

CHAPTER 3

MATHEMATICAL LEARNING

3.1. Introduction

This study focuses on the influence of academic self-confidence on mathematical learning. Therefore in this chapter factors that influence mathematical learning positively and negatively will be discussed. Barriers to mathematical learning will be dealt with in depth and known methods to overcome these barriers will be focused on. These aspects are crucial for this study as a better understanding of mathematical learning is vital.

3.2. What is Mathematics?

In order to understand mathematical learning it is important to establish first what the subject Mathematics entails. Dednam (2011:212) affirms that, as part of the basic survival process Mathematics has been part of mankind from the start of human existence (e.g. historically Mathematics was used when trading, counting, calculating the ancient Egyptian calendar, building and designing through the use of geometric shapes etc.).

Van de Walle (in Dednam, 2011:212) contends that Mathematics consists of three basic concepts, namely:

- it focuses on patterns and associations between different entities;
- it has its own unique language, which requires educators and learners to use and understand precise mathematical terminology. Furthermore, Rosner (in Dednam, 2011:212) explains that Mathematics can be seen as a language in which symbols are used; and

- it is a well-structured field of knowledge with unified, interconnected and co-dependent content and perspectives.

3.3. What is Mathematical Self-Confidence?

Since this study focuses on academic self-confidence it is also important to explain what mathematical self-confidence entails. Cretchley (2008:152) defines mathematical confidence as learners' belief about their own abilities to learn and do Mathematics. According to Barkatsas *et al.* (2008:564) and Cretchley (2008:148), mathematical confidence is learners' awareness of their personal capability to achieve good results as well as their belief in their ability to handle complicated mathematical problems. Self-confidence is an important influence on the choices learners make with regard to their mathematical learning; consequently it plays a role in their learning performances and success (Cretchley, 2008:147).

3.4. Mastering Mathematical Learning

Du Plessis *et al.* (2008:3) declare that a variety of dimensions contribute towards a learner's learning ability. These may include physical, cognitive, emotional, social and moral dimensions. However, since every learner is unique, they react in their own way to each learning situation, and consequently every learner learns differently.

Dednam (2011:211) points out that educators are not the only ones who must accept responsibility for guiding learners to master mathematical learning. In addition to the learners themselves, their peers and their parents should also be actively involved in guiding learners to effectively master mathematical learning, since each experience a learner embraces has the potential of

increasing the learners' mathematical knowledge and understanding.

According to du Plessis *et al.* (2008:15) mastering learning is not a passive process, but rather one in which learners should actively participate. To be able to do this, learners need to be confident in their ability to learn and should not rely on others to feed them knowledge. One learns by repeating something until one has mastered the ability to perform it with confidence.

3.5. Preconditions for Successful Mathematical Learning

According to Dednam (2011:214) there are five developmental levels learners should achieve in order to be successful in mathematical learning.

3.5.1. Content level

In this level of mathematical learning learners should be able to confidently count objects and do basic mathematical operations (e.g. addition, subtraction, multiplication and division).

3.5.2. Educational level

Learners should be able to relate mathematical ideas to real-life situations, and solve the mathematical problem on this level of mathematical learning.

3.5.3. Development level

This is the learners' intellectual development and ability to work with mathematical ideas with confidence. It also includes the learners' development of their mathematical knowledge.

3.5.4. Emotional level

For learners to perform satisfactorily in Mathematics, it is important for them to have a positive attitude towards Mathematics as a subject, as well as confidence to work with the different mathematical ideas and concepts.

3.5.5. Contextual level

During this level of mathematical learning, learners should be able to confidently apply and use mathematical ideas in their everyday life.

3.6. Development of Mathematical Learning

Mathematical development starts at a concrete level and advances through a semi-concrete level to an abstract level of knowledge (Dednam, 2011:215). Jordan and Levine (2009:60) declare that the development of mathematical learning can be influenced by a learner's social and emotional experiences.

