CHAPTER ONE

INTRODUCTION

1.1 ORIENTATION TO THE CHAPTER

This introductory chapter includes a discussion on declining enrolments in science-related courses and the low uptake of science-related careers worldwide, including South Africa. This is followed by a discussion on young people's loss of interest and poor performance in science subjects as possible determinants of reduced enrolments in science programmes at tertiary level. Further, the effects of traditional and context-based teaching approaches on learner performance are discussed. Thereafter, the problem of the study and consequent research questions and hypotheses are presented. The chapter is concluded with a discussion of the significance and delimitations of the study.

1.2 INTRODUCTION TO THE STUDY

In recent years, one of the most discernible trends in science education worldwide has been the declining numbers of young people taking science-related courses and pursuing science-related careers (Centre for Education and Industry (CEI), 2009; Economic and Social Research Council (ESRC), 2008; European Industrial Research Management Association (EIRMA), 2009; Jenkins & Pell, 2006; The Institute of Engineering and Technology (IET), 2008). To this effect, research findings (Barmby, Kind & Jones, 2008; Jenkins, 2006; Jenkins & Nelson, 2005; Osborne, Simon & Collins, 2003; Sjøberg & Schreiner, 2005) have shown an alarming global decline in young people's interest in the study of science and the consequent uptake of science-related careers. It appears that the youth are losing interest in the pursuance of science.

South Africa has not been an exception to the problem of declining enrolments in science-related courses. For example, in comparison with non-science fields such as business and management, humanities and social sciences, the enrolment of South African learners in science, engineering and technology (SET) in public higher education institutions has been consistently lower over the past decade (Figure 1.1).

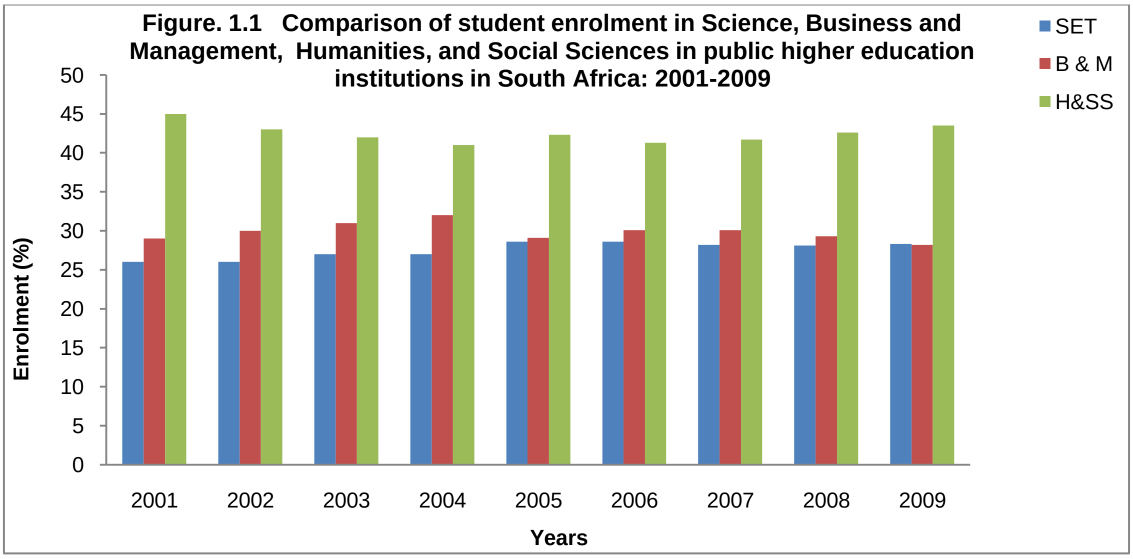


Figure. 1.1 Comparison of student enrolment in Science, Business and Management, Humanities, and Social Sciences in public higher education institutions in South Africa: 2001-2009

Key: SET = Science, Engineering and Technology B&M = Business and Management
H&SS = Humanities and Social Sciences, including Education
Source: Data obtained from DoE; Education Statistics 2000–2009:

