

DIFFICULTIES THAT LEVEL ONE TRAINEES ENCOUNTER IN LEARNING  
MATHEMATICS: A CASE STUDY OF THE WINDHOEK VOCATIONAL  
TRAINING CENTRE

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## ABSTRACT

The low performance of the Level 1 trainees at the Windhoek Vocational Training Centre has been on an increasing at an alarming rate. Over the years many of the Level 1 trainees Of Windhoek Vocational Training Centre (WVTC) perform below average in their final year examination. However, at the present moment there were no proven reasons why the performance of these trainees was so low. The study therefore investigated the difficulties that the Level 1 trainees experience in learning Mathematics at the WVTC in the Khomas Educational Region of Namibia. The study sought to address the following questions: (1) What is the state of the number sense of the Level 1 trainees at WVTC? (2) What are the difficulties experienced in learning Mathematics by Level 1 trainees at WVTC?, (3) What are the contributing factors to the difficulties experienced in learning Mathematics by the Level 1 trainees at WVTC?, and (4) What can be done to ameliorate the difficulties experienced by the Level 1 trainees in learning Mathematics at WVTC?

The study was guided by Blackwell, Trzesniewski and Dweck (2007) of “fixed” and “growth” mind-set theory. The study employed a mixed-methods approach in two sequential phases. StratifiedThe group of trainees selected are in the entry stage of Vocational Education and Training therefore, since they are new to the system of VET they provided rich information to answer the researcher’s questions. To determine the appropriate sample number, the sample formula by Fowler (2014) dictates that the sample size needs to be 241. Thereafter, stratified sampling was used to get a sample of 241 out of 645 Level 1 trainees at the WVTC. As a result, a total of 241 Level 1 trainees participated in the study, and all the participants completed the number sense test and the Fennema-Sherman Mathematics Attitude Scale. The

data collected from the number sense test and the Fennema-Sherman Mathematics Attitude Scale were analysed using frequency tables and graphs and thematic analysis was used to analyse the qualitative data.

The responses from the two instruments were used to purposefully select 48 Level 1 trainees for phase two, in which qualitative data were collected through group discussions. Trainees were randomly assigned to six focus groups discussions consisting of eight trainees each.

The study found that more than 50% of the Level 1 trainees had a negative attitude towards Mathematic. The findings from the focus group discussions revealed the following specific difficulties that the trainees experienced in learning Mathematics; and they were among others: difficulty in in transferring knowledge, incomplete understanding of the language of Mathematics, and low number sense level. The identified difficulties were caused by the following factors; large number of trainees in the classroom, trainee's attitude towards Mathematics, trainee's poor English Language proficiency, and time allocated for Mathematics lessons on the timetable.

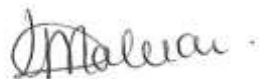
The study recommended that the admission office should admit a number that is manageable to the Mathematics instructors at the centre. Also the instructors should provide remedial teaching to those trainees that are finding it hard to cope in the normal classroom teaching and the centre should develop a bridging course that will help prospective trainees for Level 1 to fill the gap on the needed number sense efficiency to cope with the Level 1 Mathematics content.

## DECLARATIONS

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**Signature**

20 November 2017

**Date**

## **DEDICATION**

**I dedicate this thesis to**

**My parents Mr Festus Hafeni and Mrs Lovisa Malwa**

For your understanding, love, support, and encouragement that motivated me to push on when all hope were lost. I will always remember you both for being my pillar of strength and courage to move further when I felt like giving up. Thank you for giving my academic journey so much light and meaning. Most of all for taking up the greatest responsibility of raising my son while per suing my studies. I am indebted to you for ever.

**My son Panduleni M Kahiurika**

For enduring long months of not being able to see mommy while I pursued my studies and enduring the vulnerable early years of growing up without me every day. I will always love you

**I. Z. Kahiurika**

Thanks for believing in me and for your massive support and motivation throughout my studies. I may not thank you enough but God will truly reward you for that. God bless you

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My good friend and class mate Lloyd Nsingo who was always ready to offer support, advice and a shoulder to lean on during the difficult times. I will be forever grateful for the friendship and support you offered me throughout my studies.

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### TO WHOM IT MAY CONCERN

This is to certify that I Godfrey M Tubaundule, in my personal capacity of freelance editor, edited the Master thesis of Ms Lovisa Malwa and can, to the best of my knowledge, declare it free of grammatical errors.

The changes I have indicated concerning the thesis have been made by me and Ms Malwa.



.....  
Dr Godfrey M. Tubaundule

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## LIST OF ACRONYMS

<b>AU</b>	African Union
<b>BETD</b>	Basic Education Teacher Diploma
<b>CBET</b>	Competency Based Education and Training
<b>DNEA</b>	Directorate of National Examinations and Assessment
<b>ETSIP</b>	Education and Training Sector Improvement Program
<b>GRN</b>	Government of the Republic of Namibia
<b>HPP</b>	Harambee Prosperity Plan
<b>ILO</b>	International Labour Organisation
<b>JSC</b>	Junior Secondary Certificate
<b>MEC</b>	Ministry of Education and Culture
<b>MoE</b>	Ministry of Education
<b>MHEVTEC</b>	Ministry of Higher Education Vocational Training and Employment Creation
<b>NSSCO</b>	Namibia Senior Secondary Certificate Ordinary Level
<b>NDCP</b>	Namibia's Development Cooperating Partners
<b>NDP4</b>	Fourth National Development Plan
<b>NPC</b>	National Planning Commission
<b>NIED</b>	National Institute for Educational Development
<b>NTA</b>	Namibia Training Authority
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organisation
<b>VET</b>	Vocational Education and Training
<b>VTC</b>	Vocational Training Centre
<b>WVTC</b>	Windhoek Vocational Training Centre

## **CHAPTER ONE: INTRODUCTION**

### **1.1. Orientation of the study**

Prior to independence, the Vocational Education and Training (VET) system in Namibia was decentralized and each industry such as in mining, fishing and agriculture. However, after Namibia gained independence in 1990, the Namibia Training Authority (NTA) was established under the Vocational Education and Training Act, 2008 (Act No. 1 of 2008). This meant that VET was effectively handed over to the then Ministry of Labour and Manpower Development, which is currently known as Ministry of Labour with the aim of regulating the provision of VET in Namibia (Office of the Prime Minister (OPM), 2008). The NTA is expected to contribute to the establishment of an effective and sustainable system of skills development that is aligned to the needs of the labour market.

The NTA regards Mathematics as an integral part of the competencies to be acquired by trainees of VETs. This view is supported by the National Institute for Educational Development (NIED) (2010) which states that Mathematics is the foundation for scientific and technological knowledge that is vital in the social and economic development of Namibia. The NTA develops Mathematics competencies that are needed for productive work and increased standards of living in post-independent Namibia, promotes access, equity and quality in VET, with greater emphasis on the development of Mathematical proficiency (Onwumere, 2009). Given the emphasis on the development of mathematical proficiency, Mathematics education occupies an important position in the Namibian Education system and is a compulsory subject at both primary and secondary school levels (NIED, 2010). Further, at tertiary level, Mathematics is used as a basic entry requirement into any of the prestigious degree

programmes such as Medicine, Architecture, Engineering and others (National Institute for Educational Development (NIED), 2010). The knowledge and skills of Mathematics are essential in VET because they encourage and support enquiry and creativity and are the foundation to lifelong learning and entrepreneurship (Ministry of Education, MoE, 2005).

The Namibia Training Authority (NTA) mandated each training centre to determine its own admission criteria (NTA, 2014). The minimum admission requirement at Windhoek Vocational Training Centre (WVTC) is Grade 10 certificate with a D symbol in Mathematics, Physical Science and English Second Language. The duration of programmes at WVTC is three years. On admission the trainees are placed in Level 1 in the first year, and move on to Level 2 in the second year and Level 3 in the third year (MoE, 2005). During a three year training period in their chosen trades, trainees are taught “generic subjects” comprising Mathematics, Engineering Science and Engineering Drawing (Ministry of Higher Education Vocational Training and Employment Creation, MHEVTEC, 2004).

The Mathematics content taught at Level 1 to Level 3 at the VTC is benchmarked on the secondary school Mathematics syllabus which is part of the Namibian Broad Curriculum for schools developed by the NTA (NIED, 2010). The VET Mathematics syllabus which is benchmarked on the National Senior Secondary Certificate Ordinary Level (NSSCO) Mathematics syllabus is as follows:

- Level 1 VTC syllabus covers the content taught in Grades 8 to 10.
- Level 2 covers Grade 11 to 12 core syllabus content.

- Level 3 content is equivalent to the Grade 12 extended Mathematics syllabus (MHEVTEC, 2004).

Therefore, in the context of this study, the assumption is that if the trainee has attained either Grade 10 or Grade 12 Level Mathematics at secondary school phase, then he/she should not struggle with Level 1 VTC Mathematics which is essentially based on the Grade 10 Mathematics syllabus. A study of the performance of students at the WVTC reveals incongruence in the assumption that since the students at WVCT are doing the same Level Mathematics as that done at secondary school, they would perform better. On the contrary, and according to NTA reports for the period 2010 to 2015, trainees' performance in Mathematics was at an average pass rate of 25.27% over the six years at the Windhoek Vocational Training Centre (NTA, 2010, 2011, 2012, 2013, 2014, 2015).

Table 1 shows the results in Mathematics Level 1 end-of-year examinations at WVTC from 2010 –2015.

**Table 1 Level 1 WVTC examination symbol distribution of Mathematics (NTA) trainees over six years**

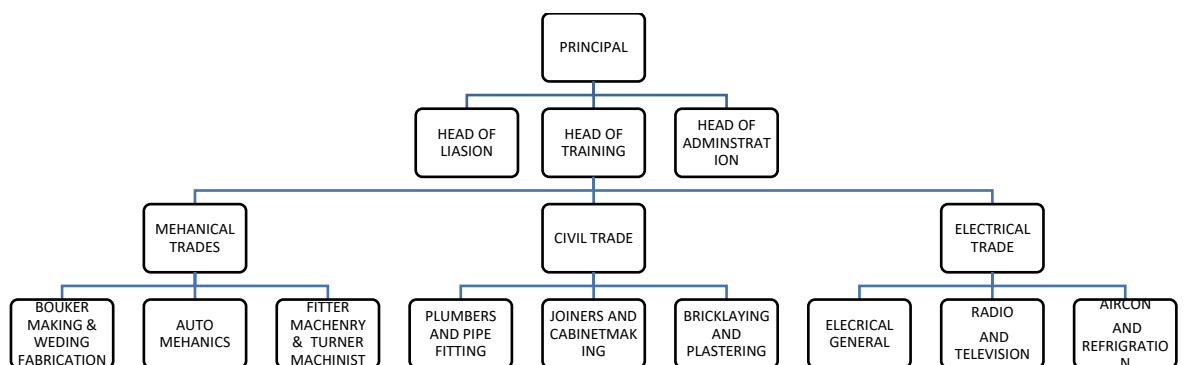
Year of examination	Grades obtained in the examination								Passed (%)	Failed (%)	Total
	A	B	C	D	E	F	G	U			
<b>2010</b>	3	4	9	18	42	20	45	68	34 (16.34)	175 (84.13)	<b>208</b>
<b>2011</b>	11	17	30	21	54	25	44	28	79 (34.34)	151 (65.65)	<b>230</b>
<b>2012</b>	9	12	17	21	69	28	56	156	59 (16)	309 (84)	<b>368</b>
<b>2013</b>	18	25	28	30	83	6	59	145	101 (25.63)	293 (74.36)	<b>394</b>
<b>2014</b>	17	37	25	49	73	69	67	189	128 (24.61)	398 (75.38)	<b>520</b>
<b>2015</b>	18	10	13	19	71	90	180	240	60 (9.36)	581(90.64)	<b>641</b>

Source : (NTA, 2010b, 2011, 2012, 2013, 2014, 2015)

Table 1 clearly shows an increase in the failure rate of the trainees over the period 2010 to 2015 in Mathematics at WVTC. Given that the Mathematics being studied by the students at the WVTC is essentially the same Mathematics they studied at secondary school Level, the researcher sought to find out the difficulties the students were facing in learning Level 1 Mathematics at WVTC.

### 1.1.1. Vocational and training system in Namibia

The VET system in Namibia is founded on the concept that trainees get prepared for specific trades and are equipped with specific skills as part of a general education and Mathematics skills are part of this package of training (MoE, 2000). The WVTC prepares young Namibians to become artisans in eleven trades falling into three categories as shown in Fig 1.



**Figure 1: The trades offered at WVTC**

NTA provides equal access to vocational education training institutions that prepare Namibians fit to participate in the rapid changing global environments, thus contributing to the economic growth of the country. In its mission and vision statement, the NTA maintains that the VTCs should prepare trainees that respond

positively to the local and international changing economic and technological conditions in order to meet the demands of the industry (NTA, 2010).

The mission and vision of the NTA is aligned to that of Vision 2030 that aims at creating an integrated, unified, flexible and qualitative education and training system (NPC, 2004). This view is also shared by the Harambee Prosperity Plan (HPP) which states that:

Vocational Education and Training (VET) is steadily emerging as a global front runner in driving national development agendas, and features prominently in the strategic and operational priorities of regional economic communities and multilateral organisations, including that of the African Union (AU), International Labour Organisation (ILO) and United Nations Educational, Scientific and Cultural Organisation (UNESCO). The rationale to prioritise and invest in VET is strong and convincing and stems from the recognition of VET as a source of skills, knowledge and technology needed to drive productivity in knowledge-based and transitional societies for the twenty-first century (OP, 2015, p.44).

## **1.2. Statement of the problem**

According to Ndhlovu, Mulendema and Mulenga (2016), problem - solving is at the heart of Mathematics teaching and learning at primary school and beyond. The NTA places Mathematics as an integral part of the competencias required to be acquired by trainees of VET and this is supported by NIED (2010).

The low performance in Mathematics of Level 1 trainees as depicted in Table 1 is indicative of the difficulties faced by the WVTC in achieving the goal of NTA. This is further exacerbated by the fact that the Level 1 students on admission into the programme must have obtained a D symbol or better in Mathematics and the expectation therefore, is that they would do better as this would be revision of the work done during the secondary school years. It is worth noting that, the Mathematics offered at Level 1 WVTC is equivalent to that offered at Grade 10 at secondary school level and some students enrolled into the programme are Grade 12 school leavers who would have covered this same material at a higher Level. Given that Level 1 students at WVTC had all studied Grade 10 or 12 Mathematics content at secondary school level, which is equivalent to Level 1 Mathematics content at WVTC, Level 1 Mathematics at WVTC then should pose no problems and should serve as revision of the content learned at secondary school level.

According to Blömeke, Felbrich, Müller, Kaiser, & Lehmann (2008), people hold beliefs about the nature of Mathematics that is indicative of their actions toward the subject. Blömeke et al. stated that these beliefs influence the way that the students interact with the subject and how they perceive the subject. This is supported by Van Niekerk and Web (2016), who conducted a study on student mindsets on Mathematics learning and noted that some students believe that people are born with a certain level of ability and that this cannot be changed; whereas other students believe that they can improve their abilities with resilience and hard work. Van Niekerk and Web (2016) also observed that the mindset of the students affected how they ultimately performed in Mathematics. Those that believe people are born with certain level of abilities believe that one is either clever or dull and frequently avoids

challenges preferring instead to complete easier work which they know they would succeed in. The other group on the other hand seems to work and learn more efficiently, relish challenges and shows resilience in the face of failure. A learner's productive disposition is his or her habitual inclination to see Mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and ones' own efficacy.

### **1.3. Research questions**

The study therefore sought to find answers to the following four questions:

- 1.3.1. What is the state of the number sense of the Level 1 trainees at WVTC?
- 1.3.2. What are the difficulties experienced in learning Mathematics by Level 1 trainees at WVTC?
- 1.3.3. What are the factors contributing to the perceived difficulties experienced in learning Mathematics by the Level 1 trainees at WVTC?
- 1.3.4. What can be done to ameliorate the perceived difficulties experienced by Level 1 trainees in learning Mathematics at WVTC?

### **1.4. Significance of the study**

Knowledge of the difficulties that students hold and face in the learning of Mathematics at WVTC might help instructors devise strategies that might help trainees succeed in their learning of Mathematics which is key to their programme. The results of this study might also help other VTCs across the country in addressing some of the challenges they face in the teaching of Mathematics.

This study might also inform the educational planners and policy makers at national and local levels to tailor their VTC curricula and syllabi into one that addresses the

factors that might lead to the difficulties that trainees encounter while learning Mathematics. It is also envisaged that value might be added to the existing body of knowledge on teaching and learning of Mathematics as a subject at VTC centres in Namibia.

### **1.5. Limitations of the study**

The researcher did not have enough time with the trainees to fill in the questionnaire because the study was carried out during the training time at WVTC. The researcher only met the participants during their free time on the timetable which was not enough to go through the items in the questionnaire.