In the following paragraphs key elements for the successful development of mathematical learning will be discussed:

3.6.1. Two key elements for basic Mathematics skills

According to Jordan and Levine (2009:61) mathematical development starts during the infant stages of a learner's life. The development of the basic mathematical skills can be divided into two key elements:

3.6.1.1. Primary preverbal number knowledge

Jordan, Glutting and Ramineni (2010) as well as Jordan and Levine, (2009:61) affirm that learners' sense of numbers forms well before they enter school. Preverbal number knowledge develops with little to no verbal instructions, and forms during the early infant stage. As infants, learners' sense of numbers develops as they symbolize small quantities of numbers with their toys. According to some developmental theories (Jordan & Levine, 2009:61) infants have a natural ability for symbolizing numbers in a nonverbal manner; they experience Mathematics and therefore have confidence in their understanding thereof. Preverbal number skills form the foundation for the development of the secondary verbal number knowledge (Jordan & Levine, 2009:61; Jordan *et al.*, 2010)

3.6.1.2. Secondary verbal or symbolic number knowledge

Jordan *et al.* (2010) affirm that when learners start to understand verbal and symbolic number skills, they learn the importance of the numeric order of numbers and their values. During this phase, learners start verbalizing mathematical ideas by means of counting, explaining their knowledge of numbers, verbalizing arithmetic calculations and expressing concerns for what they do not understand. Some learners become unsure of themselves and a lack of self-confidence emerges (Jordan & Levine, 2009:61).

3.6.2. Four stages to grasp Mathematics

Dednam (2011:216) describes four stages through which a learner will need to advance before fully grasping a new mathematical idea; thus effecting successful learning and using the new concept. These stages are:

- Stage 1: When learners are first faced with a new mathematical idea it can be very vague and unanalysed; they may feel slightly confused by the new concept.
- Stage 2: Learners then do a variety of similar examples, therefore they experience the method used to solve the mathematical problem, and their confidence and understanding of the idea improves.
- Stage 3: Learners explore the new mathematical idea thoroughly, and gain a better understanding of the idea. Learners feel confident to try more challenging ideas
- Stage 4: The learners grasp the main idea entirely, and can describe the new mathematical idea in the correct mathematical terminology with confidence.

Dednam (2011:217) affirms that learners with barriers to mathematical learning tend to have a lack of confidence and tend to form a mental block regarding new mathematical ideas. Consequently they tend to struggle through subsequent similar examples. In most cases these learners do not even reach stage three where they will have enough confidence to explore the concept sufficiently to grasp a full understanding thereof (Dednam, 2011:217).

3.7. Gender Differences in Mathematics

In research conducted by Nuttall and Pezaris (2001:28) only a few cases of gender differences in Mathematics could be found in foundation and early intermediate phase (Grade R-Gr.7). However, there is a shift in mathematical capabilities during the later stage of the intermediate phase (Grade 8 onwards). During this stage males gain a minor advantage in Mathematics over females. This may be because Algebra and Geometry are introduced in the mathematical subject during the grade 8 year.

The largest differences can be found in areas using high-level cognitive skills, where males show a stronger aptitude towards mathematical areas in which visualization benefits problem solving. These areas include:

- Geometry,
- Measurement
- Estimations
- Word problems, and
- Proportional thinking

Carr and Jessup (in Nuttal & Pezaris, 2001:29) found that female learners use concrete manipulation to solve basic mathematical problems, while males on the other hand use mental interpretations and manipulation of numbers as well as retrieval strategies for solving the same basic mathematical problems. Males tend to use more abstract thinking strategies that reflects their conceptual understanding, making them better at applying their mathematical knowledge to more complicated problems, where females would rather use more concrete solution strategies which include modelling and counting (Nuttall & Pezsaris, 2001:29).

3.8. Motivation and Mathematical Learning

According to Boekaerst (1997:5) research in Educational Psychology found that motivation and effort have a large effect on learners' abilities to learn Mathematics and subsequently perform well and achieve success. Motivation, according to researchers, can be considered to take place in three stages, namely (Boekaest, 1997:6):

- The Superordinate Stage: Motivation can be seen as a major activity in a learner's daily life. A learner that is not motivated today may be motivated tomorrow and vice

versa. It is also important to remember that the level of motivation can also differ from time to time.

- The Middle Stage: Motivation within certain subjects depends on the learners' beliefs and attitudes towards this subject). Learners who "love" and enjoy a subject, such as Mathematics, will most probably be highly motivated to work hard in the subject in order to learn effectively. On the other hand, learners who find Mathematics difficult and "hate" the subject will find it hard to stay motivated to work hard at it.
- Momentary Stage: This stage of motivation corresponds with the quality of personal experiences within the learning process. This means that learners' level of motivation can change while completing a task, depending on how they experience it. E.g. if learners find a task extremely difficult it may cause their motivation and confidence levels to drop, whereas an easier task may have the opposite reaction.