Low enrolment rates in science-related courses have resulted in the scarcity of personnel in related careers in South Africa. This shortage has been acknowledged in several reports, such as those published by the Human Sciences Research Council (HSRC, 2009). These reports show that the skills of medical practitioners and nurses, engineers and technicians, biotechnologists, and information and communication technology professionals are in short supply. Other publications, including reports by the Department of Home Affairs (DHA, 2006) and the Department of Labour (DoL, 2005), list the skills of science and engineering professionals, science and mathematics educators, health and medical science professionals, and agricultural scientists as critically scarce in South Africa.

In comparison with other countries, South Africa’s ratio of scientists and engineers to the population stands at 3.3 per 1000, compared with 21.5 per 1000 and 71.1 per 1000 in the US and Japan respectively (National Research Foundation [NRF] Annual Report, 2005). It would appear that South Africa is among the countries where the youth are increasingly losing interest in pursuing science-related professions. In the South African context, a review of the literature on the uptake of science-related courses seems to show a racial trend. For example, a report by the Small Business Project (SBP, 2011) shows that black learners in South Africa are under-represented in the Science, Engineering and Technology (SET) field of study, as shown in the table below.

Table 1.1 Enrolments in SET studies at higher education institutions by race (2008).

Race	% of the SA population	% of total enrolments in SET
Black	79.2	64.5
Coloured	9.0	5.9
Indian	2.6	6.9
White	9.2	23.1
Total	100	100

Source: SBP report, 14 February 2011 (adapted from HEMIS database and StatsSA, mid-year population estimate, 2008).

Table 1.1 shows that the white population, who made up approximately 9.2% of the total population in South Africa, had 23.1% of SET undergraduate enrolments in 2008, whereas black people, who consisted of about 79.2% of the population, constituted 64.5% of enrolments in SET in the same year. Racial discrepancies in SET enrolments in South Africa have persisted over several years (Department of Education: DoE - education statistics 2000–2009). The challenge of low enrolment rates in science-oriented courses and professions among the black population is one that needs urgent attention. It was therefore deemed necessary in this study to focus on the performance and interest of learners in peri-urban (township) schools where the population predominantly comprises of black people.

Since science has become a fundamental factor in national social and economic progress, low uptake of science subjects and careers is likely to impact negatively on the quality and quantity of scientific research, and national economic development (ESRC, 2008; European Commission (EC), 2007) in developing countries, including South Africa. Science education is seen as a means of producing the scientists and scientifically literate citizenry (Sjøberg & Schreiner, 2005) required for an improved economy and liberation from social ills such as poverty, crime and disease. School science serves as the foundation not only for access to science-oriented courses at tertiary education, but also for the production of skilled personnel in science-related professions, and the creation of scientifically literate citizenry (Centre for Development and Enterprise (CDE), 2010). Unfortunately, school science seems to have failed to excite and attract many learners or enhance their performance in science subjects, and hence has led to a decline in young people's pursuit of science oriented careers. The subsequent section reviews the performance of South African learners in science.

1.2.1 The performance of South African learners in science subjects

A review of the literature shows that the performance of South African learners in local and international assessments in science subjects has been abysmal for several years. For example, the performance of South African primary and high (secondary) school learners in international science and mathematics assessments has been much lower than international average scores in three successive appraisals (Trends in International Mathematics and Science Study - TIMSS reports 1995, 1999, & 2003: Beaton, Martin, Mullis, Gonzalez, Kelly & Smith, 1996; Gonzalez, Guzmán, Partelow, Pahlke, David, Kastberg & Williams, 2004; Mullis, Martin, Fierros, Goldberg, & Stemler, 2000; Reddy, 2006). See table 1.2.