The study only focused on the Level 1 trainees of the Windhoek Vocational Training Centre. The researcher could not include more VTCs in this study due to financial constraints.

### **1.6. Delimitations of the study**

This study was limited to WVTC Level 1 trainees only in order to find out the difficulties they experienced when learning Mathematics. Level 1 is the entry Level for Vocational Education and Training. Hence, any hindrances to attaining proficiency at this Level of their training should be addressed earlier in order to produce quality graduates at the end of the training period.

## **1.7. Definition of terms**

The following terms should be understood as defined herein:

***Trainees:*** this will refer to any person undergoing training at a VTC in any trade and at any Level of training (NTA, 2014).

***Vocation Education and Training (VET):*** Is education based on occupation or employment that prepares people for specific trades, crafts and careers at various Levels of a trade, a craft, technician, or a professional position (Willemse, 2013).

***Number sense:*** Refers to a person's general understanding of numbers and operations along with the ability and inclination to use this understanding in flexible ways to make Mathematics judgments and to develop useful and efficient strategies for dealing with numbers and operations (McIntosh, Reys, & Reys, 1992).

***Competency Based Education and Training (CBET):*** Is training that develops the skills, knowledge and attributes required to achieve competency standards (NTA, 2014).

***Mathematics Difficulties:*** The term refers to specific difficulties in numbers and Mathematics (Hurks & Van Loosbroek, 2012).

## **1.8. Summary**

This chapter introduced the study, provided a brief description of the research landscape, statement of the problem, research questions, significance of the study, limitation and delimitations of the study and definition of terms. The next chapter

described the theoretical framework of the study and the literature pertaining to the study was also reviewed.

## **CHAPTER TWO: THEORETICAL FRAMEWORK AND LITERATURE REVIEW**

### **2.1. Introduction**

This chapter reviews the literature related to this study. The theoretical framework underpinning this study is discussed first, which is then followed by a discussion of the background of VET in Namibia. The chapter also reviews literature on difficulties experienced in Mathematics learning in general, and factors that lead to possible difficulties in learning Mathematics. It also reviews literature related to possible ways of eliminating the difficulties experienced by learners while learning Mathematics.

### **2.2. Theoretical framework**

This study is informed by Blackwell, Trzesniewski and Dweck (2007) “fixed” and “growth” mind-set theory. Blackwell, Trzesniewski and Dweck (2007) postulates in their theory that two types of mind-sets exist. First are learners with a “fixed” mind-set who are according to them are learners who believe that people are born with a certain level of ability which cannot be changed. The second group are learners who harbour a growth mind-set who work and learn more efficiently, relish a challenge and show resilience in the face of failure.

They further states that learners with a “growth” mind-set believe that they can improve their abilities with resilience and hard work. Furthermore, Blackwell, Trzesniewski and Dweck (2007) wrote that learners who display characteristics of a fixed mind-set believe that one is either clever or dull. When learners with a fixed mind-set fail or make a mistake they believe that they are just not clever enough and

give up trying. Such learners frequently avoid challenges preferring instead to complete easier work on which they know they will succeed.

Blackwell, Trzesniewski and Dweck (2007) followed 373 learners across America during a two year period. At the beginning of the first year, they assessed the learners' mind-sets along with other motivation-relevant variables, and then monitored their Mathematics grades over the two years. Learners with fixed and those with growth mind-set had entered 7<sup>th</sup> grade with equal prior Mathematics achievement. By the end of the first term, the Mathematics grades of the two groups had a huge difference between them and continued to diverge over the two years divergent. With the students with a growth mindset believe that they are capable of doing better in Mathematics whereas the students with fixed mindset still believed that they could never do better in Mathematics.

The theory of "fixed" and "growth" mindset is considered useful for this study because students at the WVTC might be facing a similar situation. They seem to exhibit traits of either "fixed" or "growth" mindset. Like learners in the Blackwell, Trzesniewski and Dweck's (2007) study, trainees at the WVCT enter level one with almost equal prior Mathematics achievement but later their results start to diverge in such a way that some of the trainees continues to perform good in Mathematics and some still continue to perform low.

Blackwell et al. (2007) findings also suggest that when students with fixed mind-sets fail at something, they tend to tell themselves that they cannot or will not be able to do it, or make excuses to rationalize their failure. Dweck (2008) expanded further on

the theory, learners with a fixed mind-set in the Mathematics class will not be motivated to do any work beyond what they believe they know or think they can do. These students often say that “I just cannot learn Mathematics no matter how I try”. This implies that students with a fixed mind-set are likely to have negative attitudes towards Mathematics as a subject. This negative attitude could affect their learning of Mathematics and eventually lead to poor performance in the subject.

### **2.3. Mathematics in Vocational Education and Training**

Mathematics is essential towards the understanding or learning of other subjects at all levels of education, be it high school or tertiary level. This is irrespective of the field of study. Mathematics is equally important in all Faculties, both Arts and Sciences. It is also an international language that is essential in almost every field, such as handling money, measurements, in fashion, carpentry, technical economics, and many more. Mathematics is also regarded as the queen of all sciences, such as chemistry, physics, biology, economics, and others.

Mathematics is a way of thinking and organizing logical proof. It can be used to determine whether or not an idea is true, whether it is probably true as a way of thinking, as it gives insight into the power of the human mind and becomes a challenge to intellectual curiosity (Ali, 2013). An individual, who is competent in mathematical sciences, can equally have the ability to do any other course. Consequently, a good performance in Mathematics is important.

Mathematics plays a fundamental role in the scientific and technology progress of any nation, and as a result, Mathematics is taught at all Levels of education in VET

in Namibia. Greater demand for scientific and technological knowledge in Namibia's development programmes has brought about the need for Excellency in Mathematics knowledge in VET education. Thus, increasing knowledge in Mathematics of future engineers, artisans, and other professionals cannot be overemphasized.

The world of work has, throughout history and across cultures, incorporated Mathematics thinking and communication into its tools, symbols, and organisational practices, as part of the production of goods and services (Brights, 2011). However, the main objective is to get the job done as efficiently as possible, to satisfy a range of stakeholders, customers, employers, shareholders, patients, and audiences (Winch and Hayland, 2007). In both formal academic education and vocational training, the development of Mathematics skills and techniques is the focus of attention and the object of the activity in the Mathematics classroom. In the workplace, Mathematics is always regarded as one major tool in the process of achieving a desired outcome. Workers generally do not regard what they do as Mathematics or themselves as being Mathematics users (Michael, 2010). To make artisan aware of the importance of Mathematics in their various trades integrated Mathematics should be enforced during training. Instructors at the workshop should be encouraged to motivate trainees about the need of Mathematics in their theory and practical subject. As good understanding of Mathematics in skill learning fosters better thinking skills hence problem solving becomes easier (NIED, 2010).

The VET system reflects the same approach held by the Ministry of Education because it recognises that Mathematics instils higher order thinking abilities in trainees which are important skills in the process of learning (NIED, 2010).

Mathematics is viewed as a backbone for learning and this view is not different when it comes to skills and problem solving learning in VET. According to Stevenson and Palmer (1994) problem solving is a necessary component of learning, which is only acquired through learning and understanding of Mathematics. Mathematics is also found in every technical trade and all practical vocations require Mathematics calculations. So it is not by surprise that a good understanding of Mathematics is deemed necessary and crucial in the training of artisans.

Naanda (2010) is of the opinion that upon exiting the VTCs trainees need to have employability skills such as team work, time management, positive attitudes, problem solving, planning and multiple tasking. According to FitzSimons (2008) these skills are acquired through the learning and application of Mathematics in VET. Hence, there is a need to know how to teach and learn for transfer and retention so that the Mathematics knowledge and skills that trainees gain in VTCs are available for use throughout the VET curriculum, work, and play of their lifetime.

Despite the important role that Mathematics plays in society, there has always been poor performance in the subject at most institutions of learning. Discussing factors affecting students' academic performance in Mathematics will require looking at the concept of poor performance. According to Chambers (2008) and Ali (2013), poor performance is a performance that is judged by the examiner as some significant fall below an expected standard. The interpretation of this "expected standard" is better appreciated from the perceptual cognitive ability of the assessor of the performance. Ali (2013) described poor academic performance as any performance that falls below the desired standard.

#### **2.4. The need for Mathematics in VET**

The aim of vocational programmes is to provide education and training to trainees that lead to the level where they should achieve acceptable vocational knowledge that is to get their first job in a specific vocation (MoE, 2005). However, it is important to mention that these vocational programmes should also provide preparation that can be used as a basis for further studies later or immediately upon completion of the programme.

It is difficult to pinpoint specific and precise skills that are needed from Mathematics study into the workplace (Ball, and Bass, 2003). This is as stated by FitzSimons (2013) due to the diversity of practice and lack of any single definition of the “workplace” and as a result of changing demands of mathematical skills. She further states that learning about a specific context, with its working practices and technologies is an important part of understanding how Mathematics is used in the workplace. Dalby (2015) argues that the application of Mathematics in the workplace is very different from the classroom situation and the connection of school Mathematics and the workplace is often not recognized by students and the employers. He further states that separating the content from the context is difficult and when Mathematics is embedded into tasks or technologically dependent processes it may not be easily identified.

Mathematics is not a value free subject and the meanings of both constructs and symbolic representations are bound together with socio-cultural meanings, values and beliefs of trainees’ transition experience (Dalby, 2015). Although the cognitive processes may appear to be similar, the social context in which learning takes place

affects the object of the activity and the meaning endorsed. FitzSimons (2013) further argues that in a work situation the fusion of mathematical skills with the work context changes the way the actual Mathematics is viewed because its meaning is derived from the work situation. This in my opinion is a misleading concept because we are to view Mathematics as something that adds value to the workplace.

In a Mathematics class, trainees' interpretations of mathematical problems are likely to relate to the classroom goal rather than one associated with the workplace and so in the end their perceptions of the purpose are also different. FitzSimons (2013) emphasises that in a work situation Mathematics is forms part of a larger of activities at work and it is just one tool in the process of achieving a desired outcome. The prime aim is to achieve the task outcome rather than to learn about Mathematics itself and the purpose for the mathematical process is to contribute, in some way to the completion of a wider work related goal.

Therefore, trainees studying a vocational programme need to have a good understanding of Mathematics because in everyday and vocational life, there is an increasing need to understand the meaning of and be able to communicate on issues with a mathematical content (Ali, 2013). Ali continues to say that the power of Mathematics as a tool for understanding and modeling reality becomes evident when the subject is applied to areas that are familiar to trainees. Finally it is advised that vocational school Mathematics should thus be linked to the study orientation chosen in such a way that it enriches Mathematics and subjects specific to a course. The knowledge of Mathematics is a prerequisite for achieving many of the goals of the programme specific subjects. This indicates that there are many good reasons to

justify the importance of Mathematics and show the connection between Mathematics and work.

The methods of performing mathematical processes in formal and informal situations may also be very different, even if the Mathematics involved is the same. Using mathematics in the workplace often involves informal methods that are adapted to the working environment. FitzSimons (2013) explains how terminology that is specific to the workplace may also add to the disguise so that trainees and employees fail to identify certain activities as Mathematics, despite a dependency on mathematical knowledge or process. Perhaps at vocational training centre one can look into the concept of contextual teaching and learning in Mathematics so that the trainees can benefit better from the subject and its application into their trades. Contextual teaching is defined by Kapenda, Kasanda, & Nawaseb (2015) as a teaching method that relates academic concepts to real-world conditions and encourages students to see how what they learn relates to their lives. They further state that contextualized teaching and learning enables learners to connect what they learn in the class to real-life contexts in which the new knowledge and skills can be applied. This method of teaching can be a motivating factor itself for the trainees to see the need for Mathematics in their trades at WVTC.

## **2.5. Difficulties in learning Mathematics**

Mathematics is a complex subject including different domains such as arithmetic, problem solving, geometry, algebra, and many more (Karagiannakis, 2014). He further posits that studying Mathematics implies mobilizing a variety of basic abilities associated with the sense of quantity, symbol decoding, and memory logics.

Students with difficulties in any one of these abilities or in their coordination may experience mathematical learning difficulties. Learning Mathematics is uniquely challenging in that it is highly organised, sequential and progressive. Simpler elements or concepts must be learned successfully before moving on to complex ones. Because of the interrelated nature of the subject, learners who have learning difficulties in Mathematics may appear lost in trying to “make sense” of what is required in mastering the concepts, processes and symbolisms, which is a natural way of learning with understanding.

The problem is that Mathematics learning is determined by the subject matter to be taught. Its logical ideas neglect the needs of the learner and the way his/her mind and mental processes work when trying to make sense of what is being taught. Consequently, learners often experience significant problems during the learning of Mathematics. Brights (2011) considers this in relation to chemistry but and concludes that the principles might broadly apply to Mathematics. Ashcraft and Kirk (2001) noted that Mathematics is a subject where one learns the parts; the parts build on each other to make a whole; knowing the whole enables one to reflect with more understanding on the parts, which in turn strengthens the whole. Knowing the whole also enables an understanding of the sequences and interactions of the parts and the way they support each other so that the destination clarifies the stages of the journey.

Ali (2013) identified three major sources of difficulty in learning Mathematics. These include: (1) Confusion between trying to achieve Mathematics understanding (knowing both what to do and why) and trying to learn Mathematics procedures (knowing rules and routines without appreciating the reasons for them). (2) Increased

anxiety, relating particularly to problems of miscommunication. (3) Reading Mathematics and understanding the language of Mathematics is challenging. Some words are used only in Mathematics English, and are therefore unfamiliar until learners have been taught them, while some other words are used confusingly with different meanings in Mathematics English and ordinary English.

## **2.6. Indications of difficulties in learning Mathematics**

According to Dumont (1994) the cause of a difficulty in learning is situated outside or inside the child. Individuals who exhibit learning difficulties may not be intellectually impaired; rather, their learning problems may be the result of an inadequate design of instruction in curricular materials.

Bryant, Porterfield, Dennis, Falcomata, Valentine, and Bell (2016) lists the following as common indicators that a trainee with learning difficulties in Mathematics will have: (1) Incomplete mastery of number facts: Number facts refer to the basic computations (for example  $9 + 3 = 12$  or  $2 \times 4 = 8$ ) that trainees are required to memorize in the earliest grades of elementary school. Recalling these facts efficiently is critical because it allows a student to approach more advanced Mathematics thinking without being bogged down by simple calculations. (2) Computational weakness: Many students, despite a good understanding of Mathematics concepts, are inconsistent at computing. They make errors because they misread signs or carry numbers incorrectly, or may not write numerals clearly enough or in the correct column. These students often struggle, especially in primary school, where basic computation and “right answers” are stressed. Often they end up in remedial classes, even though they might have a high level of potential for higher-

level Mathematics thinking. (3) Difficulty transferring knowledge: One fairly common difficulty experienced by people with Mathematics problems is the inability to easily connect the abstract or conceptual aspects of Mathematics with reality. Understanding what symbols represent in the physical world is important to how well and how easily a student will remember a concept. Holding and inspecting an equilateral triangle, for example, will be much more meaningful to a student than simply being told that the triangle is equilateral because it has three equal sides. (4) Making connections: Some students have difficulty making meaningful connections within and across Mathematics experiences. For instance, a student may not readily comprehend the relationship between numbers and the quantities they represent. If this kind of connection is not made, Mathematics skills may not be anchored in any meaningful or relevant manner. This makes them harder to recall and apply in new situations. (5) Incomplete understanding of the language of Mathematics: For some students, Mathematics is driven by problems of language. These students may also experience difficulty with reading, writing, and speaking. In Mathematics, however, their language problem is compounded by the inherently difficult terminology, some of which they hear nowhere outside of the Mathematics classroom. These students have difficulty understanding written or verbal directions or explanations, and find word problems especially difficult to translate.

## **2.7. Factors contributing to difficulty in learning Mathematics**

### **2.7.1. Difficulties in understanding Mathematical concepts**

Many of the concepts and procedures studied in Mathematics are abstract because rules and algorithms dominate them, and, therefore, inherently difficult to learn. According to Borich (2004) abstraction is a process of forgetting unimportant details

and without abstraction thought will be impossible. This gives rise to many difficulties in teaching some Mathematical ideas without appropriate use of analogies or models. Learners tend to be good at mastering facts but they are not so good at grasping the underlying concepts. This is because the way we build up concepts depends on the content which we can see, sense and experience (Chambers, 2008).

The work of Piaget (1977) establishes the learner as a person who is trying to make sense of what is experienced. In Mathematics, trying to recognize or master the concepts without appropriate use of models may well create enough pressure on limited working memory capacity. Fitzsimons (2008) says that Mathematics is the subject in which we never know what we are talking about, or whether what we are saying is true. Thus, the difficulties may arise because these concepts do not exist in the mind. Learners can learn better where concepts are seen, sensed and experienced.