3.9. Resilience during Mathematical Learning

Johnston-Wilder and Lee (2010:38) define resilience as learners' capability to rise above difficulty. Therefore mathematically resilient learners will learn Mathematics more successfully. This is because these learners expect to find mathematical problems difficult at first, but will apply various strategies in order to solve these problems instead of fearing failure before attempting a problem. This means that mathematical resilient learners will demonstrate more self-confidence in their own abilities to successfully solve mathematical problems. Building mathematical resilience proves to be more difficult in mathematical learning than in various other subjects. Mathematically resilient learners believe that hard work will help them in becoming better problem

solvers. Dweck (in Johnston-Wilder & Lee, 2010:40) states that these learners “develop a ‘growth mind-set’”, and their ability to reason and question mathematical ideas will enhance an effective learning process. Most learners fear that asking questions will make them look stupid in front of their peers and the educator, where mathematically resilient learners will see the importance of asking questions and discovering various solutions to the problems they may face (Johnston-Wilder & Lee, 2010:38).

Donald *et al.* (2002:223) state that a number of cognitive and personality characteristics appear to help learners recover from a negative setback, such as failing Mathematics. This could be a quick or a slow process the learner struggles with. Resilience is a two-dimensional concept; the first, being experience of hardship and the second, a positive attitude towards that hardship (Johnston-Wilder & Lee, 2010:38). Emotional resilience enables a learner to know how to refrain from getting irritated, depressed or stressed about Mathematics being difficult even before starting to solve a problem: therefore retaining a positive attitude concerning their ability to learn Mathematics. This enables a learner to calm down and think logically (Bernard, 2006:108).

Donald *et al.* (2002:223) affirm that cognitive and personality characteristics include:

- Effective communication and problem-solving skills. These skills help learners to express themselves, helps them overcome problems and to avoid the feeling of helplessness and vulnerability.
- Self-confidence. This implies the way learners think about themselves and their abilities. This includes what they regard as their good or bad abilities, as well as the way they affiliate themselves with these abilities.

- Self-worth. This characteristic points to learners' sense of their own value. When learners feel good about themselves, they will be able to engage positively with others and their work.
- Internal locus of control is linked to a sense of hope and future-directed goals. By having a feeling of control, it becomes possible for a learner to have hope and set personal goals.

3.10. Difficulties in Learning Mathematics

Mazzocco (2009:2) asserts that mathematical learning difficulties can even manifest in learners with the cognitive skills to learn Mathematics successfully, because these learners are influenced by various other aspects causing learning difficulty in Mathematics. Some of these aspects include poor teaching, Maths anxiety and a lack of academic confidence.

Bernard's (2006:110) research showed that learners with learning disabilities, including barriers to mathematical learning, have a lower academic confidence level than learners with no disabilities. Difficulties in learning Mathematics can be caused by internal factors, external factors and parental beliefs (Dednam, 2011:217):

3.10.1. Internal factors

There is a rich array of possible internal difficulties learners can face which could cause a barrier to learning Mathematics successfully. According to Dednam (2011:219) and Bernard (2006:108) these internal factors are the following:

3.10.1.1. Learning problems

Some learners find it difficult to think in an abstract and symbolic manner. They tend to find it very difficult to find relationships and see patterns between numbers and objects. Learners may also have poor reading and comprehension skills. Their reading difficulty causes difficulty when reading and understanding mathematical problems, such as word sums. These learning problems cause further barriers in mathematical learning (Dednam, 2011:219).

3.10.1.2. Lack of self-confidence

Confidence means that learners will recognize that they can be successful in their ability to learn Mathematics. This in turn will limit their fear of making mistakes. Learners with a lack of self-confidence will avoid doing Mathematics at all, because they do not want to make mistakes. These learners truly believe that they cannot do Mathematics and therefore don't even try as it seems impossible to them. This can cause learners to get stuck in the first stage (*cf.* 3.6.2) of mathematical learning development (Bernard, 2006:108).

According to Donald *et al.* (2002:13), mastering learning has immense value in developing a sense of success and confidence and it has particular value with learners who are faced with barriers to mathematical learning. Berry (2008:44) asserts that learners' desire to gain positive and/or negative opinions, leads to different behaviour patterns that depend on the learners' present level of self-confidence. When learners have high levels of self-confidence in their own mathematical abilities, they will tend to be more goal-orientated and driven to seek challenges to expand these mathematical abilities, which in turn will expand and further their success in their mathematical achievement. If learners have

a low level of self-confidence, they will tend to fear their own abilities which, combined with the fear of failing, will lead to a negative judgment and a sense of feeling hopeless. These learners will not seek mathematical challenges because of their fear of making mistakes or failing, and therefore their mathematical abilities will not be expanded (Berry, 2008:44).