Table. 1.2 TIMSS Average Achievements per Science Content Area (1995, 1999 and 2003)

Year	International average scores	South Africa average scores per science content areas				
		Life science	Earth science	Physics	Chemistry	Environmental science
1995*[1]	56 %	27%	26%	27%	26%	26%
1999*[2]	488	289	248	308	350	350
2003*[2]	474	250	247	244	285	261

*[1] Data reported as average percentage scores. *[2] Data reported as average scale scores

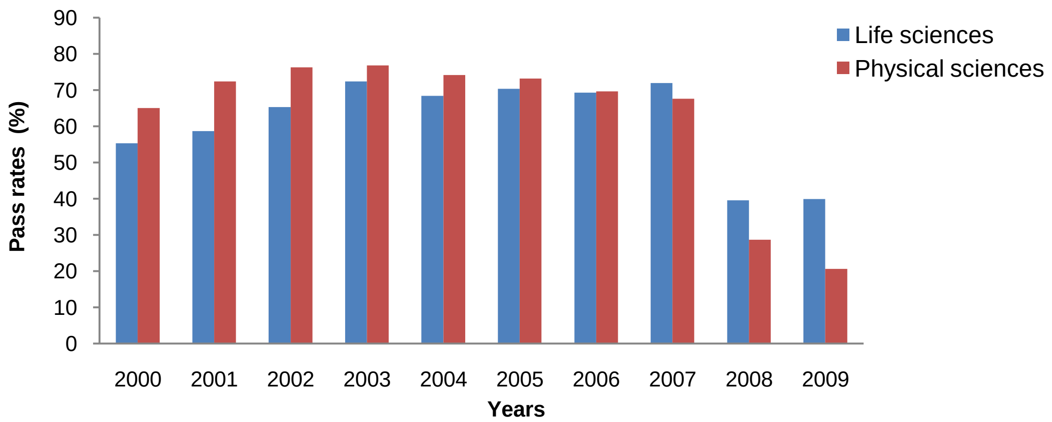
Source: 1995 data - IEA Third International Mathematics and Science Study – TIMSS 1994/95
1999 data - IEA Third International Mathematics and Science Study – TIMSS 1998/99
2003 data - IEA Trends in International Mathematics and Science Study – TIMSS 2003

Table (1.2) shows a comparison of international and South African average scores in three consecutive TIMSS assessment studies (TIMSS 1995, 1999, & 2003: Beaton, et al., 1996; Gonzalez, et al., 2004; Mullis, et al., 2000). In 1995, TIMSS average scores were reported as percentages, whereas in 1999 and 2003, the average scores were reported as scale scores. The international averages for each science content area are scaled to a single figure (the same as the overall international average), as shown in table 1.2. Data from TIMSS reports placed South Africa at the bottom of the participating countries, including African countries such as Morocco, Tunisia, Egypt, Botswana and Ghana, in all the three appraisals.

South African learners' poor performance in science subjects is also evident in the school-leaving National Senior Certificate (NSC) examination results, which, as shown in figure 1.2, have been consistently poor for the decade 2000 to 2009. Figure 1.2 shows a general decline in pass rates in life and physical sciences from

2003 to 2007, with lower pass rates in life sciences. It also shows a dramatic decline in pass rates for the years 2008 and 2009, with pass rates in physical sciences dropping even more significantly.

Figure. 1.2 Pass rates in life sciences and physical sciences, in national senior certificate examinations: 2000-2009



Source: Data from DoE statistics 2000–2009

Pass rates, in figure 1.2, were based on higher grade results in the senior certificate examinations for the years 2000 to 2007. For 2008 and 2009, pass rates were based on an achievement of at least 40% in the new national senior certificate examination whose grading system was different from the previous one. These pass rates were approximations of the basic requirements for entry into science-related programmes at tertiary level. For instance, the minimum entry requirement for science programmes at most universities in South Africa is 50% (Faculty of Natural and Agricultural Sciences, 2010). Therefore access rates into science-oriented programmes at tertiary institutions in South Africa are likely to be much lower than estimated by the above pass rates.