### **2.7.2 Language as a contributing factor to difficulty in learning Mathematics**

Language is the most important tool of communication. Teaching and learning depends heavily on language. Learning is not a passive absorption of knowledge but an active process in which the learner is engaged in constructing meanings from text, dialogue and physical experience. Lack of clarity often comes in the form of language vagueness.

In Mathematics the primary role of language is to enable both the teacher and the learner share mathematical knowledge with precision (Mulwa, 2015). Mulwa further states that a teacher needs to use language suitable for the cognitive developments of

the learners. Hence language is a powerful instrument in the formation of concepts, acquisition of particular abilities and the transfer or communication of such concepts. Mulwa also argued that language serves three functions; first, language allows people to communicate with each other. Second, it facilitates the thinking and third, it allows people to recall information beyond the limits of memory. From these arguments it is safe to say that language is not only important for meaningful communication but it also assists intellectually.

Mathematics is full of technical concepts such as formula, index, limits, planes, inequality, roots, set, identities, and so on. These words have been given precise technical meanings which are often closely related to but not identical to their everyday meanings. Words, whose meanings in everyday life might not be the same as the Mathematical ones create confusion in the learner's mind (Ali, 2013). Learners use their previous language of concepts to interpret the new information which they receive. Familiar vocabulary changing its meaning as it moves into Mathematics might cause confusion and lead to a misunderstanding of Mathematics concepts.

The language used for thinking is most likely the first language, thus Mathematics communicated in one language might need to be translated into another language to allow thinking and then translated back in order to converse with the teacher (Mulwa, 2015). It is also cautioned by Mulwa that errors and misunderstandings might arise at any stage of this two-way inner translation process. Berry (1985) conducted a study on two groups of students (from Botswana and China) who were studying in Canada at that time. Berry was interested in studying how they answered mathematical activities on proofs. The two groups of students were grouped into two

groups of according to their countries of origin. The students from Botswana had to answer questions stated in English and the students from China had to answer questions that were stated in Chinese. The results showed that the students from Botswana had to do all their thinking in English since their vernacular language does not facilitate mathematical proofs, some students said they did find activities easy to handle. On the other hand their counterparts from China claimed that they carried out their proofs in Chinese and then translated them into English. They reported that this strategy made their working very easy. From this study's' results it can be concluded that some of the difficulties in Mathematics could be attributed to students trying to learn Mathematics through the medium of an unfamiliar language which is very different from their own.

This study showed that English as a medium of instruction in Mathematics has a potential of posing difficulty to students that are not native English speakers. This study hopes to find out if English Language could be a contributing factor to the difficulties that the Level 1 trainees at WVTC might be experiencing in learning Mathematics.

### **2.7.3. Topics in the syllabus as a factor contributing to difficulty in learning Mathematics**

Several studies have identified topics and themes that cause greatest difficulty for the learners in learning Mathematics. For example, Charlton (2006) investigated the crisis in school-level Mathematics education curriculum across South African schools. Their findings confirm that problems often observed in students are linked to some the following aspects:

- Algebraic manipulation: simplifications, formula, equations, and so on.
- Numeracy : basic number relationships, place value, decimal, measurement,
- Graphs of functions.
- Limited ability to translate between language and Mathematics.
- Computational skills - many students can only calculate if they have a calculator, and have no sense of order of magnitude as a result of this calculator dependence.

According to Sichombe, Tjipueja, and Nambira (2013) the following are some of the reasons for poor performance in some of the topics in Mathematics:

- Poor Mathematics foundation laid at lower primary. Therefore the poor learners' performance at upper primary phase was not eccentric,
- The linear nature of the Mathematics syllabus,
- Difficult topics and competencies, and
- Medium of instruction just to name a few

Sichombe et al. (2013) suggested that teachers should improve the teaching of the topics and competencies that learners experience difficulties with in Mathematics, assess reasons for difficulties and improve the assessment modes. School principals should monitor and evaluate teaching and learning processes regularly. NIED's Curriculum Development Division should review the identified difficult competencies; intensify the training of teachers on these competencies.

#### **2.7.4. School Culture as a factor leading to difficulty in Mathematics**

Closely associated with the attitudes of learners toward learning and teaching is the influence of the school culture on learners' performance (Lethoko, Heystek, & Maree, 2002). A learner's educational outcome and academic success is greatly influenced by the type of school they attend. The school a learner attends indicates the extent to which the learner's performances can excel. Reeves (2006) believe that the school culture affects the behaviour and achievement of learners though the effect of classroom and student variables remain greater. Schools' cultures are different, whatever their commonalities, no two schools have the same culture. The school culture provides a focus and clear purpose for the school. Some cultures can be counter-productive and an obstacle to educational success. A school culture can also be oppressive and discriminatory for various sub groups within the school. For example, it will be very difficult to change a culture of a school because teachers and learners are used to the status quo.

Engelbrecht and Green (2001) affirm that the attitudes of centre managers and instructors are also part of a school culture as they influence the performance of learners. Poor administration can contribute to learner poor performance in a school (Legotle, 2005). Legotle found that one of the causes of poor performance of the learners in South Africa was poor management and ineffective policies at the schools. He emphasized that the responsibilities and accountability of the principal needs to be clearly defined. Engelbrecht and Green's (2001) argue that if principals do not execute their responsibilities accurately, there will be no control of both learners and teachers, resulting in chaos and low performance.

### **2.7.5. Number sense as a contributing factor to learning difficulty in Mathematics**

Number sense is about moving from the initial development of basic counting techniques to a more sophisticated understanding of size of numbers, number relationships, patterns, operations and place value. Numerical knowledge competencies are viewed as a general cognitive skill composed of discerning and ordering and ordering of quantities, counting, and solving simple addition and subtraction facts. Overall, several studies have found that cognitive development problems are manifested in number systems, which may contribute to deficits in number processing fluency, rapid retrieval of basic facts, and understanding the base 10 system. It is also important to note that when these students enter institutions of higher learning they exhibit procedural errors and immature counting strategies at a higher rate than typical achieving students.

A firm understanding of numbers and the number system is central to learning Mathematics (Dennis et al., 2006). The concept of number sense comprises the following components:

- Understanding the meanings of numbers and operations.  
This implies an understanding of the base ten number system, including place value, number patterns and the use of multiple ways to represent numbers.
- Recognizing relative number size. This implies the recognition of the relative size of numbers. For example, when students compare fractions, they do not need to depend on standard written methods such as finding the least common denominator suggested in the Mathematics curriculum. They are

able to use meaningful ways, such as the same numerator, same denominator, transitive, and residual to compare the fractions (Mazzocco & Myers, 2003).

- Being able to compose and decompose numbers. This means that an individual is able to decompose and compose numbers flexibly for the convenience of computational fluency. For example, when students are asked to solve  $32 \times 25$ , they know how to decompose 32 to  $8 \times 4$  and  $8 \times 4 \times 25$  equal to  $8 \times 100$ , and then the answer is 800. This can help children to solve problems easily.
- Recognizing the relative effect of operations on numbers. This; this means that an individual is able to recognize how the four basic operations affect the results. For example, when asking pupils to find the best estimate for  $591 \times 0.95$  or  $196 \div 0.95$ , they do not need to depend on written methods to find the answers,
- Judging the rationality of computational results. This implies that individuals can mentally apply estimation strategies to problems without using written computations (McIntosh et al., 1992). At the same time, they should also be able to judge the rationality of the result.

Early interventions and formal explicit instruction that is aimed at developing number sense should be geared towards the entire system as children in developing countries who are frequently at the same levels as children who in the developed world are seen as needing special help (Mazzocco & Myers 2003). This puts the

spotlight on the teachers and their competence to develop learners' number sense. Teachers should be confident in their knowledge and understanding of how the number system works, be able to use this understanding in flexible ways to make Mathematics judgements and have a repertoire of strategies for handling numbers and operations (Greeno, 1991). This means that teachers should possess number sense themselves.

This argument is supported by other researchers such as Michael (2010) who compared a teacher to a guide who takes learners from their current understanding to further learning and prepares them for future travel. To be able to do this, the teacher needs a sound understanding of the key Mathematical concepts for the learners' grade level as well as an understanding of how those concepts connect with learners' prior and future learning. Such knowledge includes an understanding of the conceptual structure and basic construction in Mathematics inherent in the elementary curriculum (Michael, 2010) as well as an understanding of how best to teach the concepts to children. This is what Fitzsimons (2008) termed specialised content knowledge, an uncanny kind of unpacking of concepts in Mathematics which makes particular features of content visible to a learner and learnable by all children. Dennis et al. (2016) indicates that number sense should not be treated as a new topic, but rather as on-going and informal emphasis in all kinds of work should be placed on numbers. This is reflected in the notion of big ideas, which are statements that focus on Mathematics ideas as networks of interrelated concepts so that Mathematics can be represented as a coherent and connected enterprise (Greeno, 1991).

Courtney-Clarke and Wessels (2014, p. 45) in a study that explored the relationship between teacher subject matter knowledge and instruction, came to the ‘inescapable conclusion that there is a powerful relationship between what a teacher knows, how she knows it, and what she can do in the context of instruction’. Haufiku (2008) concluded that the majority of primary school teachers in Namibia in the Ohangwena region have limited number sense and have a very little understanding of what number sense is. For example, teachers tend to rely on standard algorithms and avoid mental calculations and estimation; they do not use benchmarks to reason about the effects of operations; they cannot flexibly apply numbers and operations to computational situations; they hold some of the same misconceptions as their learners, especially in the domain of rational numbers. If we want to improve learners’ number sense, the development of number sense should become a focus of pre-service primary school teacher education.

However, not only content knowledge and skills play an important role in the performance of the students in Mathematics. Teachers’ self-confidence affects the way in which they approach problems, the connections they are able to make between related concepts and their repertoire of strategies (Shahrill, Abdullah, and Yusof, 2015). Eraikhuemen (2003) assumed that confidence in being able to learn Mathematics is a resource that enables teachers with little Mathematics training to learn the Mathematics competencies required for teaching Mathematics. Attempts to improve learning content knowledge by the teacher should therefore be coupled with a safe and supportive environment in which these students can develop confidence and positive feelings towards the subject.

### **2.7.6. Attitude towards Mathematics as a contributing factor leading to poor performance**

Wasiche (2006) defines attitude as a feeling towards something or somebody which is sometimes reflected in a person's behaviour. Attitudes formed by an individual mostly depends on his/her experience in the learning environment. Attitudes are further enhanced by interpersonal interaction. Xin, Tzur, Hord, Liu, Park, & Si, (2017) explained that attitude is either positive or negative depending on whether a person likes or dislikes something or someone.

Conventional wisdom and some research suggest that students with negative attitudes towards Mathematics have performance problems simply because of anxiety (Tapia & Marsh, 2004). Attitudinal research in the field of Mathematics has dealt almost exclusively with anxiety or enjoyment of subject matter, excluding other factors. Some authorities regard attitude towards Mathematics as just a like or dislike for Mathematics, while others extend the meaning to embrace beliefs, ability, and usefulness of Mathematics. Shahrill, Abdullah, & Yusof, (2015), however, defines attitude towards Mathematics as an aggregated measure of a liking or disliking of Mathematics, a tendency to engage in or avoid Mathematics activities, a belief that one is good or bad at Mathematics, and a belief that Mathematics is useful or useless.

Similarly, Hunt, Welch-Ptak, & Silva (2016) considers attitude towards Mathematics from a multidimensional perspective and defines an individual's attitude towards Mathematics as a more complex phenomenon characterised by the emotions that he

associates with Mathematics, his beliefs about Mathematics and how he behaves towards Mathematics. A negative attitude towards Mathematics includes the tendency to be fearful of and anxious about Mathematics.

Attitude towards Mathematics has cognitive, affective and behavioural components; and like any other kind of attitude, it can be formed through any of the three processes described earlier. A student can develop a positive attitude towards Mathematics because he or she has associated positive experiences with it. Ashcraft and Kirk (2001) describe the common belief that because of long-term avoidance of Mathematics, and their lesser mastery of the Mathematics that couldn't be avoided, high-Mathematics-anxiety individuals are simply less competent at doing Mathematics. The “competence explanation” is central to Fennema’s model (Fennema and Sherman, 1976), which explains Mathematics performance as merely an interaction of affect (attitudes and Mathematics anxiety) and behaviour during learning tasks.

The conceptions, attitudes, and expectations of students regarding Mathematics and Mathematics teaching have been considered to be very significant factors underlying their school experience and achievement (Shahrill, Abdullah, and Yusof, 2015, 2015). In general, the concepts students’ hold about Mathematics determines how they approach the subject. In many cases, students have been found to approach Mathematics as procedural and rule oriented. This prevents them from experiencing the richness of Mathematics and the many approaches that could be used to develop competence in the subject.

Research on the relationship between student attitudes and performance has been inconclusive. Researches that have been conducted to determine the relationship between students' attitude towards Mathematics and achievement in Mathematics have yielded contradictory results (Xin et al., 2017). The findings have thus lacked consistency on the subject. Some studies have demonstrated a strong and significant relationship between attitude towards Mathematics and Mathematics achievement (Xin et al., 2017). In Xin et al.'s (2017) study of elementary school pupils, a positive correlation between student attitude towards Mathematics and student performance was found. Student beliefs and attitudes were found to have the potential to either facilitate or inhibit learning. In a comparative study of factors influencing Mathematics achievement, Tian (2016) found that there is a direct link between students' attitudes towards Mathematics and student outcomes. Blackwell et al. (2007) also found a positive correlation between attitude and Mathematics achievement. The correlation showed that the more positive the attitude, the higher the level of student achievement.

Tian (2016) demonstrated that there is a correlation between attitude towards Mathematics and achievement in Mathematics is rather weak and could not be considered to be of practical significance. Michael (2010) found that attitude towards Mathematics and achievement in Mathematics was positively and reliably correlated but not strong. The correlation was not statistically significant. Following from the preceding findings, studies in different cultural settings are eminent to realise the influence of student attitude towards Mathematics on student learning outcomes in the subject.

Students may find Mathematics to be simply unappealing or socially unacceptable, although they may actually have high aptitude. In any case, it is crucial that any investigation of attitudes be assessed with an instrument that has good technical characteristics if research conclusions are to be meaningful. The relationship of affect to course selection, performance, achievement, and cognitive processes must be based solidly on a valid, reliable measure of attitudes.

Furthermore, this study seeks to provide a better understanding of how various aspects of students' attitudes to learning and their learning behavior relate to each other and to trainees' performance, it observes how these relationships differ across countries, and it explores the distribution of relevant characteristics among students, schools and countries. Existing evidence shows that trainee's attitude could or contain the following attributes:

- Students' engagement with Mathematics. This is related both to their own interest and enjoyment and to external incentives. Subject motivation is often regarded as the driving force behind learning, but the analysis extends the picture to students' more general attitudes towards school including students' sense of belonging to a school.
- Students' beliefs about themselves. This includes students' views about their own competence and learning characteristics in Mathematics, as well as attitudinal aspects, which have both been shown to have a considerable impact on the way they set goals, the strategies they use and their performance.
- Students' anxiety in Mathematics, which is common among students in many countries and is known to affect performance.

- Students' learning strategies. This considers what strategies students use during learning. Also of interest is how these strategies relate to motivational factors and students' self-related beliefs as well as to students' performance in Mathematics.

This view on trainee's attitude is shared by Murimo (2013) when he says that the affective domain in Mathematics education is conceptualized as comprising three components: beliefs, attitude and usefulness. He further considers value, interest, confidence and aspirations to be part of the affective domain in Mathematics. Mathematics related beliefs are the individual's subjective knowledge about Mathematics, self-Mathematics teaching and the social context where the learning of Mathematics happens. Furthermore, affect is related with feelings and emotional reactions that students experience during Mathematics activities.

Some scholars such as Fennema & Sherman, (1976) have described attitude towards Mathematics as the predisposition of responding favourably or unfavourably to Mathematics tasks. Attitude is viewed as having three attributes: cognition (beliefs, knowledge), affect (emotion, motivation), and performance (behaviour, action). Confidence, attitude and usefulness were studied in this study because they are a befitting trait of the mind-set theory in the Mathematics classroom.

## **2.8. Strategies to alleviate difficulties in learning Mathematics**

Hott, and Isbell and Montani (2014) state that if no intervention is provided to students that experienced learning difficulties, these students lag significantly behind as compared to their peers. This then means that it is very important to identify the many difficulties that students experience in their quest to learn Mathematics. As

stated by Hott Isbell and Montani if students experiencing difficulties do not get the intervention on time this backlog follows the students throughout their years of schooling at all levels of learning. This could be some of the backlog that the Level 1 trainees are experiencing at their tertiary level of learning. But it still remains to be proven whether this backlog is a contributing to the difficulties the Level 1 trainees are be experiencing.

