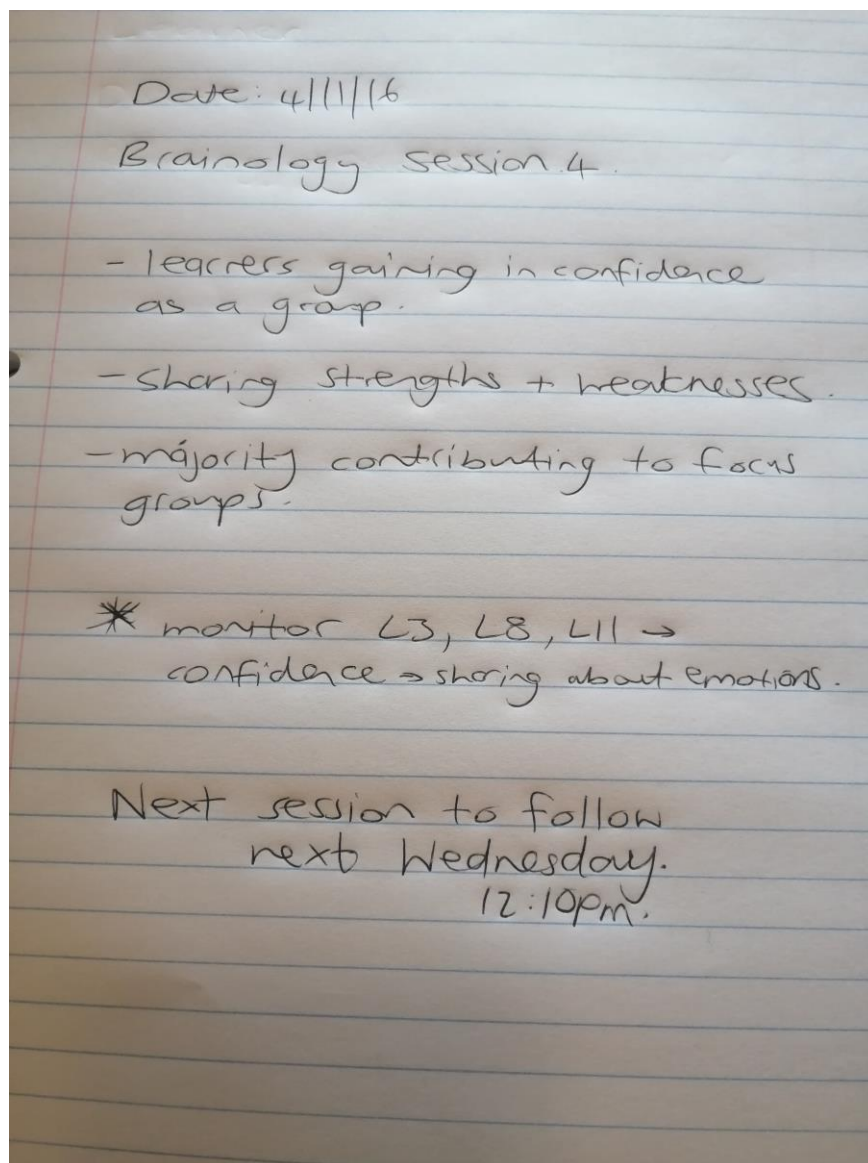
Appendix A – Example of A Pre/Post Brainology Observation Schedule

PRE/POST BRAINOLOGY OBSERVATION SCHEDULE
BRAINOLOGY SESSION: BRAINOLOGY TOPIC: DATE:
L1
KEY OBSERVATIONS/COMMENTS

AN EXAMPLE OF AN OBSERVAION SCHEDULE USED IN THE STUDY

PRE/POST BRAINOLOGY OBSERVATION SCHEDULE
BRAINOLOGY SESSION: 1   BRAINOLOGY TOPIC: Intelligence – What is intelligence?

L1   KEY OBSERVATIONS/COMMENTS

- active participant – seemed to enjoy.
- good general knowledge – loves reading!
- sometimes hesitant when directly asked a question → tended to fidget.
- set high standards for himself.
- fear of failure?? Afraid to make mistakes. Intelligence = Talents.

Appendix B – Example of an Interview Schedule

PRE/POST BRAINOLOGY INTERVIEW SCHEDULE
BRAINOLOGY SESSION: **BRAINOLOGY TOPIC:**   **DATE:**   **L1**
   _____   _____   _____   _____   _____   _____   _____   _____   _____   _____   _____   _____

AN EXAMPLE OF AN INTERVIEW SCHEDULE USED IN THE STUDY

Appendix C – Example from a page from my Reflective Journal

Date: 4/11/16

Brainology session 4.