Dednam (2011:215) affirms that higher cognitive skills are needed to successfully learn Mathematics, especially during the higher grades in schools where mathematical problems become more complicated. Basic mathematical knowledge is not enough to solve complicated mathematical problems. In order to solve these problems learners should be aware of their own knowledge and comprehension of mathematical methods and theories, which enables learners to choose the correct methods for solving mathematical problems and helps them to monitor the process and reflect on the results. In short, this process is known as meta-cognition (*cf.* 2.8).

This study will specifically focus on the above-mentioned aspect of academic self-confidence (see Chapter two).

3.10.1.3. Mathematics anxiety

Johnston-Wilder and Lee (2010:39) state that anxiety towards Mathematics is a feeling of tension which hinders learners' ability to manipulate numbers and solve mathematical problems. Learners are afraid of making mistakes and failing, and when they don't have self-confidence in their mathematical abilities, this fear increases to anxiety (Boekaerst, 1997:6; Weiten, 2004:497; Dednam, 2011:219).

3.10.1.4. Negative attitudes towards Mathematics

Learners with a negative emotional outlook towards Mathematics can be described as learners who have negative attitudes towards the subject. A variety of emotional problems can manifest within these learner that cause barriers to learning Mathematics. When learners have a negative attitude towards Mathematics, and poor mathematical self-confidence, they tend to suffer from anxiety in Mathematics. As a result these learners will try to completely avoid doing Mathematics, which increases their poor learning abilities in Mathematics. These learners convince themselves that they do not need to do Mathematics; therefore they stop paying attention during classes (Dednam, 2011:219; Zan & Martino, 2007:159).

3.10.1.5. Passivity

Learners lose interest because of their lack of confidence and therefore refuse to actively participate in their mathematical learning process (Dednam, 2011:219). Furthermore, Bernard (2006:108) warns that learners need to have determination to keep trying and to refrain from giving up and becoming passive when Mathematics may seem difficult or boring. They need to believe that they can do it, and therefore should put in more work and effort.

3.10.1.6. Attention deficit disorders

Attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD) cause learners to have a shortened attention span. This causes difficulty when learning Mathematics, as many of these learners struggle to follow instructions and complete learning activities (Dednam, 2011:219).

3.10.2. External factors

External barriers are difficulties caused by factors such as the educator, school and environment. These factors tend to shape or limit the learners in achieving success in Mathematics. According to Dednam (2011:217) as well as Lamb and Fullarton (2001:2) some of these external barriers include:

3.10.2.1. Absenteeism and illness

Being absent from school, as a result of illness or otherwise, causes learners to fall behind in their schoolwork, including Mathematics. They may miss out on some basic mathematical concepts used in a variety of mathematical problems, which in turn causes further difficulty when solving problems. If the missed work is never caught up, these learners suffer continuous difficulties in Mathematics as most concepts are built on prior knowledge and this causes a vicious “snowball” effect where the problem and difficulty worsen.

3.10.2.2. Educators and poor teaching

There are many educators who teach Mathematics poorly and this causes barriers to learning Mathematics. Some educators assume that all learners understand the basic mathematical concepts taught in previous grades, which is often not true. Another fundamental error some educators make is to leave learners to “explore” and “discover” new mathematical ideas before explaining these concepts to the learners. Good and poor teaching strategies will be discussed further in paragraph 3.11.

3.10.2.3. Parental beliefs

Parental beliefs, especially if negative, may cause their children to experience difficulties in Mathematics. These negative and false beliefs include (Dednam, 2011: 220; Pritchard, s.a.:478):

3.10.2.3.1. High demands ensure success

Obsessive parental concern over their child's performance within a subject like Mathematics could result in an unpleasant learning environment that leads to difficulty when learning Mathematics (Pritchard, s.a.:478). High demands from parents may cause mathematical anxiety if the learner is experiencing difficulties in this subject, as they do not want to disappoint their parents.

3.10.2.3.2. Lack of interest in Mathematics

Learners whose parents show a lack of interest in the importance of Mathematics may share their beliefs. Many of these parents have negative feelings towards Mathematics because they themselves struggled to cope with the subject in school; therefore they believe their children will probably find it difficult as well. Often these learners will also indicate the same lack of interest, and will believe that because their parents could not do it they do not need to try their best to cope with Mathematics and this will cause barriers to learning Mathematics.