High school Mathematics skills predict a host of positive adult outcomes, including college degree attainment, job quality, salary, and even health care choices (Reyna, Nelson, Han, & Dieckmann, 2009). Reyna, Nelson, Han, & Dieckmann, further state that there is an association between Mathematics ability shortly after pupils enter school and later elementary school achievement. This association has been used as evidence to support interventions designed to boost early Mathematics skills, with the implication that such interventions could help narrow gaps between advantaged and disadvantaged children in later Mathematics achievement. Since the students are exposed to Mathematics at the higher school level they are supposed to be equipped with all the necessary skills and knowledge needed to cope with beyond high school Mathematics.

### **2.8.1. Improving school management and leadership**

Effective school management and leadership are necessary tools for schools to improve their academic performance. According to Mushaandja (2006), the fundamental roles of leadership are to bring people to work as a team, to inspire their loyalty towards the group and to make meaningful contribution to the achievement of

the school goals. He adds that school managers and leaders need to be visionary and innovative so that they can turn their schools into centres of excellence.

For a VTC to be regarded as a centre of excellence, the centre managers and heads of training has to seek assistance and cooperation from the community and business people to improve the quality of education provided by the training centre. Reeves (2006) concurs with Mushaandja's view and adds that quality managers and leaders are those who can identify the potential of their subordinates and encourage them to translate the potential into something tangible. Quality managers always motivate their followers not to settle for the average, but to produce excellent work.

For centre managers and heads of training not to tolerate indiscipline and non-commitment among their trainees they should have systems in place to ensure effective teaching and learning and should provide a suitable atmosphere needed for curricula delivery at training centres. This can be done through monitoring and evaluation of programmes implemented at training centres (Reeves, 2006). Reeves adds that only heads of training that are involved in the training process in their training centres can be able to know and see what is happening in their centres. He encourages all heads of training to have subjects to teach at their centres. Legotlo et al. (2002) noted that not all centre managers or heads of training have a wide range of managerial skills and clear policies relating to the instructional programme such as classroom visits, and assessment policy among others. Such centre managers need to upgrade themselves by furthering their studies in order to sharpen their managerial knowledge and skills

### **2.8.2. Improving teaching and instruction process**

It is important that students with difficulties in Mathematics should be prepared to meet with success of the new level of expectations in Mathematics (Hott, Isbell & Montani, 2014). In assisting the students get over their Mathematics difficulties the teacher is expected to have strategies to help students who struggle with Mathematics to succeed in all the areas of Mathematics that they find difficult.

There are few strategies or methods that can be used by the teacher to assist the students overcome their various difficulties. These strategies can help students improve their vocabulary and include (i) pre- teaching vocabulary, (ii) mnemonic techniques, and (iii) key word approaches (Hott, Isbell and Montani, 2014). These are elaborated as:

Pre- teach vocabulary: use presentation, both pictorial and concrete, to emphasize the meaning of Mathematics vocabulary. Pre-test student's knowledge of glossary terms in their Mathematics textbook and teach vocabulary that is unknown or incorrect. (ii) Mnemonic techniques: teach mnemonic techniques to help remember word meanings. Use mnemonic instruction to help students improve their memory of new information. (iii) Key word approaches: use the keyword approach (such as visualize a visor as the keyword for divisor, visualise quotation marks as the keyword for quotient).

It is therefore the responsibility of the teachers to familiarise themselves with the strategies that are befitting to their student's needs.

## **2.9. Summary**

This chapter presented the theoretical framework underpinning this study and helped in setting a clear picture of the difficulty experienced by trainees in their quest to learn Mathematics. The literature review highlighted several factors that contribute to the difficulty experienced in learning Mathematics by Level 1 trainees. The chapter also reviewed literature on the attitudes of trainees towards Mathematics and ended up identifying strategies needed to assist learners overcome the difficulties they experience in learning Mathematics.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1. Introduction**

In this chapter, the researcher describes the research design, population, sample and sampling procedures, research instruments, data collection procedures, data analysis and ethical considerations.

### **3.2. Research design**

A research design is defined as a general strategy or plan for conducting a research (Gay, Mills, & Airasian, 2011). A research design provides the overall structure for the procedures the researcher used for collection, and analysis of data in the study (Creswell, 2014). Johnson and Christensen (2014) describe a research design as an outline, plan or strategy one intends to use in order to seek an answer to a research problem. Johnson and Christensen further indicate that the research design focuses on the end product that the researcher wants to get upon completing the study.

This study employed a mixed method approach, specifically the explanatory-sequential mixed methods design. This allowed the study to generate both quantitative and qualitative data in two sequential phases. The researcher followed up the quantitative results obtained in the first phase of the research with qualitative data which helped to explain in greater detail findings in the first phase (Creswell, 2013). The overall intent of this research design was to have a situation where the qualitative data assisted in elucidating the initial quantitative results. Creswell (2013) suggests that a typical example might involve collecting survey data in the first phase, analyzing the data, and then following this up with qualitative interviews to help explain the survey responses.

Further, Creswell (2013, p.97) states that a “case study method explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) overtime, through detailed in-depth data collection involving multiple sources of information and reports a case description and case themes”. Hence the researcher focuses on a unit of study known as a bounded system which recognizes and accepts that there are many variables operating in a single case study. Therefore, in order to control for effects of these variables likely to emanate from a study of this nature, it requires more than one tool for data collection and many sources of evidence (Yin, 2009). Yin further clarified that the embedded case study design is an empirical form of inquiry appropriate for descriptive studies, where the goal is to describe the features, context, and process of a phenomenon. The researcher opted for an embedded, single –case study in which more than one unit of analysis is incorporated into the design (Cohen, Manion, & Morrison, 2014). This choice gave the researcher the ability to analyze the data within the case analysis. Yin (2009) supports this by saying that this gives the researcher the ability to look at subunits that are located within a larger case.

The case was the Windhoek Vocational Training Centre (WVTC) and the unit of analysis was the difficulties that the Level 1 trainees are experiencing in their quest to learn Mathematics. This was an appropriate approach to use for this study as the researcher wanted to study the units (trainees) of WVTC in their natural setting. This approach also helped in determining the tools to use to get the desired information from the participants.

### 3.3. Population

According to Gay et al. (2011) the population of the study is the general term for the larger group from which the sample will be selected. For the purpose of this study the population comprised all 645 Level 1 trainees at the WVTC in Windhoek, Namibia.

### 3.4. Sample and sampling procedure

To determine the appropriate sample size for this study at the desired confidence level of 95% with a margin error of 5%, the researcher used Fowler's (2014) sample size formula.

$$\text{Desired sample size: } N_s = \frac{(N_p)(P)(1-P)}{(N_p-1)\left(\frac{B}{C}\right)^2 + (P)(1-P)}$$

Where:

$N_s$  = complete sample size needed

$N_p$  = size of population

$P$  = proportion expected to answer a certain way (50% or 0.5 is most conservative)

$B$  = acceptable level of sampling error (0.05 =  $\pm 5\%$ )

$C$  = Z statistic associated with confidence interval (1.960 = 95% confidence level)

By using the formula above the sample size needed for the population size of 645 was 241 trainees. To obtain the 241 trainees that made up the sample for the study stratified sampling method was used. According to Dowling and Andrew (2010) in stratified sampling the population is divided on some specific characteristic and then using simple random sampling, sampling from each subgroup of the population. To get a good representation of the sample the researcher used proportional allocation which Maree et al. (2013) said that when proportional allocation is used, the number

allocated to each stratum is proportional to its population size. This method guaranteed that the sample included all the specific characteristics that the researcher wanted to include in the sample.

Table 2 shows the number of trainees per trade in the sample in order to ensure an equal representation of trainees. These trainees were selected to take part in completing the number sense test and the Fennema-Sherman Mathematics Attitude Scale.

**Table 2: Sample representation of Level 1 trainees in various trades at WVTC 2016**

<b>Trade</b>	<b>Registered Trainees</b>	<b>Sample number</b>
Air conditioning & refrigeration	29	10
Auto Mechanics	100	37
Boiler maker & welding	87	33
Bricklayer & plastering	59	23
Electrical general	73	28
Fitter & turner/ Fitter machinery	79	29
Joinery & Carpentry	81	31
Pipe fitting & fabrication	89	34
Radio and Television	44	16
<b>Total</b>	<b>645</b>	<b>241</b>

### 3.5. Research Instruments

The study used the Number sense test, the Fennema–Sherman Mathematics Attitude Scale, and Focus group discussions in order to collect data from the Level 1 trainees, there are described below.

#### 3.5.1. Mathematics number sense test

This study adopted and adapted the number sense test from McIntosh et al. (1992) (see Appendix G). McIntosh et al. (1992) identified four levels that depict different numerical abilities; i.e. (level 1- 4) which according to (McIntosh, Reys, and Reys, 1992) are in the order of increasing strength. That is, weakest number sense is represented by level 1 and level 4 represents the strongest level of number sense. The following descriptions as adopted from McIntosh, Reys, and Reys (1992) were used to explain the levels of number sense among which learners fell see Table 3:

**Table 3: number sense Level descriptors**

<b>Level</b>	<b>Description</b>	<b>Percentage</b>
<b>4</b>	Very strong number sense	A score from 60% and above
<b>3</b>	Strong number sense	A score from 50% to 59%
<b>2</b>	Weak number sense	A score from 30% to 49%
<b>1</b>	Very weak number sense	A score from 30% and below

The number sense test consisted of the 4 sections on the following key components:

- **Meaning and size of numbers:** Understanding of the base 10 number system (whole numbers, fractions, and decimals) includes patterns and place value which provide clues to the meaning/size of a number (for example,  $\frac{5}{6}$  is a fraction less than one, it is close to one because of the relationship between

the numerator and denominator or 1000 is a large number if you are referring to the population of a school but a small number if you are referring to the population of a town). It could involve relating and/or comparing numbers to standard or personal benchmarks. It includes comparing the relative size of numbers within a single representational form.

- **Equivalence of numbers:** This strand includes recognize that numbers take many different numerical and representational forms (for example, fraction as a decimal, a whole number in expanded form, or a decimal on a number line) and can be thought about and manipulated in many ways to benefit a particular purpose. It also includes the ability to identify and/or reformulate numbers to produce an equivalent form: the use of decomposition and recomposition to reformulate numbers for ease in processing; relating and/or comparing size of number(s) to a physical referent and crossing among various representational forms.
- **Meaning and effects of operations:** This strand includes understanding the meaning and effect of an operation either generally or as it relates to a certain set of numbers (e.g., Division means breaking a number into a specified number of equivalent subgroups or Multiplying by a number less than 1 produces a product less than the other factor). It includes judging the reasonableness of a result based on understanding the numbers and operations being employed.
- **Counting and computing strategies:** This strand involves applying various number sense components previously described in the formulation and implementation of a solution process to a counting or computational situation (for example, is  $28 \times 38$  more or less than 400?)

The test was administered in order to gain an understanding of the trainee's situation upon enrolling at the centre as well as to have a point of reference for all the participants in the study.

### **3.5.2. The Fennema-Sherman Mathematics Attitude scales**

The researcher obtained permission to use the from the original author of this tool Prof Elizabeth Fennema (see Appendix B). The Fennema–Sherman Mathematics Attitude Scale (Fennema and Sherman, 1976) is divided into nine domain-specific, Likert-type scales that measure attitudes toward learning Mathematics in any institution of learning. Likert scales ratings are useful when a behaviour, attitude, or phenomenon of interest needs to be evaluated on a continuum of, say, inadequate to excellent, never to always or strongly disapprove to strongly approve (Leedy, & Ormrod, 2012).

The Fennema-Sherman Mathematics Attitude Scale is one of the most popular instruments used in research over the last four decades. The complete Fennema-Sherman Mathematics Attitude Scale instrument is composed of nine subscales, each with 12 items. The nine scales include; Mathematics as a Male Domain Scale; Mother, Father, and Teacher scales; Confidence in Learning Mathematics; Mathematics Anxiety scale; Effectance and Motivation in Mathematics scale; and Usefulness of Mathematics scale.

Fennema and Sherman (1976) suggest that the scales can be used as a total package for measuring important attitudes related to Mathematics learning, or the sub-scales can be used individually. This study therefore, chose to use the three sub-scales;

Confidence in learning Mathematics scale, Usefulness of Mathematics scale and the Attitude towards Success in Mathematics. The three subscales were viewed relevant for this study as they were closely linked to the fixed and growth mind-set learning theory which is the theoretical framework of this study. Furthermore, this tool was deemed appropriate for the kind of information the study sought from the trainees.

The Confidence in Learning Mathematics Scale is intended to measure the confidence in one's ability to learn and to perform well on Mathematics tasks. This scale ranges from distinct lack of confidence to definite confidence. The Mathematics Usefulness Scale is intended to measure students' beliefs about the usefulness of Mathematics currently, and in relation to their future education, vocation, or other activities (Fennema & Sherman, 1976).

The Attitude towards success in Mathematics scale is intended to measure how one feels about Mathematics as a subject (or the general feeling towards learning Mathematics at WVTC in this study). The dimensions range from lack of involvement in Mathematics to active enjoyment and seeking of a challenge. The scale is not intended to measure interest or enjoyment of Mathematics; rather, it attempts to measure attitudes toward the enjoyment of Mathematics (Fennema & Sherman, 1976). The trainees responded to items in the Fennema-Sherman Mathematics Attitude Scale which were ranked on a Likert scale from Strongly Agree [4 points], Agree [3 points], Disagree [2 points], and Strongly Disagree [1 point]. Tapia and Marsh (2004) assert that the Fennema-Sherman Mathematics Attitude scale is an efficient and effective research tool because of its content validity and reliability.

### **3.5.3. Focus Group Discussions**

The researcher conducted the focus group discussions, using a semi-structured interview guide during the focus group discussion sessions which comprised four groups of six participants. The discussions were recorded using a digital voice recorder. Permission to use a voice recorder was granted by the participants. The recordings were transcribed verbatim by the researcher. The transcripts were then checked against the voice recordings by one of the participants for accuracy and any transcription errors were corrected.

The researcher employed focus group discussions in which the researcher asked questions to the group and allowed only one participant at a time to speak as to allow the participant say his view without interruptions (McMillan & Schumacher, 2014). A semi-structured interview guide was employed during the focus group discussions and follow up questions were asked to participants for clarity. Dowling and Andrew (2010) define a semi- structured interview as a process whereby the researcher asks a pre-determined set of questions, using the same wording and order of questions as specified in the interview schedule. The questions were generated from some of the responses to statements emanating from the first phase namely the Number Sense Test and Fennema-Sherman Mathematics Attitude Scale in order to get a deeper understanding from the participants' perspective.

### **3.6. Validity and reliability of the measuring instruments**

According to Best and Khan (2014) reliability is the degree of consistency that the instrument or procedure demonstrates. That is whatever it is measuring, it does so consistently. Validity is that quality of data gathering instrument or procedure that

enables it to measure what it is supposed to measure. Hence, in this study to ensure validity of the instruments, the interview guide was given to the researcher's supervisors for scrutiny before administering them to the participants. The researcher also requested the Mathematics Senior instructor at WVTC to assess the construct validity of the test. According to Phelan and Wren (2006), having a second evaluator to go through the research tool enhances the reliability of the instrument and controls instrumentation as a threat to validity, which reflects the lack of consistency in measuring instruments (Gay et al., 2009).

Best and Khan (2014) highlighted that in a case study, validity calls for a "chain of evidence" to be provided, such that an external researcher can track through the whole process of the study from the beginning to the end. It is therefore very important to note down the time and place in which the case study data were collected, since many actions and events are context-specific and are part of a thick description, as this will enable any replication research to be planned.

### **3.7. Data Collection Procedures**

Permission to carry out this study was sought through the Faculty of Education from the University of Namibia Post Graduate Committee, by being issued an ethical clearance certificate (see Appendix A). Thereafter, permission was obtained from the management of WVTC. The researcher sought permission from the principal (see Appendix C) and explained the purpose of the study and how it was going to be conducted. The researcher received written permission to carry out her study at WVTC (see Appendix D). The data were collected in two distinct phases. The researcher personally distributed the Fennema-Sherman Mathematics Attitude Scale

to all the trainees identified in the centre. For ethical purposes, each Fennema-Sherman Mathematics Attitude Scale had a letter of consent attached to it (Appendix D) that trainees had to sign as proof of their voluntary participation in the study (Appendix I). The trainees filled out the Fennema-Sherman Mathematics Attitude Scale and consent forms the same day they were handed out to them. The trainees were divided in 3 groups so that the researcher could fit them in one class per session. The trainees were given a maximum of 60 minutes to complete the Fennema-Sherman Mathematics Attitude Scale, and upon completion the researcher collected them.

The researcher personally took time to explain the purpose of the Focus group discussion to the Level 1 trainees who were selected for the Focus group discussions. The researcher also discussed issues of when it would be convenient to conduct the Focus group discussions. The Level 1 trainees were also informed that the deliberations of the focus group discussions would be audio-recorded for the purpose of not missing anything out and their permission sought. The focus group discussions were meant to get an in-depth understanding and clarity about some issues that emerged from the questionnaire. Focus group discussions lasted for about 30 minutes per participant. The participants were assured that the audio recorder would be used only for the purpose of the research.