- learners gaining in confidence
  as a group.

- sharing strengths + weaknesses.

- majority contributing to focus
  groups.

* monitor L3, L8, L11 →
  confidence → sharing about emotions.

Next session to follow
     next Wednesday.
              12:10pm.

Appendix D – Mindset Assessment Profile Tool

MINDSET ASSESSMENT PROFILE   Name: _____

This is NOT a test! It is an opinion survey about beliefs and goals regarding ability and performance. It is very important that you give your honest opinion, not what you believe someone else would think best. Read each statement, decide how much you agree or disagree with the statement, and circle your answer.

Do you Agree or Disagree?	Disagree A Lot	Disagree	Disagree A Little	Agree A Little	Agree	Agree A Lot	Profile Number
1. No matter how much intelligence you have, you can always change it a good deal.	1	2	3	4	5	6	
2. You can learn new things, but you cannot really change your basic level of intelligence.	1	2	3	4	5	6	
3. I like my work best when it makes me think hard.	1	2	3	4	5	6	
4. I like my work best when I can do it really well without too much trouble.	1	2	3	4	5	6	
5. I like work that I'll learn from even if I make a lot of mistakes.	1	2	3	4	5	6	
6. I like my work best when I can do it perfectly without any mistakes.	1	2	3	4	5	6	
7. When something is hard, it just makes me want to work more on it, not less.	1	2	3	4	5	6	
8. To tell the truth, when I work hard, it makes me feel as though I'm not very smart.	1	2	3	4	5	6	
MINDSET ASSESSMENT PROFILE NUMBER							

Creating Your Mindset Assessment Profile

1. **First, determine your Profile Number for each question.**
- **For questions with odd numbers (1, 3, 5, 7)**, write the number of your answer into the boxes in the right column.
- **For questions with even numbers (2, 4, 6, 8)**, use the table below to fill in the gray boxes in the right column.

If you chose this answer:	Then write <u>this</u> number in the gray box on the right (Profile Number).
Disagree A Lot (1)	6
Disagree (2)	5
Disagree A Little (3)	4
Agree A Little (4)	3
Agree (5)	2
Agree A Lot (6)	1

2. **Now, add up all your Profile numbers.**
- Add up all the numbers in the Profile column on the right, and write the total in the last box in the bottom right corner.

3. What does your Mindset Profile Number mean?
- Find the group that includes your number in the chart below and circle it.
- Now, read what it says about your MAP group.

If your profile number falls into this range:	Then your MAP (Mindset Assessment Profile) group is:	People in this MAP group usually believe the following things:
8-12	F5	You strongly believe that your intelligence is fixed—it doesn't change much. If you can't perform perfectly you would rather not do something. You think smart people don't have to work hard.
13-16	F4	
17-20	F3	You lean toward thinking that your intelligence doesn't change much. You prefer not to make mistakes if you can help it and you also don't really like to put in a lot of work. You may think that learning should be easy.
21-24	F2	
25-28	F1	You are unsure about whether you can change your intelligence. You care about your performance and you also want to learn, but you don't really want to have to work too hard for it.
29-32	G1	
33-36	G2	You believe that your intelligence is something that you can increase. You care about learning and you're willing to work hard. You do want to do well, but you think it's more important to learn than to always perform well.
37-40	G3	
41-44	G4	You really feel sure that you can increase your intelligence by learning and you like a challenge. You believe that the best way to learn is to work hard, and you don't mind making mistakes while you do it.
45-48	G5	

4. **Do you think the description under your MAP group matches the way you think and feel about your school work? Which parts are true for you and which are not?**

Appendix E: Kwa-Zulu Natal Department OF Education Request Letter

Title:

An exploratory case study of an online mindset programme with grade four learners who experience learning disabilities in KwaZulu-Natal

Dear Sir/Madam

I, Penny Lynne Goodrick, am doing a six-week study with Prof T Majoko, my supervisor, towards a Master's Degree in Inclusive Education at the University of South Africa (UNISA).

The purpose of the study is to explore the Brainology software programme in a learning support classroom context with grade four learners who experience learning difficulties.