3.10.2.3.3. Taking over the teaching process

Some parents feel they can teach their children better methods to solve certain problems. This, however, may prove to hinder the learners' learning process instead of helping them. It is because the different methods may confuse the learner and therefore make the concepts and processes difficult to comprehend.

3.11. Teaching strategies in Mathematics

According to Kyriacou (2005:168), the challenge facing educators teaching Mathematics is to encourage learners to make the best start in the development of their own Mathematical comprehension and knowledge by building up these learners' mathematical self-confidence in themselves. This is because there is an important link between mathematical confidence and mathematical abilities. Teaching Mathematics well and creatively is a very important factor that influences the successful learning of Mathematics.

3.11.1. Good teaching strategies

Johnston-Wilder and Lee (2010:41) state that good teaching practice includes various opportunities set for learners to solve problems and engage in their own learning process. Educators can do this in various ways:

3.11.1.1. Communication

Kyriacou (2005:179) affirms the important influence educators have on learners' mathematical confidence, especially when it comes to communication. Educators need to remember that the subject, Mathematics, uses a unique language, where the mathematical terminology and vocabulary should be explained thoroughly in order for the learner to comprehend new mathematical ideas and develop confidence to successfully use their mathematical knowledge. Educators need to encourage learners to actively take part in classroom discussions. The importance of the correct mathematical language should be emphasized. Educators must spend some time explaining and discussing new terminology so that all learners can understand and use this unique language effectively. Furthermore, Johnston-Wilder and Lee (2010:41) advise that learners should also be

encouraged to not only discuss mathematical problems within the class, but also discuss difficult problems with their peers outside the classroom. By doing this, learners can help each other in solving more complex problems together if they feel the need to do so.

3.11.1.2. Logical thinking

Educators should encourage learners to think in a logical manner and apply their mathematical skills and knowledge when they learn Mathematics and attempt to solve problems. Learners should also be motivated to constantly strive to enhance their understanding of more complex problems and explore various techniques and strategies to solve these problems.

3.11.1.3. Reflection is key

A good teaching strategy is to teach learners to always reflect on their work, since reflection instils good meta-cognitive skills. To enable learners to think critically about their solutions they need to reflect on and judge the reasonableness of their answer to a problem. This will in turn enhance their cognitive development and learning.

3.11.1.4. Importance of asking questions

To motivate learners to constantly ask questions, educators must always be open and friendly. Learners who are afraid of asking questions in front of their peers in class can come afterwards and ask in person. This is important because if a learner does not ask questions when they do not understand a concept this can have a “snowball effect” on future mathematical concepts, as prior knowledge in Mathematics is of the utmost importance.

3.11.1.5. Parental involvement

Parents should be actively involved in the learners' learning process and help the educator to instil a positive attitude towards Mathematics.

3.11.1.6. Continuous support

Educators should offer continuous support to learners this can be done by means of extra lessons and additional one on one attention for those who need some extra attention to enhance their mathematical understandings and abilities. Educators can also give expanded opportunities to improve their understanding of new mathematical concepts through means of extra time to complete a task and/or additional worksheets about these concepts.

3.11.1.7. Subject knowledge

. It is undeniable that an educator's subject knowledge influences the quality of their teaching ability as well as their ability to connect with and respond to learners' difficulties (Kyriacou, 2005:180). Educators with good subject knowledge will be able to effectively support the development of a learner's mathematical self-confidence. Miller (2003) asserts that educators should teach learners to understand mathematical knowledge and procedures, and not only memorize the steps of how to do Mathematics.

3.11.2. Poor teaching strategies

Teaching Mathematics may prove difficult for many educators. Johnston-Wilder and Lee (2010:39) list some commonly made mistakes in the teaching of Mathematics which in turn leads to problems in learning Mathematics successfully:

3.11.2.1. No relation to real life

Educators, who teach Mathematics, often fail to help learners make links between real life situations and mathematical problems. This may be because these educators themselves do not know what these links are, consequently they just ignore it. Learners are told that Mathematics is very important but they do not understand why that is, as they don't see the link to Mathematics in their future endeavours. Glencoe (2005) affirms that learners can comprehend Mathematics better if they see the value and relevance thereof in real-life.