### **3.8. Pilot study**

A pilot study is a procedure in which a researcher tries out the data collecting tools in order to determine whether the tool operates properly before using the instrument in the research study (Johnson and Christensen, 2014). Upon receiving the results from

the pilot test the researcher then makes changes in an instrument based on feedback from a small number of individuals who completed and evaluated the instrument, as noted by Creswell (2014). The Fennema-Sherman Mathematics Attitude Scale and the focus group discussion guide for the group discussions were piloted with a group of the Level 1 trainees that were not selected to form part of the sample for the main study to determine whether the three instruments would produce the intended responses. This was also done to ensure that both items in the instruments were clear and did not lead to misinterpretation. During the pilot study, the respondents understood the instruments and answered the questions accordingly. No adjustments were made to the research instruments after piloting.

### **3.9. Data analysis**

Creswell (2014, p. 582) states that in an explanatory sequential design “Because the data is collected in distinct phases, the analysis of an explanatory design is easier to see and conduct”. A popular approach is to collect quantitative data and look for extreme cases to follow up in a qualitative phase. Since the researcher sought to explain the results more in-depth in the qualitative phase of the study, quantitative data was collected first and then further explained with qualitative data. Therefore, the analysis of data in this study, followed two distinct phases; phase 1 the quantitative phase which used descriptive numeric analysis whereby frequencies of trainees’ responses were scored, ranked, and frequency tables generated and phase 2 the qualitative phase used thematic text analysis whereby the main occurrences of responses from the trainees were noted and grouped to establish patterns, themes and categories (Welman, Kruger, & Mitchell, 2011).

The analysis phases were based on the type of tools used and the data obtained. Data were analysed separately so that data from the quantitative phase could be used to inform and design the qualitative phase.

### **3.10. Ethical Considerations**

The ethical approval was sought from the UNAM Research and Publications Committee (Appendix A). Upon the certificate being issued, the researcher sought permission from the centre manager of WVTC (Appendix B). The researcher waited until WVTC replied (Appendix C) before gathering the data from the centre. According to Beukes-Amis (2011), adhering to ethical issues is part and parcel of any research project. Assuring respondents of critical issues, such as confidentiality and anonymity and how it is adhered to, is imperative for the success of any study. According to De Vos et al. (2005, p. 69), “ethics in research are important in ensuring the humane treatment of participants”. The respondents were made aware of their rights as individuals and the fact that participating in the study was on a voluntary basis (Appendix E and F). The respondents were assured that their answers and participation would remain confidential.

Furthermore, the names of the participants were not revealed to any person other than the researcher, since each participant received a code when their contributions were being discussed in this study. Finally, the researcher promised to be objective, honest and to report on the process accurately and with integrity and to share the research findings with the management of WVTC upon completion of the study.

### **3.11. Summary**

This chapter described the research design and the methodology used in obtaining the information from the sample. It also described the number sense test, the Fennema-Sherman Mathematics Attitude Scale, and focus group discussions used in this study. The data collection procedures, data analysis and ethical considerations were also discussed. The next chapter presents and discusses the results.

## **CHAPTER FOUR: DATA ANALYSIS, INTERPRETATIONS AND DISCUSSIONS**

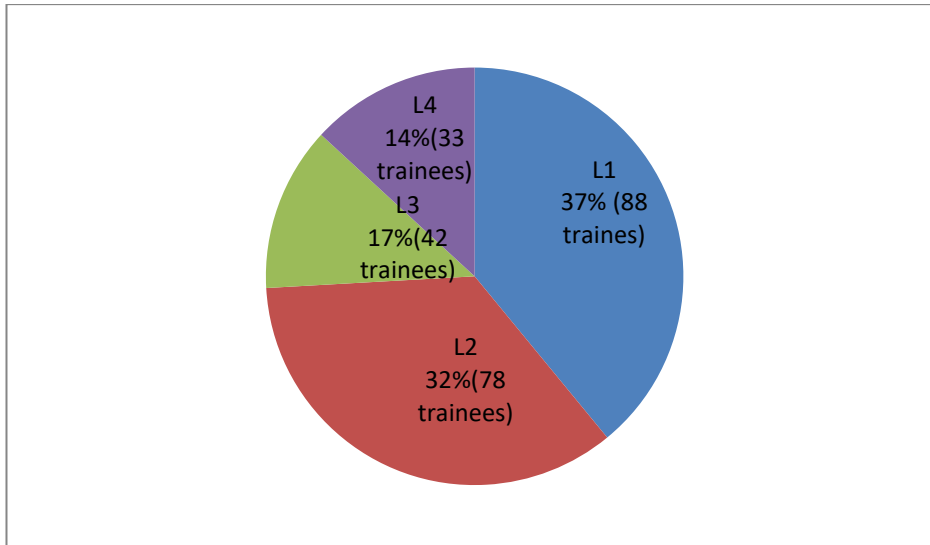
### **4.1. Introduction**

This chapter presents the findings, interpretations and discussions of the results obtained. The data (both quantitative and qualitative) were collected from the Level 1 trainees of the WVTC.

### **4.2. The state of the number sense of the Level 1 trainees at WVTC**

#### **4.2.1. Number sense test**

In order to determine the state of the number sense among the Level 1 trainees of the Windhoek Vocational Training Centre, this study adopted and adapted the number sense test from McIntosh, Reys and Reys (1992). The number sense test scores for all the 241 Level 1 trainees at WVTC that took part in the number sense test were categorised in four levels according to McIntosh, Reys and Reys (1992). These levels are in the order of increasing strength as explained in Chapter 2. In Figure 2 frequencies and percentages of all the 241 Level 1 trainees of WVTC who took part in the number sense test.



**Figure 2: Achievement levels in the numbers sense test of the Level 1 trainees (N=241)**

Figure 2 shows that 69% of the trainees' scores were in level 1 and 2 which are weak levels of the number sense test. On the other hand, 31% of the trainees scored in the strong levels of the number sense test. This is an indication of a deficiency of numerical sense amongst the Level 1 trainees of WVTC. The numerical deficiency amongst the Level 1 trainees may compromise the learning and teaching of Mathematics at WVTC. The weak number sense found amongst the trainees in this study might negatively impact on how the learners grasp the Mathematics content and their performance in Mathematics. Naukushu (2011, 2006) noted that the learners need to be prepared well in their number sense comprehension if they are to excel in their academic challenges. This then means that if the learners' foundation in Mathematics foundation is weak they are likely to experience difficulties in learning Mathematics in the higher grades of learning.

### 4.3. The difficulty experienced in Mathematics as perceived by the Level 1 trainees at WVTC

The researcher used the number sense test scores, the Fennema-Sherman Mathematics Attitude scales and the focus group discussions to identify the problems faced by the Level 1 trainees at WVTC in learning Mathematics. .

#### 4.3.1. The number sense test results

Table 4 shows the scores of trainees as per their trade.

**Table 4: The frequency of the trainees of each level of number sense in each trade at WVTC**

Trade	Levels				Total
	1	2	3	4	
Air conditioning &refrigeration	3	3	3	1	10
Auto mechanics	8	12	10	7	37
Boiler maker & welding	8	15	6	4	33
Bricklayer & plastering	10	9	3	1	23
Electrical general	6	13	5	4	28
Fitter &turner/ Fitter machinery	11	12	3	4	29
Joinery & Carpentry	21	1	6	3	31
Pipe fitting & fabrication	12	11	6	5	34
Radio and Television	9	4	1	2	16
<b>TOTAL</b>	<b>88</b>	<b>78</b>	<b>42</b>	<b>33</b>	<b>241</b>

Table 4 suggests the same trend (as in Figure 2) of numerical deficiency among many Level 1 trainees of Mathematics at the Windhoek Vocational Training Centre. Furthermore, Table 2 shows that 6 out of 9 (66.7%) trades at WVTC had more than

half of their Level 1 trainees scoring marks that are ranked weak according to the Levels of number sense test level descriptors. Additionally, according to Table 1 only 3 out of 9 (33.3%) trades at WVTC with more than half of their Level 1 trainees scored marks that are ranked in the strong Levels of number sense.

#### **4.3.2. The Fennema-Sherman Mathematics Attitude scales**

The Fennema-Sherman Mathematics Attitude scales was used to confirm the information obtained from the number sense test. The Fennema-Sherman Mathematics Attitude scales gave an indication of the confidence, views on usefulness of Mathematics and the attitude of the trainees towards Mathematics.

A total of 241 of The Fennema-Sherman Mathematics Attitude scales were distributed to the Level 1 trainees at the Windhoek Vocational Training Centre. All the 241 Fennema-Sherman Mathematics Attitude scales were completed and collected for analysis by the researcher. The Fennema-Sherman Mathematics Attitude scales included 36 statements that were scored on a Likert rating scale (Strongly Disagree = 1 to Strongly Agree = 4 to each positively worded item, and Strongly Agree = 1 to Strongly Disagree = 4 to each negatively worded item). The Fennema-Sherman Mathematics Attitude scale is divided into three subscales and each subscale consists of 12 statements. Possible scores range from 12 to 48 for each subscale.

##### **4.3.2.1. Confidence in Learning Mathematics sub – scale (CLM)**

Confidence in Learning Mathematics scale considers an abstract indication to Mathematics self-efficacy and has consistently been found to predict both

Mathematics performance and Mathematics anxiety (Tapia & Marsh, 2004). The Confidence in Learning Mathematics Scale was intended to measure the confidence in trainees' ability to learn and to perform well in mathematical tasks in their classrooms. The dimension ranged from distinct lack of confidence to definite confidence. The responses are given in Table 4.

**Table 4: Trainees Confidence in Learning Mathematics**

Statements	Strongly Agree	Disagree	Agree	Strongly Agree	Total
	Fr (%)	Fr (%)	Fr (%)	Fr (%)	
1. I am sure that I can learn mathematics.	98 (40.7)	78(32.37)	39(16.18)	26(10.79)	241
2. Mathematics is hard for me.	35(14.52)	44(18.6)	65(26.9)	97(40.3)	241
3. I don't think I could do advanced mathematics.	18(7.5)	31(12.8)	91(37.7)	101(41.9)	241
4. I am sure of myself when I do mathematics.	99(44.1)	93(38.58)	16(6.63)	33(13.69)	241
5. Mathematics has been my worst subject.	21(8.7)	37(15.35)	85(35.26)	98(40.7)	241
6. I'm not the type to do well in Mathematics.	21(8.7)	43(17.8)	99(41.7)	78(32.36)	241
7. I think I could handle more complex Mathematics.	88(36.5)	79(32.7)	53(21.9)	21(8.7)	241
8. I'm no good in Mathematics.	21(8.7)	34(14.6)	87(36.09)	99(41.07)	241
9. Most subjects I can handle OK, but I just can't do a good job with Mathematics.	16(6.6)	23(9.5)	98(40.6)	104(43.15)	241
10. I am sure I could do complex work in Mathematics.	86(35.68)	102(42.32)	34(14.1)	19(7.8)	241
11. I know I can do well in Mathematics.	97(40.2)	87(36.09)	35(14.5)	22(9.12)	241
12. I can get good grades in Mathematics.	90(37.3)	84(34.8)	38(15.76)	29(12.4)	241

Key: Fr = Frequency

Confidence in Learning Mathematics has been associated with Mathematics achievement with correlation coefficients ranging from 0.3 to 0.4 (Newman, 1990).

Table 3 indicates that 67% trainees were in agreement with the statement that: “Mathematics is hard for me”, whereby, 80% of the trainees were not confident that they could do well in Mathematics. Seventy eight percent of the Level 1 trainees disagreed with the statement that they “think they could handle complex Mathematics” activities in the classroom. Trainees’ willingness to take on challenging tasks in Mathematics is at times affected by their own views on their competence and learning characteristics. Hence the trainees’ confidence determines how comfortable the trainees are with the subject content. Table 4 also shows that 83.8% of the trainees stated that it is only Mathematics amongst the subjects they were taking at WVTC that they cannot handle or do better at.

#### 4.3.2.2. *Usefulness of Learning Mathematics sub – scale (ULM)*

The Usefulness of Learning Mathematics sub-scale was intended to measure the trainees’ beliefs about the usefulness of Mathematics currently, and in relation to their future education, vocation, or other activities (Fennema & Sherman, 1976). Table 5 presents the views of the trainees regarding the usefulness of learning Mathematics during their current study and upon completing their vocational training.

**Table 5: Trainees view on Usefulness of learning Mathematics**

Statements	Strongly disagree	Disagree	Agree	Strongly Agree	Total
	Fr (%)	Fr (%)	Fr (%)	Fr (%)	
13. Mathematics will not be important to me in my life's work.	48(19.9)	89(36.9)	59(24.48)	45(18.67)	241
14. Knowing Mathematics will help me earn a living.	81(33.6)	87(36.09)	40(16.59)	33(13.69)	241

15. I'll need Mathematics for my future work.	97(40.74)	71(29.46)	47(19.50)	26(10.78)	241
16. I don't expect to use much Mathematics when I get out of school.	40(16.59)	33(13.69)	75(31.12)	93(38.58)	241
17. Mathematics is a worthwhile, necessary subject.	87(36.1)	82(34.3)	37(15.37)	35(14.52)	241
18. Taking Mathematics is a waste of time.	55(22.8)	63(26.14)	86(35.68)	84(34.85)	241
19. I will use Mathematics in many ways as an adult.	39(16.18)	46(19.87)	68(28.21)	88(36.5)	241
20. I see Mathematics as something I won't use very often when I get out of high school	29(12.3)	50(20.7)	89(36.9)	73(30.29)	241
21. I'll need a good understanding of Mathematics for my future work.	83(34.4)	78(32.36)	31(12.86)	49(20.4)	241
22. Doing well in Mathematics is not important for my future.	36(14.93)	29(12.4)	86(35.68)	90(39.34)	241
23. I study Mathematics because I know how useful it is.	89(36.9)	82(34.2)	31(12.86)	39(16.18)	241
24. Mathematics is not important for my life.	47(19.5)	33(13.69)	90(37.34)	71(29.46)	241

Key: Fr = Frequency

Table 5 shows that about 70% of the trainees did not agree with the statement that “Knowing Mathematics will help me earn a living”. The same percentage number of trainees (70%) also did not see the need of learning Mathematics at all. Another 70% of the trainees did not agree with the statement that Mathematics is a worthwhile subject. Furthermore, 66% did not see the need for Mathematics in their future work. This is also shown when 67% of the trainees said that they will not need Mathematics when they completed their studies at the Windhoek Vocational Training Centre. Another 73% of the Level 1 trainees held the view that Mathematics was not important for their future. This information from the trainees is very

disturbing because even the Ministry of Basic Education supports the sentiment of VET that Mathematics instils higher order thinking abilities in learners which is an important skill in the process of learning (NIED, 2010). Hence, irrespective of the field of study Mathematics is important. Therefore, the trainees at the Windhoek Vocational Training Centre need Mathematics in their studies in order to develop the much needed skills and knowledge. According to Hodges (2004), learners are likely to perform well in school activities when they value a subject and when they know the importance of that subject in their own lives.

#### 4.3.2.3. *Attitude towards Mathematics sub-scale*

The Attitude towards Mathematics sub-scale is intended to measure attitude (or problem-solving) as applied to Mathematics. The dimensions range from lack of involvement in Mathematics to active enjoyment and seeking of a challenge. The scale is not intended to measure interest or enjoyment of Mathematics; rather, it attempts to measure attitudes toward the enjoyment of Mathematics (Fennema & Sherman, 1976) (see Table 6).

**Table 6: Trainees' views on their attitude towards Mathematics**

Statements	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
	Fr (%)	Fr (%)	Fr (%)	Fr (%)	
25. I am interested to learn new things in Mathematics.	97(40.24)	82(34.2)	26(10.79)	36(14.9)	241
26. I don't understand how some people can get so enthusiastic about doing Mathematics.	54(22.4)	32(13.27)	75(31.12)	80(33.19)	241
27. I get a sense of satisfaction when I solve Mathematics problems	94(39.41)	71(29.46)	37(15.35)	39(16.18)	241
28. Having to spend a lot of time on a math problem	7(2.9)	67(27.8)	78(32.36)	89(36.92)	241

frustrates me					
29. I plan to take as much Mathematics as I can during my Education.	71(29.46)	97(40.42)	48(19.9)	25(10.37)	241
30. I would like to avoid using Mathematics in college	28(11.6)	34(14.1)	88(36.5)	91(37.7)	241
31. I like to stick at a Mathematics problem until I get it out	79(32.78)	99(41.78)	34(14.10)	29(12.33)	241
32. I can become completely fascinated doing Mathematics problems	93(38.58)	85(35.26)	31(12.86)	32(13.27)	241
33. Learning Mathematics is enjoyable.	72(29.87)	81(33.6)	54(22.4)	34(14.17)	241
34. If something about Mathematics puzzles me, I would rather be given the answer than have to work it out myself.	22(9.12)	46(19.78)	89(36.9)	84(34.55)	241
35. The challenge of understanding Mathematics does not appeal to me.	31(12.86)	44(18.25)	77(31.9)	89(40.24)	241
36. I wish to avoid taking on Mathematics during my education.	27(11.2)	44(18.25)	73(30.29)	97(40.24)	241

Key: Fr = Frequency

According to Table 6, 74% of the trainees agreed that they were not interested in learning new things in Mathematics, and 68% agreed that they did not get any sense of satisfaction when solving mathematical problems. Furthermore, 74% agreed that they preferred not to use Mathematics in their future studies. Another 74% of the trainees also agreed that when working on a Mathematics problem that they are struggling with, they would not put in an effort until a Mathematic problem is solved but they would rather leave it up to where they could. Seventy four percent of trainees agreed that they never get fascinated by doing mathematical problems. Lastly, 70% of the trainees agreed that they wished to avoid taking Mathematics at WVTC during their studies. According to Attwood (2014), interest in and enjoyment of a subject is a relatively stable orientation that affects the intensity and continuity

of engagement in learning situations, the selection of strategies and the depth of understanding.