Generally, life sciences have always been assumed to be softer and thus easier sciences for learners to comprehend than physical sciences. However, in the South African context, achievement in life sciences has been as poor as, if not worse than that in physical sciences. For instance, figure 1.2 shows that from 2000 to 2006, the performance of learners in life sciences has been consistently poorer than that in physical science (DoE statistics 2000–2009). Life sciences are becoming increasingly important in understanding prevalent socio-scientific issues, such as

HIV/AIDS, teenage pregnancies, environmental sustainability, pollution, food production, stem cell technology, and genetic engineering. It is therefore important, through meaningful learning of life sciences at school level, that learners are empowered to relate effectively to these issues, and take up life science professions. This study was an attempt to explore ways of achieving better results in life sciences.

The poor level of achievement in life sciences seems to derive, among other things, from specific topics that are considered difficult for educators to teach and for learners to learn. For instance, genetics has been cited by many researchers (Abimbola, 1998; Araz & Sungur, 2007; Dairianathan & Subramaniam, 2011; Furberg & Arnseth, 2009; Kindfield, 1991; Knight & Smith, 2010; Topçu & Sahin-Pekmez, 2009; Tsui & Treagust, 2004, 2007, 2009; Venville & Dawson, 2010) as one of the most difficult topics in life sciences. Genetics concepts and applications are important for understanding other topics in life sciences (for example evolution, animal and plant diversity, and reproduction). Failure to understand genetics is therefore likely to adversely affect overall achievement in life sciences. In this study, an investigation of learner performance in genetics was thus deemed necessary.

In regard to the study of genetics, a review of literature (Dogru-Atay & Tekkaya, 2008; Ibanez-Orcajo & Martinez-Aznar, 2005; Lewis & Kattman, 2004) shows that misconceptions about genetics concepts, domain-specific vocabulary and terminology in genetics, the nature of genetics problems (which require application and reasoning skills), and perceived irrelevance of the study of genetics to learners' daily lives are considered to be determinants of the supposed difficulty of this topic. The factors that may account for the difficulty of genetics in particular and science in general are complex and multifaceted. These factors include both educational and non-educational issues such as infrastructures, teaching and learning resources, quality of educators, instructional approaches, gender, learners' cognitive preferences, learners' attitudes, and influences from role models such as parents, educators and peers (IET, 2008, Mji & Makgatho, 2006). In this study, the focus is on instructional approaches because they seem to play a significant role in learners' comprehension of study materials and the subsequent performance in science. For example, a study conducted by Mji and Makgatho (2006) in South Africa showed that teaching strategies were among the determinants of poor performance in science at high school. Similarly, poor performance in genetics could be a consequence of the instructional approaches that are usually employed by educators to teach the topic. The subsequent section discusses the relationship between the approaches used by educators to teach science, including genetics, and learner performance.

1.2.2 Science teaching and performance in science

Various studies (King, 2007; Kyle, 2006; Onwu, 2000, 2009; Schwartz, 2006; EC, 2007; and Van Aalsvoort, 2004) suggest that the way that science subjects are taught in schools and the learning environment could be major determinants of learner performance. In recent times, the manner in which school science is taught seems to bring about what has been variously described as ‘a crisis of relevance’ and ‘a crisis of misalignment’ – science education failing to be relevant in meeting the needs of learners and society in a rapidly changing world (Onwu, 2009; Onwu & Kyle, 2011). Consequently, science is perceived by many learners as an abstract and irrelevant subject (Lyons, 2006), and they therefore feel alienated by it (Carter, 2008; Stears, Malcolm, & Kowlas, 2003).

Several reports and studies (Anderson, 2006; CEI, 2009; EIRMA, 2009; IET, 2008; Jenkins & Pell, 2006; Schayegh, 2007; and Schreiner & Sjøberg, 2004) indicate that learners regard the study of science, including life sciences, as particularly difficult, uninteresting and having no bearing on their aspirations. In South Africa, for example, learners not only perceive some life sciences topics as difficult, but they see the life science curriculum as overloaded and mostly divorced from learners’ daily life experiences (De Jager, 2000). For instance, Ferreira (2004) found that the majority of the learners who were surveyed, irrespective of gender or school type, agreed with a questionnaire statement that the life sciences learning programme contains too much information that has to be memorised.