3.11.2.2. Over emphasis on speed

Educators would prefer learners to all respond as fast as they possibly can. However, it is important to remember that all learners are individuals and have individual abilities. Many Mathematics educators over-emphasize the importance of speed calculations in Mathematics (e.g. in the intermediate phase a table test will be given and learners will only be allowed a certain amount of time to complete the test). The problem with this is that not all learners have the capability of responding as quickly as others. This means that these learners' mathematical thinking is undermined, because they fail to do well in these speed tests. The fact that these learners struggle to respond as quickly and succeed with these speed tests does not necessarily mean that they do not understand the work, or that they cannot solve the problems. In spite of this, learners are penalized for being slower. Often this will result in a fear for these speed tests and more often than not also a fear for Mathematics as a subject, which results in Maths anxiety, causing learners to create a mental block towards Mathematics.

3.11.2.3. “Careless” mistakes

Mistakes made in Mathematics are often referred to by educators as carelessness, silliness or stupidity. It is important for educators to remember that there are many new concepts and rules for learners to learn when doing Mathematics, which means that mistakes are bound to happen. Making mistakes, however, is part of the learning process and therefore educators must not emphasize that making mistakes is “stupid” or silly; these are stepping stones to successful learning as mistakes can be learned from.

3.11.2.4. One way to solve a problem

Many educators make the mistake of teaching Mathematics as if there is only one way for solving a problem (Johnston-Wilder and Lee, 2010:39). The truth of the matter is that in Mathematics there are many possible solutions to one problem. Not all learners will look at a single problem from the same angle as the educator, which will probably lead them to a different solution; it does not mean that the learners are wrong for following a different route and should rather be commended for the fact that they can see different ways for solving the problem.

3.11.3. Conclusion

Johnston-Wilder and Lee (2010:41) are of the opinion that good teaching strategies will foster a positive attitude towards mathematical learning. On the other hand, poor teaching strategies add to learners’ fear of Mathematics and poor learning abilities. Therefore it is important for educators to adjust their teaching styles and compensate for poor teaching strategies by making sure they are not guilty of adding to a learner’s anxiety for Mathematics.

3.12. Misconceptions in Mathematics

According to Anon (2011), barriers to mathematical learning are often caused by false beliefs about Mathematics and learners' own abilities. These false beliefs, better known as myths, also influence learners' self-confidence and the efforts to succeed in Mathematics.

Mathematics is considered to be an abstract, general and absolute subject with a unique language. One universal myth in Mathematics is that the subject is a purposeless and culture-free discipline. This falsehood may pose a barrier to learners when constructing mathematical concepts and knowledge. Mathematics is an objective-driven subject in which problems are solved (Kantner, 2008:3).

According to Anon (2011), the belief that only "smart" learners are good in Mathematics is untrue, since there is no proof that certain skills are better than other skills. It is important to remember that not all learners are the same and that not all learners have the same abilities or aptitudes. Another myth is that learners who do well in Mathematics never find Mathematics problems difficult. The truth is that some Mathematics problems are not easy or quick to solve and may take time, patience and determination (Anon, 2011). Whether or not learners solve a problem quickly makes no difference in their ability to do Mathematics. Being good at Mathematics comes from experience and practice (Anon, 2011). Learners also foster a false belief that one cannot study for Mathematics. However, experiencing, practising and solving various problems enhance mathematical learning and the understanding thereof.

The belief that good memory also has an influence on mastering the ability to learn Mathematics is untrue (Anon, 2011).

Successfully learning Mathematics does not require a learner to have an outstanding memory, but rather an understanding of the concepts, rules, formulae and methods. Therefore it also makes no difference in learners' ability to do Mathematics if they use certain tools to help them solve mathematical problems (e.g. matric learners using formulae sheets in their final exam, learners using calculators to solve advanced arithmetic problems, foundation phase learners counting on their fingers when adding small numbers etc.).

3.13. General Conclusion

In this chapter it was emphasised that mathematical confidence is a learner's belief in their own abilities to be successful in solving mathematical problems (Barkatsas *et al.*, 2008:564, Cretchley, 2008:148). A wide variety of aspects influence a learner's ability to learn Mathematics successfully. There are also many beliefs and myths regarding learners' abilities to do and learn Mathematics. Factors that influence learners' ability to be successful in Mathematics include their confidence in their own abilities and willingness to work hard to achieve success. The truth of the matter is that Mathematics is not a subject to be taken lightly, since it takes a huge amount of practice to successfully learn and do Mathematics.

In the next chapter the research methodology will be discussed