During the group discussions, the trainees indicated the difficulties that they experienced in learning Mathematics. The results from the discussions are presented under the following headings: Difficulty in transferring knowledge, Incomplete understanding of the language of Mathematics, Computational weakness, and incomplete mastery of number facts.

#### **4.3.3. Difficulty in transferring knowledge**

During the group discussions the trainees indicated that they found it difficult to understand the meaning of certain concepts if written in symbols. They also indicated that they found it difficult to apply theoretical concepts to practical situations. Therefore, these trainees had difficulty manipulating abstract Mathematics as shown in Question 9 and Question 21 on the number sense test.

Those questions fell in the category of Equivalence of numbers on the number sense test. This strand includes recognition that numbers take many different numerical and representational forms (e.g. fraction as a decimal, a whole number in expanded form, or a decimal on a number line) and can be thought about and manipulated in many ways to benefit a particular purpose. A trainee need to have a good understanding of the number size in various forms of numbers, fractions or decimals, he or she then needed to carry over this basic understanding to applied tasks like question 21. A trainee also needed to have understood the comparison of numbers in different forms by being able to convert it in one form to another in order to enhance better

understanding of the activity like question 9. The following are some of responses by trainees:

Trainee AM 85 began by commenting that: *that question (question 9) was a bit difficult because I am always confused by the symbols of greater than and less than* [23 May 2017].

Trainee BP 34 said: *how do I estimate the size of the number without carrying out at least some measurements or calculations, some of the answers are just not that easy to give on top of my head (as asked in question 21)* [20 March 2017].

There were however some trainees who indicated that completing activities of the above questions did not pose a problem to them.

Trainee FT/FM 06 said: *I don't have a problem with such calculations like the one of question 9 because before I get the answer I write all the numbers as decimals then if I do that it easy for me to compare and see which is bigger or smaller* [07 October 2017].

Symbols and formal notations are crucial and fundamental elements of mathematics. They summarize the order of concepts into shorthand form. However, these notations are sometimes a cause of difficulty in the learning of Mathematics by trainees.

#### **4.3.4. Incomplete understanding of the language of Mathematics**

Language is an issue of concern to most of the trainees' that took part in the study. The spoken and written problems coupled with the Mathematical terminologies of the subject made it very difficult for most of these Level 1 trainees to perform well in

Mathematics. This is also highlighted by the manner in which Question 14, 16 and 22 were answered by the trainees. Following up on these responses from the number sense test during the focus group discussions, some of the trainees indicated that those questions proved to be difficult because they could not understand what it was that they were expected to do.

Those three questions were word problems and trainees were expected to solve the scenarios presented in words. The content of Mathematics is full of words such as formula, notations, and so on. These words have been given precise technical meanings which are often closely related to but not identical to their everyday meanings. Words, whose meaning in everyday life might not be the same as the mathematical ones; the difference in the terminology use used creates confusion for trainees to understand. Table 7 below indicates the performance of the Level 1 trainees on questions 12, 14 and 16 in the number sense test.

**Table 7: Level 1 trainees’ performance on questions 12, 14 and 16**

Questions	No of correct responses (%)	No of wrong responses (%)	<b>Total</b>
14	144 (59.8)	97 (40.2)	<b>241</b>
16	158 (65.6)	83 (34.4)	<b>241</b>
12	165 (68.5)	76 (31.5)	<b>241</b>

During the focus group discussions the trainees alluded to the fact that they find it difficult to make sense of what some questions were asking trying to say especially if they were word problem format as the three questions above.

Trainee AM 19 stated: *I find it better to understand if the questions are straight forward and mathematical symbols are used instead of hiding the meanings in problems.* [23 May 2017].

Another trainee EG 23 said: *if a Mathematics problem is stated as a riddle I am not very good at getting the meaning out of such questions so I would rather leave it and move on to the next question* [24 May 2017].

On the other hand there were other trainees that seemed to not have a problem with the language of Mathematics.

Trainee RTV 27 said: *I do not have a difficulties understanding the language used in Mathematics as a matter of fact I find word problems interesting , since they make me think deeper when I am trying to find a solution* [ 09 October 2017].

#### **4.3.5. Incomplete mastery of number facts**

During the focus group discussions it came out clearly that trainees could not answer some of the questions in the number sense test because they could not perform calculations with basic arithmetic operations as shown in the scores of Question 3, 11 and 14. This means that their background knowledge of Mathematics was not adequate for the Mathematics that they are doing in Level 1 at the WVTC. When queried, trainees could not explain why they could not answer the questions correctly.

During the focus group discussions some trainees indicated that they still found it hard to apply arithmetic operations especially if they have to work with fractions.

Trainee ACR 13 said: *if the question requires one to work on fractions by adding or using any of those signs I just don't know where to start* [29 May 2017].

Trainee BM/WF 07 said: *I have an issue with ordering numbers especially if it has to do with fractions, this numbers are just too complicated to work with* [29 May 2017].

Trainee PPF 67 said: *yes these subject is not easy but one just need to understand the basic of the subject, I believe may people find it hard because they did not understand it well from the beginning* [10 October 2017].

The performance of the Level 1 trainees in the three questions on the number sense test is summarised in Table 8 below.

**Table 8: Level 1 trainees' performance in question 3, 11 and 14**

Questions	No of correct responses (%)	No of wrong responses (%)	Total
3	128 (53.1)	113 (46.9)	<b>241</b>
11	131(54.4)	110 (45.6)	<b>241</b>
14	144 (59.8)	97 (40.2)	<b>241</b>

#### **4.3.6. Computational weaknesses**

During the focus group discussions the trainees indicated that they got confused in presenting their calculations clearly and correctly. The trainees were not capable of carrying out the calculations and they had some inconsistency in computing when answering Question 3 and 10. However, most of these trainees seemed to have the potential to perform well in Mathematics. Table 9 below illustrate how the Level 1 trainees performed on the number sense test in the two questions.

**Table 9: Level 1 trainees' performance in question 3 and 10**

Questions	No of correct responses (%)	No of wrong responses (%)	Total
3	128(53.1)	113 (46.9)	241
10	108(44.8)	133(55.2)	241

Trainee WF 34 said: *I am not all the time sure, simply because if there are some steps to be done before solving the problem. Now the problem is if the first manipulations or calculations are wrong then the answer will not come out good.* [23 May 2017].

Another trainee FT 85 remarked: *No...I am not always sure because Mathematics is very tricky, you think what you are doing is correct but when it's time to do the corrections then you will see that one have used a wrong method.* [23 May 2017].

#### **4.4. The factors contributing to Level 1 trainees' difficulties in learning Mathematics at WVTC**

In order to specify the factors contributing factors to the difficulties that the trainees at WVTC were experiencing, the Level 1 trainees were interviewed during group discussions.

The focus group discussions revealed that the following factors contributed to the difficulty experienced in learning Mathematics by the Level 1 trainees at WVTC. More than 50% of the Level 1 trainees at WVTC had a negative attitude towards Mathematics (Table 7); they also had poor English proficiency (Language (Table 5)), the time allocated for Mathematics lessons (Table 5), trainees' poor background in

Mathematics (Table 4), and Topics in Mathematics (Table 6). These factors will be discussed in the next sections.

#### **4.4.1. Large number of trainees in the Mathematics classrooms**

During the focus group discussions with the Level 1 trainees, the participants felt that they were too many in the Mathematic classroom and it is difficult for the instructor to pay attention to individual trainees. From the discussion it also emerged that a large number of trainees in the classroom led to indiscipline and disturbance during lessons. Therefore, the large numbers of trainees in the classroom were too big for the instructor to manage which led to disruptive behaviours from some trainees. Trainee EG 16 had this to say:

*We are about seventy five trainees in the class. Even if the instructor gives us homework it is difficult for him to mark and give us feedback on time. Yes, he does try here and there but you will find the trainees that are not interested in Mathematics can be very disruptive that even us who are trying to learn it become a problem to pay attention to the instructor. In a case were some us do catch up on what was said how will he explain this slowly or one-on-one if he is also running out of time and he have another class coming in for a lesson? [05 May 2017].*

During the focus group discussions another trainee BP 23 mentioned that: *the instructor cannot see us any other time for re-teaching because his time table is fully booked to give re-teaching to us so then it means we are on our own* [23 May 2017].

The Level 1 trainees felt the need to have remedial classes but unfortunately that could not be done because the instructors do not have room on their timetable to add more slots remedial classes.

The views of trainees in the focus group discussions were in line with what the trainees indicated on the Fennema-Sherman Mathematics Attitude scales (Table 7) when they indicated that they were not interested in learning Mathematics because they were not supported well by the instructor during their lessons. This suggested that the Level 1 Mathematics classrooms at the Windhoek Vocational Training Centre were overcrowded with a lot of trainees which constrained the teaching of Mathematics. Therefore, the over crowdedness of the Mathematic classroom seems to inhibit the instructor to use the perceived teaching methods in Mathematics, such as group work, and problem-based learning that might improve the learning of Mathematics by the Level 1 trainees.

#### **4.4.2. Level 1 trainees' attitude towards learning Mathematics**

The second factor contributing to the difficulty in learning Mathematics by the Level 1 trainees at WVTC indicated by the participants was the Level 1 trainees' attitude towards Mathematics. During the discussion some of the trainees said that they

developed a negative attitude towards learning Mathematics from their previous secondary schools.

Trainee BP 28 remarked: *Since high school I never passed Mathematics so I do not expect to do better now that I am at VTC* [23 May 2017].

Trainee RTV 70 said: *I am not good in Mathematics because I do not have the brains for Mathematics I am not smart to do those things they do in Mathematics* [10 May 2017].

Another trainee BP14 echoed this view: *What is the point of doing well in Mathematics since even the course I am doing is not what I wanted to do when I applied at WVTC? Nothing is making sense to me here* [20 May 2017].

These comments from the focus group discussion were this is consistent with what was indicated by the trainees in the Fennema-Sherman Mathematics Attitude scales. Statement 33 (Table 6) shows that 153 out of 241 trainees did not find learning Level 1 Mathematics enjoyable at all. In the same vein statement 25 (Table 6) also indicates that the majority of the trainees (179 out of 241) did not agree with the statement that they were willing to learn new things in Mathematics. These results are consistent with the results obtained by Blackwell, Trzesniewski and Dweck (2007) when they found out that attitude affects how the students perform. One can therefore, argue that if trainees developed a positive attitude towards Mathematics they would take the learning of Mathematics more seriously and effective learning would likely take place. Level 1 trainees' poor English Language proficiency

The Level 1 trainees agreed with the statement “Mathematics is hard for me” (Table 4 Statement 2). In classifying Statement 2 trainees remarked as follows during the focus group discussions:

Trainee BM 56 remarked: *Mathematics is that subject that no matter how hard I try I just can't get to understand it. Just when the teacher starts speaking that mathematic language; my head is already getting heavy. There are times when I try to consult my fellow students but they are no also patient with me as am too slow for them, “hmm” this subject is not for me at all.* [21 May 2017].

Trainee PPF 94 remarked: *I really have a problem of using Mathematics and during classes I need to sit next to my friend so that she could translate in my vernacular or else I will not get anything from the lesson, if I am trying to study at home is a problem because I can follow the instructions in the textbook because the language is just too difficult* [25 May 2017].

Thus, in the focus group discussions the trainees agreed that their poor English language proficiency affected their learning of Level 1 Mathematics at WVTC. During the focus group discussion some participants failed to follow the discussion in English and an interpreter was used when necessary. These trainees believed that their English was not good enough to read and understand the Level 1 Mathematics questions and instructions. Similarly, following classroom instructions is difficult.

#### **4.4.3. Time allocated to Mathematics lessons**

The other factor contributing to the difficulty in learning Mathematics identified by the Level 1 trainees at WVCT was the limited time allocated for Mathematics on the

timetable. According to the trainees during the focus group discussion, they did not have enough time to meet the instructor for Mathematics. They explained that, they only met the instructor once a week and they do not have extra classes, tutorials or remedial classes. The one hour thirty minutes allocated to the lesson was not enough, because Level 1 Mathematics classrooms were situated outside the main buildings of the centre and it took the trainees about thirty minutes to walk to the venue, hence wasting precious teaching time. The following were some of the comments from the Level 1 Mathematics trainees during the focus group discussion:

Trainee FT 85 remarked: *It will be good if we can get extra classes in smaller groups because the time on the time table is not enough and we don't get a chance to see the instructor to ask were we do not understand* [23 May 2017].

The management needs to look into the issue of allocating adequate time to the subjects on drawing up the timetable in line with the weight of the subject in the curriculum. At this point, the admission requirements of trainees into VET must also be taken into consideration, since the trainees entering WVTC do not come in with the same knowledge in terms of the secondary school leaving certificate.

#### **4.4.4. Level 1 trainees' poor background of Mathematics**

During the focus group discussion with the Level 1 trainees, it emerged that their poor background in learning Mathematics was one of the factors contributing to the difficulties experienced in learning Mathematics. They agreed that they had little Mathematics background. It was clear from their responses that these trainees were not exposed to basic Mathematics concepts at secondary school as shown in Figure

2. Further, the trainees did not perform well in the number sense test (see Fig 2) which covered the content of Basic mathematics taught at Grade 10. They were not well prepared for learning advanced Mathematics. As such the trainees were struggling with the same Mathematics they were supposedly taught in Grade 10 and Grade 12 this is what the trainees said during the focus group discussions.

Trainee JC 14 remarked: *I could get good grades in Mathematics if I could remember all that I was taught in my high school because it seem I need to know that before I can do very well in tis Mathematics at WVTC. But now it is late there is nothing I can do [24 May 2017].*

Another trainee PPF 89 remarked: *No I don't thing I can good grades in Mathematics because it has never happen before even when I came to WVTC I never passed Mathematics at high school so am not expecting much [24 May 2017].*

These findings correspond with the performance of the trainees in the number sense test (Figure 3). In the number sense test 69% of the trainees scored in the weak levels of the number sense test (levels 1 and 2). These findings also correspond with what the trainees indicated in the Fennema-Sherman Mathematics Attitude scales. In Statement 5 (Table 4) 183 out of 241 trainees agreed that Mathematics was their worst subject. In the same vein, Statement 8 (Table 3), 77% of trainees agreed that they were never good in Mathematics.

#### **4.4.5. Certain topics in Mathematics as a contributing factor to difficulty in learning Mathematics**

During the focus group discussions the trainees agreed that not all the topics in Level 1 Mathematics were a problem. There were a few topics that were posing difficulty to them during instruction.

Trainee JC 72 remarked: *It is just painful to listen to some topics in the class and they are not beneficial to me in my trade. And those things that we don't need they are making us to perform bad in the subject overall.* [23 May 2017].

Karagiannakis (2014) says studying Mathematics implies mobilizing a variety of basic abilities associated with the sense of quantity, symbols decoding, and memory logics. He further says that students with difficulties in any one of these abilities may experience mathematical learning difficulties. This is also what the Level 1 trainees at WVTC revealed and this section pointed out the specific difficulties that they experienced in learning Mathematics.

By knowing the specific difficulties that the Level 1 trainees of WVTC experienced in learning Mathematics it easy to develop appropriate remedy that makes make the learning of Mathematics easier for the trainees. This study used an approach where trainees provided the remedy as they have experienced the difficulty themselves. Dumont (1994) said the causes of a difficulty in learning are situated outside or inside the child. Hence the individual experiencing the difficulty is best suited to narrate his/her situation and suggest strategies that will make his or her situation bearable or even eliminate it.

#### **4.5. Strategies that could be used to improve the difficulty experienced by the Level 1 trainees in learning Mathematics at WVTC**

This section presents and discusses the Level 1 Mathematics trainees' suggestions about the possible strategies that could be implemented in order to improve the learning of Level 1 mathematics at the Windhoek Vocational Training Centre. The findings that emerged from the discussions with the Level 1 trainees are presented under the following two headings: remedial classes and reduction of the number of trainees per instructor.