Your department has been selected because of ease of access, as I live in KwaZulu-Natal. After a review of the selection criteria, I hope to conduct my study with my class. Therefore, without disruption of the school programme, I will be able to have daily contact with the participants. It must be emphasised that since the sample group all experience learning disabilities, and therefore may be seen as a vulnerable/marginalised group, all potential risk, inherent bias and subjectivity will be taken fully into account when conducting this study. The study will entail data collection procedures include participant observation, focus group interviews and a reflection journal.

The learner participants will be embarking on the six-week research-based software programme called Brainology. Brainology is a programme designed to teach learners brain science and study skills that will help them develop a growth mindset – the core belief that abilities, rather than being fixed, are developed over time – which is critical to adopting learning-oriented behaviour. When learners and educators have a growth mindset, they understand that intelligence can be developed. They focus on improvement, rather than worrying about how clever they are. Research has revealed that learners with growth mindsets show greater motivation in school, better grades, and higher test results. They not only had an increased focus on learning, but greater resilience and superior achievement.

Therefore, this study aims to encourage the learners to adopt a "growth mindset", especially as they encounter challenging tasks in their learning. Should the required permission/parent consent/learner assent be obtained, the participants will be expected to partake in the Brainology programme. Their responses and behaviour will be thoroughly observed and later, reflected on. Each Brainology session will take place in my classroom on the projector, and the session will last 1 hour in total.

The study will contribute towards the implementation of inclusive education, especially to explore how grade four learners with learning disabilities can be supported through such a programme like Brainology. Further to this, the potential benefits of this study are that learners will be provided with the opportunity to adopt the characteristics of a growth mindset as described above.
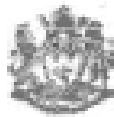
It must be mentioned that every measure will be taken to protect the confidentiality of each participant. During the entire research process, every reasonable measure will be taken to mitigate any potential risks that may present themselves. Coding will be used for names of all participants and the research site to ensure anonymity. All collected data, either as hard or soft copies will be kept under lock for five years. The feedback procedure of this study will entail an individual informal age-appropriate discussion whereby the six Brainology sessions will be reflected on. This will be integrated into the normal school programme as part of their life skills lesson.

Yours sincerely,

_____
Penny Goodrick
Researcher

_____
Prof Majoko
Supervisor

Appendix F: Permission for Kwa-Zulu Natal Department of Education Letter

Appendix G- Request For Permission To Conduct Research From The Principal

Dear Principal

Title: An exploratory case study of an online mindset programme with grade four learners who experience learning disabilities in KwaZulu-Natal

I, Penny Lynne Goodrick, am doing a six-week study with Prof T Majoko, my supervisor, towards a Master's Degree in Inclusive Education at the University of South Africa (UNISA).

The purpose of the study is to explore the Brainology software programme in a learning support classroom context with grade four learners who experience learning difficulties.

Your school has been selected because of ease of access since it is my workplace as an educator. After a review of the selection criteria, I hope to conduct my study with my class. Therefore, without disruption of the school programme, I will be able to have daily contact with the participants. It must be emphasised that since the sample group may be seen as a vulnerable/marginalised group, all potential risk, inherent bias and subjectivity will be taken fully into account when conducting this study.

The participants will be embarking on the six-week research-based software programme called Brainology. This is subsequently partly a result of your decision to purchase the Brainology programme as part of the support programme which will be integrated into life skills lessons. I too was most impressed, and after reviewing the literature on the topic of mindset and mindset interventions, I felt compelled to do my research based on this programme and to explore the extent of the usefulness of the programme to support learners. As you are aware, Brainology is a programme designed to teach learners brain science and study skills that will help them develop a growth mindset – the core belief that abilities, rather than being fixed, are developed over time – which is critical to adopting learning-oriented behaviour. When learners and educators have a growth mindset, they understand that intelligence can be developed. They focus on improvement, rather than worrying about how clever they are. Research has revealed that learners with growth mindsets show greater motivation in school, better grades, and higher test results. They not only had an increased focus on learning but greater resilience and superior achievement.

Therefore, this study aims to encourage the learners to adopt a "growth mindset", especially as they encounter challenging tasks in their learning. Should the required permission/ parent

consent/learner assent be obtained, the participants' will be expected to partake in the Brainology programme. Their responses and behaviour will be thoroughly observed and later, reflected on. Each Brainology session will take place in my classroom on the projector, and the session will last 1 hour in total.

The potential benefits of this study are that learners will be provided with the opportunity to adopt the characteristics of a growth mindset as described above.