##### **4.5.1. Remedial Classes**

All the 48 Level 1 trainees during the focus group discussion touched on the issue of remedial classes and how they felt it could be a possible remedy to the problems that they were experiencing in learning Mathematics at WVTC.

Trainee JC 13 stated: *If we could get special classes then we will have an opportunity to be assisted by the instructor as some of us do not catch at the same [time] with those smart trainees in the class. During this time the instructor can give us the much needed attention we need as well [20 May 2017].*

Another trainee BP 32 had this to say:

*We are hoping that if we get extra classes the instructor will also pay attention to us and explain things slowly to us because at times we do understand that he need to*

*cover a lot since he is only seeing us once a week and by this some us do not get time to ask for explanations [20 May 2017].*

Ashcraft and Kirk (2001) note that Mathematics is a subject where one learns the parts; the parts build on each other to make a whole; knowing the whole enables one to reflect with more understanding on the parts, which in turn supports the whole. Some trainees found it difficult to catch up with their peers when learning Mathematics. It is therefore important that the instructors found time to re-teach and emphasize basic concepts that the trainees needed needs to master in order to make the learning of Mathematics easier.

#### **4.5.2. Reduction of the number of trainees per instructor**

During the focus group discussion with the trainees, the issue of instructors teaching too many trainees to pay attention to individual trainees was mentioned by many trainees. The trainees felt that if instructors were given a manageable number of trainees to teach, instructors could return their marked tests and assignments back on time. They indicated that the instructors were not taking their various learning needs into consideration. They compared this situation of overcrowded situations in their Mathematics classrooms to that of their workshops.

Trainee PPF 80 remarked: *In our workshop we are a lot [89 trainees] and we have three instructors to attend to us but when go to the general subjects [Mathematics]*

*we only have one instructor to teach. Can you imagine this is the subject that is difficult and we need to be taught well with time [25 May 2017]?*

Trainee BM/WF 23 said: *it's difficult to communicate well with instructor especially if are placed right at the back side of the classroom, at times there is just too much commission as the instructor is trying his best to assist the other trainees [12 May 2017].*

Trainee EG 34 said: *the classes are just too overloaded and even us the trainees are just not comfortable to learn in such a large crowd of trainees and the classroom is too small and cramped [27 May 2017].*

The suggested strategies to make the learning of Mathematics easier could eliminate the difficulties that the trainees experienced in learning Mathematics and eventually lead to improved performance of the Level 1 trainees in Mathematics at WVTC.

#### **4.6. Discussion of the results**

The results of the number sense test (Table 2) that the Level 1 trainees took showed that their number sense was low with 69% of them scoring in levels 1 and 2 of the test. This is an indication that there was numerical deficiency among the Level 1 trainees at WVTC. This has the potential of affecting their understanding and performance in Mathematics. Naukushu (2011) stated that the development of

number sense in Mathematics has an influence on the academic performance of learners. This means that deficiency in number sense is one of the reasons why the trainees were finding difficulty in coping with the Level 1 Mathematics content being taught currently at WVTC. As Dennis et al. (2006) indicated a firm understanding of numbers and the number system is central to learning Mathematics. If trainees have a low number sense it is likely that their performance in Mathematics will be low as well. Namibian studies on learners' number sense have confirmed low number sense amongst the learners. Such as Haufiku (2008) concluded that the majority of the primary school teachers have limited number sense and very little understanding of what number sense is. It is therefore fair to conclude that the Level 1 trainees' numerical deficiency could be traced back to their lower primary school level instruction.

The overall attitude (Table 6) of the Level 1 trainees towards Mathematics at WVTC can be attributed to lack of confidence, lack of desire to study Mathematics and negative attitudes toward Mathematics. This was confirmed when 80% (Table 4) of the trainees indicated that they were not confident that they can do well in Mathematics. It was also affirmed when 67% of the Level 1 trainees were in agreement with the statement that: Mathematics is hard for me. Seventy percent 70% of the Level 1 trainees (Table 3) also did not see the need of learning Mathematics. Negative attitude towards a subject makes learning that subject difficult (Kuman et al., 2016). That is, if a student has a negative attitude towards Mathematics, the learning of the subject becomes difficult. This is viewed as the theory of "fixed" and "growth" mindset by Blackwell, Trzesniewski and Dweck (2007). Therefore,

developing positive attitudes toward Mathematics in Level 1 trainees might improve their performance in the subject.

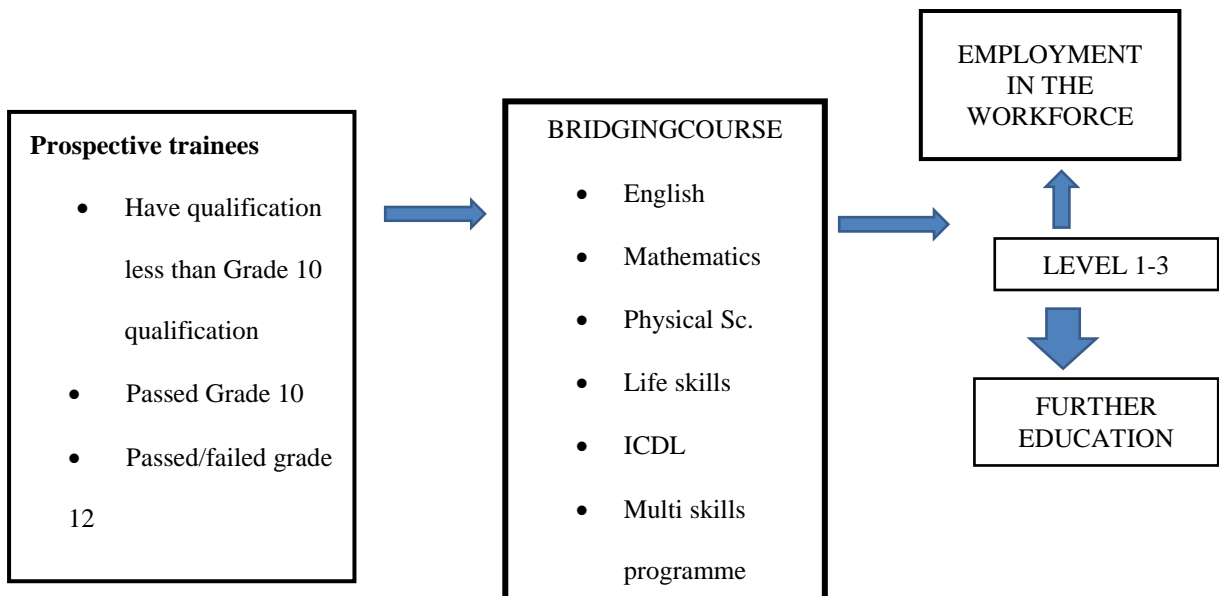
When followed up in the focus group discussion on the difficulties they experienced the Level 1 trainees said that they experienced various difficulties in learning mathematics at WVTC. Students need to have both conceptual and procedural knowledge in order to learn Mathematics without any difficulties (Bernardo, 1999). Conceptual knowledge does not only consist of recognizing the concepts or knowing the definitions and the name of the concepts, but also, having the ability to recognize the mutual transitions and relationships among the concepts and procedural knowledge which include how to do it. It included knowing the symbols and language of mathematics and the relations used for solving the mathematics problems.

More than 50% of the Level 1 trainees did not perform well in the number sense test (Figure 2). These trainees stated during the focus group discussions that they have negative attitudes towards Mathematics. During the focus group discussion the trainees further indicated that they had problems with the usage of English in all areas of their studies including Mathematics. This might explain their poor performance, since examinations are written and answered in English. Dennis et al. (2006) notes that word problems in mathematics often pose a challenge because they require that students read and comprehend the text of the problem, identify the question that needs to be answered, and finally create and solve a numerical equation. Dennis et al. (2006) further notes that many learners may have difficulty reading and understanding the written content in a word problem. If a student is learning English as a second language, he/she might not know key terminology

needed to solve the equation. This is probably the case with the Level 1 trainees at WVTC. They might have found it difficult to make sense of the questions that were presented as word problems in the number sense test.

#### 4.7. Suggested Model to improve learning of Mathematics of Level 1 trainees at WVTC

During the focus group discussions, some trainees indicated that they did not have the needed foundation content knowledge to cope with the Level 1 Mathematics that is currently offered at WVTC. The Windhoek Training Centre could develop a bridging Programme (see Figure 3) might ensure that all the trainees are at the same level upon entering Level 1.



**Figure 3: A proposed model of admission to training at the Windhoek Vocational training Centre**

This suggested bridging programme could teach the content of the general subjects for example, Mathematics, Engineering science, English, Computer literacy and

Trade theory introduction to all the trades offered at the Windhoek Vocational Training Centre. The main aim of the programme might be to equip and align the admitted trainees to into VET with the necessary knowledge and skills to cope with the Level 1 content.

The suggested bridging programme could teach the content of the general subjects for example, Mathematics, Engineering science, English, Computer literacy and Trade theory introduction to all the trades that are offered at WVTC. The main purpose of the programme would be to equip and align the admitted trainees with the necessary knowledge and skills to cope with the Level 1 content. The bridging course should be taught over a period of one year.

This chapter presented analysed, interpreted and discussed data on the difficulties that the Level 1 trainees of the Windhoek Vocational Training Centre. Suggestions by the Level 1 trainees to ameliorate the experienced difficulties are also presented. The data were collected through number sense test, Fennema-Sherman Mathematics Attitude scales and focus group discussions. In the next chapter, the summary, conclusion and recommendations are presented.

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

### **5.1. Introduction**

This chapter provides the summary, as well as the conclusion and recommendations of the study.

### **5.2. Summary**

This study sought to investigate the difficulties that the Level 1 trainees of the Windhoek Vocational Training Centre are experiencing in learning Mathematics. The following four questions were addressed.

1. What is the state of the number sense of the Level 1 trainees at WVTC?
2. What are the difficulties experienced in learning Mathematics by Level 1 trainees at WVTC?
3. What are the contributing factors to the difficulty experienced in learning Mathematics by the Level 1 trainees at WVTC?
4. What can be done to ameliorate the difficulty experienced by Level 1 trainees in learning Mathematics at WVTC?

The researcher employed an explanatory sequential mixed-method design, using both quantitative and qualitative research designs. The population of the study comprised 645 Level 1 trainees from the Windhoek Vocational Training Centre.

To determine the appropriate sample number, Fowler's (2014) sample formula was used to arrive at the sample size of 241. Thereafter, stratified sampling was used to

get participants from the different trades at WVTC. All the participants were required to complete the number sense test and the Fennema-Sherman Mathematics Attitude Scale. The data collected from the number sense test and Fennema-Sherman Mathematics Attitude Scale was analysed using frequency tables and graphs. Data that emerged from the number sense test and Fennema-Sherman Mathematics Attitude Scale were used in the qualitative focus group discussions to collect in-depth information from the participants (Creswell, 2014).

Based on the participants' answers on the number sense test and Fennema-Sherman Mathematics Attitude Scale the researcher purposively selected 48 participants to participate in the focus group discussions. The analysed data from the number sense test and the Fennema-Sherman Mathematics Attitude Scale were used as the basis for semi-structured focus group discussion questions. The focus group discussion provided the researcher with in-depth and rich information regarding the difficulty experienced by the Level 1 trainees of the Windhoek Vocation Training Centre, and the possible solutions to improve the situation. The focus group discussions were tape recorded and transcribed by the researcher. The data collected from the focus group discussions were analysed using thematic analysis.

Findings of the study indicated that the Level 1 trainees at WVTC felt that Mathematics was not important for their future as artisans, and suggested that WVTC should do away with Mathematics in their curriculum. About 50% of the Level 1 trainees believe that Mathematics was a difficult subject and the trainees should not feel that they are forced to study Mathematics at WVTC. It also emerged from the study that Level 1 trainees had a negative attitude towards the learning of

Mathematics and were not motivated at all to improve their performance in the subject. Level 1 trainee experienced various difficulties whilst learning the Level 1 Mathematics at WVTC. These difficulties included; among others, incomplete mastery of number facts, computational weaknesses; difficulty transferring knowledge, difficulty in understanding of the languages of Mathematics, high teacher-learner ratios, overcrowded Mathematics classrooms and inadequate time allocated for Mathematics lessons out of the two days per week that is currently being practiced.

### **5.3. Conclusion**

More than 50% of the Level 1 trainees at the Windhoek Vocational Training Centre had a numerical deficiency which might possible affect their understanding and performance in Mathematics. Based on the findings of this study it can be concluded that the Level 1 trainees' low performance in Mathematics is to a larger extent caused by the various difficulties they experience while studying Mathematics at WVTC. Some these included: difficulties in learning Mathematics came from the Windhoek Vocational Training Centre itself while others were carried over from the secondary schools. Regardless of the source of the identified difficulties the suggested solutions by the Level 1 trainees such as reducing the number of trainees allocated per instructor to teach, provision of remedial classes or allocating more contact time for Mathematics on the time table may help alleviate these difficulties.

#### **5.4. Recommendations**

In light of the findings of this study, the following recommendations are made:

- 5.4.1.** The number of admissions to level 1 must take the instructor to trainee ratio into consideration to make sure that the instructors have a manageable (50 - 60 trainees in a class) number of trainees in his/her classroom.
- 5.4.2.** The instructors should provide remedial teaching to the Level 1 trainees that are finding it hard to cope with teaching and learning in the normal classroom
- 5.4.3.** The instructors should always strive to make Mathematics interesting to the trainees so as to change the negative attitudes of the trainees toward mathematics. This can be done by emphasising the need of the subject in their studies and life after studies. Instructors should always incorporate various methods of teaching in their lessons as to accommodate the different learning styles of the trainees.
- 5.4.4.** Curriculum developers from the National Training Authority should include aspects of number sense in the Level 1 Mathematics curriculum to enhance the development of number sense through the teaching and learning of Mathematics.
- 5.4.5.** WVTC should build new classrooms to avoid trainees making long trips to classes outside the main centre between lessons which reduces time for Mathematics lessons.
- 5.4.6.** The Windhoek Vocational Training Centre should introduce an entry number sense test into the Level 1 Mathematics course. If the trainees are found to lack number sense they should go through the proposed bridging course (see Fig 3).

## **5.5. Further research**

- 5.5.1. Further research should be carried out to identify ways and means, of how number sense could be incorporated in the teaching of Mathematics in Level 1 course at WVTC.
- 5.5.2. This study was conducted on the Level 1 trainees of the Windhoek Vocational Centre alone and these results cannot be generalised to other vocational centres. Therefore, this leaves a gap for similar studies to be conducted at other vocational training centres in the country.

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# APPENDICES

## Appendix A: Ethical Clearance Certificate from the University of Namibia

**UNAM**  
UNIVERSITY OF NAMIBIA

**ETHICAL CLEARANCE CERTIFICATE**

**Ethical Clearance Reference Number: FOE/89/2016                      Date: 5 April, 2016**

This Ethical Clearance Certificate is issued by the University of Namibia Research Ethics Committee (UREC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the Faculty/Centre/Campus Research & Publications Committee sitting with the Postgraduate Studies Committee.

**Title of Project:** AN INVESTIGATION OF THE DIFFICULTIES THE LEVEL ONE TRAINEES OF WUTC ENCOUNTER IN MATHEMATICS: A CASE STUDY OF THE WINDHOEK VOCATIONAL TRAINING CENTRE

**Nature/Level of Project:** Masters

**Researcher:** Lovisa N.N. Malwa

**Student Number :** 200213211

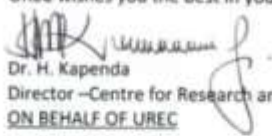
**Faculty:** Faculty of Education

**Supervisor :** Dr. H. Brunette (Main) Mr. R. Manas (Co)

Take note of the following:

- (a) Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the UREC. An application to make amendments may be necessary.
- (b) Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the UREC.
- (c) The Principal Researcher must report issues of ethical compliance to the UREC (through the Chairperson of the Faculty/Centre/Campus Research & Publications Committee) at the end of the Project or as may be requested by UREC.
- (d) The UREC retains the right to:
  - (i). withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,
  - (ii). request for an ethical compliance report at any point during the course of the research.

UREC wishes you the best in your research.

  
Dr. H. Kapenda  
Director –Centre for Research and Publications  
ON BEHALF OF UREC

**Appendix B: Permission to use the Fennema-Sherman Mathematics Attitude Scale**



Lovisa Malwa <kandeshi24@gmail.com>

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**permission to use the Fennema-Sherman Mathematics Attitude Scales (1976)**

2 messages

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Thu, Jul 21, 2016 at 4:54

Lovisa Malwa <kandeshi24@gmail.com>

PM

To: [efennema@wisc.edu](mailto:efennema@wisc.edu)

Good Afternoon Mrs Elizabeth

I am Lovisa Malwa an instructor of mathematics at the Windhoek Vocation Training Centre in Windhoek, Namibia. I am currently doing my masters in mathematics education at the University of Namibia.

My research topic is aimed finding the difficulties that the students at my centre (WVTC) are experiencing in studying mathematics and what leads to their low performance in the subject. one of the aspects I want to research on I want to find out if the attitude of the students towards mathematics as subject and see whether that attitude and beliefs could also be a contributing factor.

I came across your study and I found it fit to use in my study to collect the data I need.

I am now humbly requesting for your permission to please let me your instrument  
in my study.

Thanking you in advance.

--

If I speak in the tongues of men and of angels, but have not love, I am only a  
resounding gong or a clanging cymbal.

1 Corinthians 13:1

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**ELIZABETH H FENNEMA** <efennema@wisc.edu> Thu, Jul 21, 2016 at 9:40 PM

To: Lovisa Malwa <kandeshi24@gmail.com>

**Appendix C: Request letter to the Principal of Windhoek Vocation Training Centre to conduct research at the Centre.**

P.O.Box 4570

Kandeshi24@gmail.com

Cell: +246812262246

10 April 2016

The Principal

Windhoek Vocation Training Centre

Private Bag 13334

Windhoek

Namibia

Dear Sir/ Madam

**Re: Request for permission to conduct an Educational Research at the WVTC.**

I am a student at the University of Namibia pursuing a Master's degree in Mathematics Education. I do hereby kindly request permission from your office to conduct an educational study at the Windhoek Vocation Training Centre in the Khomas Educational Region as part of the requirement for my studies.

My research topic is: **Difficulties that the Level one trainees encounter in learning Mathematics: A case study of the Windhoek Vocational Training Centre.** The first phase of the research project will involve distributing a questionnaire to the Level 1 trainees at WVTC as well writing of a short test. The second phase of the research will involve a few chosen trainees, chosen on the basis of the results of the first phase of the research. These will participate in interview. The information gathered will be treated with confidentiality and will be used solely

for the purpose of research. Participates will have the right to withdraw from the research activity at any time. I hope that the results of this study will positively contribute towards improving the teaching and learning of Mathematics at WVTC at large.

I look forward to a favourable response from your good office.

Yours Education,

Lovisa NN Malwa

## Appendix D: Response letter from the Principal of Windhoek Vocational Training Centre

**NAMIBIA NATIONAL TRAINING ORGANISATION (PTY) LTD**

Trading as:

**Windhoek Vocational Training Centre**

Windhoek, 23<sup>rd</sup> May 2016



Private Bag 13334  
P.O. Box 3771  
WINDHOEK  
NAMIBIA  
1 Rooivak St,  
Klomasdal  
Tel (00264) 61 211742  
Fax (00264) 61 212379  
E-mail: [eva@wvtc.edu.na](mailto:eva@wvtc.edu.na)  
Web:  
<http://www.wvtc.edu.na>

Ms Lovisa NN Mulwa  
WVTC – Mathematics Teacher  
P/Bag 13334  
Windhoek

Dear Ms Mulwa

**Re: Request for permission to conduct an Educational Research at the WVTC**

Kindly note: your request has been approved provided that:

- The WVTC will receive the basic information related to the said project upon completion.
- The trainees can be well informed via their TRC leadership president: Iyambula Nestor at Plumbing and Pipe fitting (PPF) or the secretary: Kasongo Ujivii at Office Administration (OA) or via class Captains / leaders.
- The trainees' study time is not to be compromised - activities may be organised on Fridays etc.

Yours Sincerely,

**Mr PM Hunkongo**  
Principal- Centre Manager

Cc: Mrs Nangulo - HOF

TEL: 61 211 742  
Fax: 61 212 379

Board of Directors: *Mr Nditshiri (Chairperson), Mr Anuly, Mr Dier, Mr Hets, / Sturm, Mr van der Merwe*  
All official correspondence must be addressed to the Principal

## **Appendix E: Letter accompanying questionnaire**

259 Copenhagen

Street

Otjomuise

Windhoek

04 July 2016

Dear WVTC Level 1 trainee

You are invited to participate in a research project aimed at investigating the general attitude of the Level 1 trainees of the Windhoek Vocational Training Centre towards Mathematics. The aim of this study to understand the various difficulties and cause thereof, that the Level 1 trainees encounter in their quest to learn Mathematics at the WVTC. Your input and feedback are therefore essential to the study.

Your participation in this research may entail audio-taped interviews and videotaped classroom observations. Your participation is voluntary. Should you be chosen to participate in an individual interview, confidentiality will be guaranteed and you may withdraw at any stage should you wish not to continue with the interviews.

If you are willing to participate in the research, please sign this letter as declaration of your consent; that is, that you participate in this study willingly and that you understand that you may withdraw at any time. Any information obtained from the conversations will be used solely for the purpose of this research.

Yours truly,

Lovisa Malwa

**Appendix F:** Fennema-Sherman Mathematics Attitude Scale

**Fennema-Sherman Mathematics Attitude Scale**

**Instructions**

Participant code:

... ..

1. Do not write your name on this paper
2. Please indicate the extends of your agreement with each statement by crossing (X) in the column for: **Strongly Agree, Agree, Disagree and Strongly Disagree.**

Statements	Strongly disagree	Disagree	Agree	Strongly Agree
1. I am sure that I can learn math.				
2. Math is hard for me.				
3. I don't think I could do advanced math.				
4. I am sure of myself when I do math.				
5. Math has been my worst subject.				
6. I'm not the type to do well in math.				
7. I think I could handle more difficult math.				
8. I'm no good in math.				
9. Most subjects I can handle OK, but I just can't do a good job with math.				
10. I am sure I could do complex work in math.				
11. I know I can do well in math.				
12. I can get good Grades in math.				
13. Math will not be important to me in my life's work.				
14. Knowing Mathematics will help me				

earn a living.				
15. I'll need Mathematics for my future work.				
16. I don't expect to use much math when I get out of school.				
17. Math is a worthwhile, necessary subject.				
18. Taking math is a waste of time.				
19. I will use Mathematics in many ways as an adult.				
20. I see Mathematics as something I won't use very often when I get out of high school				
21. I'll need a good understanding of math for my future work.				
22. Doing well in math is not important for my future.				
23. I study math because I know how useful it is.				
24. Math is not important for my life.				
25. I am interested to learn new things in Mathematics.				
26. I don't understand how some people can get so enthusiastic about doing math.				
27. I get a sense of satisfaction when I solve Mathematics problems				
28. Having to spend a lot of time on a math problem frustrates me				
29. I plan to take as much Mathematics as I can during my Education.				
30. I would like to avoid using Mathematics at WVTC				
31. I like to stick at a math problem until I				

get it out				
32. I can become completely fascinated doing math problems				
33. Learning Mathematics is enjoyable.				
34. If something about Mathematics puzzles me, I would rather be given the answer than have to work it out myself.				
35. The challenge of understanding math does not appeal to me.				
36. I wish to avoid taking on Mathematics during my education.				

## **Appendix G: Trainees' Number sense Test**

**University of Namibia**

**Faculty of Education**

**Number Sense test**

**Candidate number** \_\_\_\_\_

An assessment test to find out how much number sense does the Level 1 trainees at Windhoek Vocation Training Centre in Khomas Education Region have.

### **Instructions:**

- a) Circle the letter that carries the correct answer.
- b) Only one answer should be selected for each question.
- c) This Paper consists of Seven (7) pages including this one.

### **Question 1**

40% means:

- a) 4 out of every 100.
- b) 40 out of every 1000
- c) 4 out of 10
- d) 40 out of 10000

### **Question 2**

One quarter means:

- a) 1 out of every 4

- b) 1 out of every quarter
- c) 1 out of every 40
- d) 1 out of every 400

**Question 3**

Putting <, = or > in the box to make the statement  $\frac{9}{12}$  true.

- a) <
- b) >
- c) =
- d) None of the above

**Question 4**

Which statement is true about the number  $\frac{2}{5}$ ?

- a) Greater than
- b) The same as 2.5
- c) Equivalent to 0.4
- d) Less than

**Question 5**

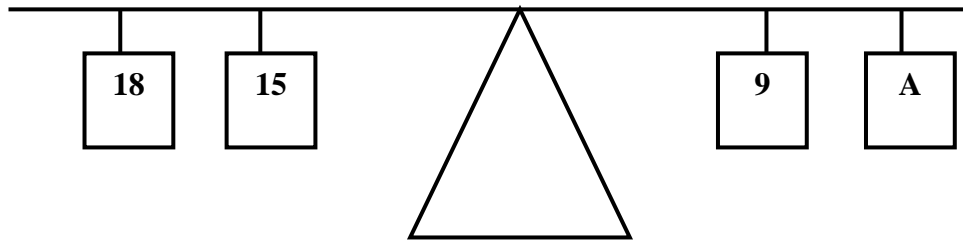
Which number is the best estimate of the shaded region of the block below?



- a) 0.65
- b) 0.45
- c) 0.75
- d) 5.0

**Question 6**

Circle the number that should be contained in box A below to balance the scale.



- a) 18
- b) 9
- c) 15
- d) 24

**Question 7**

Which sign should be inserted in the box to make the calculation true?

$$456 \div 8 \quad \square \quad 56 \times \frac{1}{8}$$

- a) <
- b) =
- c) >
- d) None of the above

**Question 8**

Which sign can be inserted in the boxes to make the statement true:  $25\% \square 0.025?$

- a) >
- b) =
- c) <
- d) None of the above

**Question 9**

Which letter shows the correct ascending order for:  $2.5; \frac{2}{5}; 2.5\%; 0.25?$

- a)  $2.5\%; \frac{2}{5}; 0.25; 2.5;$

b)  $2.5\%; \frac{2}{5}; 2.5; 0.25;$

c)  $2.5\%; 0.25; \frac{2}{5}; 2.5;$

d)  $0.25; \frac{2}{5}; 2.5; 2.5\%$

**Question 10**

For the calculation:  $16 \square = \square$  the number in the box must be.

a) Must be 0

b) Must be  $\frac{1}{15}$

c) Must be 1

d) Must be 15

**Question 11**

Which numbers should be in both boxes respectively to make the correct equation?

$$57.2 \times \square = 0.572 \div \square$$

e) 0.1 and 1

f) 0.1 and  $\frac{1}{10}$

g) 1 and  $\frac{1}{100}$

h)  $\frac{1}{100}$  and 0.1

**Question 12**

The calculation  $0.5 \times 840$  is the same as:

a)  $840 \div 2$

b)  $5 \times 840$

c)  $\frac{0}{5} \times 840$

d)  $0.5 \times 84$

**Question 13**

Circle the calculation which gives the largest answer:

a)  $\frac{3}{4} \times \frac{1}{100}$

b)  $\frac{3}{4} \div \frac{100}{1}$

c)  $\frac{30}{400} \div \frac{1}{10}$

d)  $\frac{30}{40} \times \frac{10}{1}$

**Question 14**

For the numbers  $\frac{3}{4}$ ;  $\frac{1}{2}$ ;  $\frac{1}{20}$  and  $\frac{3}{40}$  the largest difference is given by subtracting which two numbers?

a)  $\frac{3}{4} - \frac{1}{20}$

b)  $\frac{3}{4} - \frac{3}{40}$

c)  $\frac{1}{2} - \frac{1}{20}$

d)  $\frac{1}{2} - \frac{3}{40}$

**Question 15**

For the numbers:  $\frac{1}{10} \square 0.1 = 1$ , which arithmetic operation should go in the box?

a)  $\times$

b)  $+$

c)  $\div$

d)  $-$

**Question 16**

A child starts school in Namibia at the age of 6 years. About how many days has a child lived when she starts school?

- a) 200
- b) 2000
- c) 20 000
- d) 200 000

**Question 17**

Use  $930 \times 134 = 124\,620$  to find the answer to the calculation  $124\,620 \div 93$ .

- a) 13.4
- b) 1340
- c) 13400
- d) 134

**Question 18**

Each one of the five children in a class has exactly five sweets. Which calculation shows the correct total number of sweets?

- a)  $5 + 15$
- b)  $15 + 5$
- c)  $15 + 15 + 15 + 15 + 15$
- d)  $5 + 5 + 5 + 5 + 5$

**Question 19**

Simon has \$50 and spends \$ 29. He gets \$24 change. Which calculation can be used to check if he has the correct change?

- a)  $29 - 24$
- b)  $24 - 50$
- c)  $50 - 29$
- d)  $29 - 50$





**Question 20**

A shirt costing N\$ 120-00 was reduced by 12%. Which calculation can be used to find the price after the discount was issued.

- a)  $0.088 \times 120$
- b)  $\frac{88}{100} \% \times 120$
- c)  $0.88 \times 120$
- d)  $\frac{12}{100} \times 120$

**Question 21**

Which rectangle has a shaded area of about  $\frac{8}{15}$  ?

- a) 
- b) 
- c) 
- d) 

**Question 22**

Without calculating; which letter tells the correct estimation for the calculation  $29 \div 0.8$ ?

- a) Slightly less than 29
- b) Equal to 29
- c) Bigger than 29
- d) Impossible to tell without calculating

**Question 23**

Which decimal is approximately the size of the shaded area?



- a) 0.098
- b) 0.78
- c) 0.456
- d) 0.96

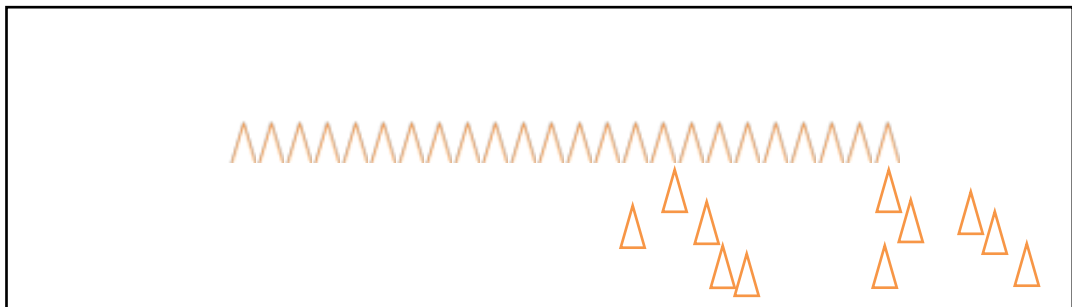
**Question 24**

Mary spent 90 % of her N\$ 426-00 on food. Circle the best estimate of how much money she will be left with.

- a) Less than 426
- b) Equal to 426
- c) Impossible to tell without calculating
- d) More than 426

**Question 25**

About how many triangles are enclosed in the rectangle below?



- a) 20 000
- b) 10
- c) 10 000

d) 50

**Appendix H: Trainees' consent form to take part in group discussions**

**CONSENT**

I agree to participate in the research entitled **“DIFFICULTIES THAT THE LEVEL ONE TRAINEES ENCOUNTER IN LEARNING MATHEMATICS: A CASE STUDY OF THE WINDHOEK VOCATIONAL TRAINING CENTRE”** as outlined in the consent letter.

Name .....

Signature .....

Date .....

## Appendix I: Trainees' Interview guide

### TRAINEES' INTERVIEW GUIDE

<p style="text-align: center;"><b>DIFFICULTIES THAT THE LEVEL ONE TRAINEES ENCOUNTER IN LEARNING MATHEMATICS: A CASE STUDY OF THE WINDHOEK VOCATIONAL CENTRE</b></p>
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**A. The views of the trainees on confidence on working and solving mathematical problems.**

1. Do you agree with the statement? "Mathematics is hard for me". Support your answer with a reason.
2. Are you always sure when completing/ tackling Mathematics work? Why do you say so?
3. Do you think you are very good in Mathematics? Give reasons for your answer.
4. Do you think you handle complex work in Mathematics? Support your respond with a reason.
5. Do you agree that you can get good Grades in Mathematics? Give reasons for your respond.

**B. Trainee's views on the usefulness of Mathematics at school and life of work.**

1. Do you agree with the statement "Mathematics a worthwhile, necessary subject"? Support your answer with a reason.

2. As a trainee at WVTC, do you think you need a good understating of Mathematics for your future work? Give a reason for your response.
3. Is studying Mathematics a waste of time? Motivate your answer.

**C. Trainee's views and perception on their attitude towards Mathematics as subject.**

1. Do you get any sense of satisfaction when solving mathematical problems?  
Why do you say so?
2. Do you agree with the statement "I wish to avoid taking on Mathematics during my education?"
3. I do not wish to take Mathematics as a subject Give reasons for your answer.
4. Are you excited by the challenge of understanding and doing Mathematics?  
Give reason for your answer.
5. What are your views on the statement? "If something in Mathematics puzzles me, I would rather choose to be given the answer than have to work it out myself". Give a reason for your answer.
6. Do you think Mathematics is enjoyable at all? Give reasons for answer.

**D. Suggestions to emolliate difficulties experienced in learning Mathematics.**

1. What can be done to make Mathematics easy for you to learn and understand?