It must be mentioned that every measure will be taken to protect the confidentiality of each participant. During the entire research process, every reasonable measure will be taken to mitigate any potential risks that may present themselves. Furthermore, the name of the school and the principal's name will be omitted from the final dissertation for reasons of confidentiality. The feedback procedure of this study will entail an individual informal age-appropriate discussion whereby the six Brainology sessions will be reflected on. Feedback with each parent will be done timeously in a parent-teacher meeting, whereby reflection of the intervention will take place. This will be done with each parent separately to guarantee confidentiality.

Yours sincerely,

_____   _____

Penny Goodrick   Principal
Researcher

_____

Prof Majoko
Supervisor

CONTACT:
Researcher: Penny Goodrick 45713820@mylife.unisa.ac.za/0828338658
Supervisor: Prof Majoko tawandamajoko@gmail.com

Appendix H – Parental Consent Letter

Dear Parent,

Your child is invited to participate in a six-week study about mindsets. This study is entitled: An exploratory study of the online Brainology software programme to support learners who experience learning difficulties. I am undertaking this study as part of my Masters research from the University of South Africa (UNISA). The purpose of the study is to explore the online Brainology software programme in a learning support classroom context with learners who experience learning difficulties.

As you are aware, the school management has decided to implement a programme called Brainology as part of their support programme for Grades 4 - 7. Due to the impressive results from the Brainology programme, I felt compelled to use it as the base of my study. With your consent, your child will be asked to participate in the Brainology programme with his/her classmates.

From there, all participants who have received parental consent (and given their consent) will be taught mindset strategies/study using the Online Brainology Software Programme as a base (see attached letter). This will take place in your child's classroom on a projector.

Any information that is obtained in connection with this study and can be linked to your child will remain confidential and will only be disclosed with your permission. His or her responses will not be linked to his or her name, your name or the school's name in any written or verbal report based on this study. Such a report will be used for research purposes only. The specific data collected from your child will include his/her responses to the survey, observations and reflections to the response to the Brainology programme. At the end of the study, learners will be individually debriefed and given age-appropriate feedback regarding the study. You as the parent will also be contacted telephonically, and an individual interview will be arranged to discuss the results and your child's general progress.

During the research process, every reasonable measure will be taken to mitigate any potential risks that may present themselves. Ultimately, learners may potentially benefit from learning new ideas and study skills that aim to assist them in their schoolwork and future studies. Furthermore, the possible benefits to the study of education include widening the scope of the investigation into this topic, particularly in a remedial context. Please note that neither your

child nor you will receive any type of payment for participating in this study. Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusal to participate will not affect him/her in any way. Similarly, you can agree to allow your child to be in the study now and change your mind later without any penalty.

The study will take place during regular classroom activities with the prior approval of the school. However, if you do not want your child to participate in the study, their response to the Brainology programme will not be used in the study. In addition to your permission, your child must agree to participate in the study, and you and your child will also be asked to sign the assent form which accompanies this letter. If your child does not wish to participate in the study, he or she will not be included, and there will be no penalty. The information gathered from the study and your child's participation in the study will be stored securely on a password-locked computer in my locked office for five years after the study. Thereafter, records will be erased.

If you have questions about this study, please contact me or my study supervisor, Prof Majoko, Department of Education, College of Education, University of South Africa (UNISA).
My contact number is 082 833 8658 and my e-mail is pennygoodrick@gmail.com. The e-mail of my supervisor is tawandamajoko@gmail.com

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. You may keep a copy of this letter. The ethics committee of the College of Education from the University of South Africa will be handling the ethics approval for this study.

Yours sincerely,

Penny Goodrick (pennygoodrick@gmail.com/082 833 8658)

Supervisor: Prof Majoko (tawandamajoko@gmail.com/0124841000) UNISA

Parental consent:

I, the parent of _____ , ___ years of age, have acknowledged the above information and permit her/his participation in a study carried out by Miss Penny Goodrick.
Parent name: _____ Parent Signature: _____
Date: _____
Researcher's name: _____Researchers Signature: _____
Date: _____

Appendix I – Learner Assent

Dear: _____

You are being invited to take part in a study about mindsets. The rest of the class are also invited (12 learners).

The title of this study is: An exploratory study of the online Brainology software programme to support learners who experience learning difficulties. The goal of this study is to see if the Brainology programme that you will be doing at school can be helpful to both you and your teachers.

This letter is to explain to you what I would like you to do. There may be some words you do not know in this letter. You may ask me or any other adult to explain any of these words that you do not know or understand. You must take a copy of this letter home. You may take your time to think about my invitation. Please talk to your parents about this before you decide if you want to be in this study.

The study will last for six weeks. During this study, you will take part in an online software programme called Brainology once a week during school time. You will be working as a team with the rest of your class in completing four units. Each session will last 60 minutes. You will be learning about your brain and how it can grow stronger, among many other interesting facts! Before and after each session, we will have a short class discussion about what you think about the session.

I will write a report on the study, but I will not use your name in the report or say anything that will let other people know who you are. You do not have to be part of this study if you don't want to take part. If you choose to be in the study, you may stop taking part at any time. You may tell me if you do not wish to answer any of the questions. No one will blame you, judge you or criticise you. If you decide to be part of my study, you will be asked to sign the form on the next page. If you have any other questions about this study, you can talk to me, or you can ask your parents or another adult to call me on 082 833 8658.

Do not sign the form until you have all your questions answered and understand what I would like you to do. Your parents will also be getting a letter, and they will be asked if they would like you to be in the study. Your parents will get a copy of the signed consent form and confidentiality agreement.

The exciting part is that you may benefit from learning new ideas that will help you in school! The information collected from your answers and access to your school records will be private. You can talk directly with Miss Goodrick or you may ask your parents to write a letter. Your parents have my email address and cell phone number too.

Do not sign the form if you have any questions. Ask your questions first and make sure that someone answers those questions.

Regards,

Miss Goodrick

Written assent

I have read this letter which asks me to be part of a study at my school. I have understood the information about my study and I know what I will be asked to do. I am willing to be in the study.

Learner's name (print) _____
Learner's signature_____   Date: _____

Witness's name (print) _____
Witness's signature _____   Date: _____

(The witness is over 18 years old and present when signed.)

Parent/guardian's name (print):_____
Parent/guardian's signature: _____   Date: _____

Researcher's name: (print) _____
Researcher's signature: _____   Date: _____

Confidentiality agreement
I_____ grant assent that the information I share during the group discussions may be used by the researcher, Miss Goodrick for research purposes. I am aware that observations from the group discussions will be manually recorded by hand, provided that my privacy will be protected. I undertake not to divulge any information that is shared in the group discussions to any person outside the group in order to maintain confidentiality.

Participants Name : _____
Participant Signature : _____ Date : _____
Researcher's Name: _____
Researcher's Signature: _____ Date: _____

Contacts:
Researcher: Miss Penny Goodrick (pennygoodrick@gmail.com/0828338658)
Supervisor: Prof Majoko (tawandamajoko@gmail.com/0124841000) UNISA

Appendix J – Ethics Certificate

UNISA | University of South Africa

COLLEGE OF EDUCATION RESEARCH ETHICS REVIEW COMMITTEE

16 November 2016

Ref : 2016/11/16/45713820/50/MC
Student : Ms PL Goodrick
Student Number : 45713820

Dear Ms Goodrick,

Decision: Approved

Researcher: Ms PL Goodrick
Tel: 082 833 8658
Email: pennygoodrick@gmail.com

Supervisor: Dr MJ Gumede
College of Education
Department of Inclusive Education
Tel: +2712 484 1000
Email: gumedmj@unisa.ac.za

Proposal: An exploratory study of the Brainology software programme to support learners who experience learning difficulties

Qualification: M Ed in Inclusive Education

Thank you for the application for research ethics clearance by the College of Education Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the research.

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the College of Education Research Ethics Review Committee on 16 November 2016.

The proposed research may now commence with the proviso that:

1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the College of Education Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for

the research participants.

3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:

The reference number **2016/11/16/45713820/50/MC** *should be clearly indicated on all forms of communication (e.g. Webmail, E-mail messages, letters) with the intended research participants, as well as with the College of Education RERC.*

Kind regards,

Dr M Claassens
CHAIRPERSON: CEDU RERC
mcdtc@netactive.co.za

Prof VI McKay

EXECUTIVE DEAN

Appendix K - Language Editing Certificate

Proof of Editing

This letter serves as proof of my (Erin Fourie) editing of Miss P. Goodrick's (student number: 45713820) Master's thesis, entitled ''An exploratory case study of an online mindset programme with grade four learners who experience learning disabilities in KwaZulu-Natal.''

Signed,

Erin Fourie
February 2021