In sum, various researchers (Holbrook, 2005; Onwu, 2009; Onwu & Kyle, 2011) have identified some of the shortcomings of the traditional ways of teaching science, which include the following:

- They do not provide learners with the opportunity to see the link between science education and their day-to-day experiences.
- They make science education unpopular and irrelevant in the eyes of learners.
- They lead to gaps between what learners want and what educators teach.
- They do not promote higher-order thinking skills.
- They do not foster a sense of confidence in learners' ability to solve problems and make informed decisions about their daily experiences and needs.

The traditional ways of teaching science could therefore at least partly account for learners' views of science as being irrelevant, uninteresting and difficult (Anderson, 2006; CEI, 2009; EC, 2007; EIRMA, 2009; Holbrook, 2005; IET, 2008; Jenkins & Pell, 2006; Onwu & Kyle, 2011; Onwu & Stoffels, 2005; Osborne & Collins, 2001; Schayegh, 2007; Schreiner & Sjøberg, 2004; Stears et al., 2003). This perception could have led to poor performance in science and low uptake of science-oriented courses and careers.

The question arises: Would instructional approaches that emphasise the linkage of scientific concepts to learners' daily life experiences enhance the relevance of studying genetics and improve learner performance more than traditional teaching approaches? Some studies (George & Lubben, 2002; Lubben, Campbell & Dlamini, 1996; Suela, Cyril & Said, 2010) have shown that learners like to be able to relate science and scientific principles to their daily lives. Connecting scientific concepts with learners' daily lives entails the notion of 'context-based' teaching (Bennett, 2003; Bennett & Holmann, 2002; Gilbert, 2006), which is discussed below.

1.2.3 Context-based approaches to the teaching of science

A discernible trend in science curriculum development in the past few decades has been the use of context-based teaching approaches to improve learner performance in science. In these approaches, scientific content is embedded in authentic contexts (real-life situations) that show learners the application of scientific concepts and methods in real life (Gilbert, Bulte & Pilot, 2006), and thus the importance and relevance of science education to their lives.

The term 'context' has been various described as a theme, situation, issue, story, practice, application, experience, or a problem (Pilot & Bulte, 2006). In science teaching, 'contexts' have been interpreted in terms of environmental, societal, health, personal, community, economic, nutritional, technological and industrial applications that could be used in developing science curriculum materials (Bennett, 2003). For the purpose of this study, context-based approaches refer to teaching that attempts to develop life science concepts from familiar contexts, such as social issues, which are considered important by learners and are closely related to their needs and situations in which they lead their lives (Bennett & Holman, 2002).

Previously, context-based science curricula at various educational levels, especially primary and secondary level, have almost consistently been developed from contexts that are perceived relevant by educators and curriculum developers, who are adults, and not by the learners themselves (Bennett & Holman 2002; Osborne & Collins, 2001). Curriculum developers and educators seem to assume that learners would be familiar with, and be interested in the same contexts that appeal to them as curriculum designers and educators (Mayoh & Knutton, 1997). As a result, few studies are reported in the literature that focus on discovering directly from the learners the contexts that they find particularly relevant, accessible and interesting in the study of science at high school level.

It is intriguing that learners, whose interest is meant to be aroused by the use of context-based materials, should seldom be given the opportunity to contribute to decisions about the contexts which they consider suitable for science learning. Various authors (for example Cook-Sather, 2005; Jones, 1997) warn that the inability of learners to relate to 'authentic contexts' (as perceived by educators and curriculum developers who are adults) could result in learners being reluctant to engage with the contexts, thus shielding their knowledge and experience from educators. Excluding learners from curriculum decisions in essence negates the whole purpose of incorporating learners' experiences in the curriculum. It would therefore seem essential to involve learners in the choice of contexts to be used in contextualised teaching. One way of achieving this is by finding out from the learners themselves the kinds of contexts which they would value in studying a given topic, particularly one that is considered difficult to learn, such as genetics.

The importance of learners' input into decisions about their own education has been acknowledged by several other researchers (Basu & Barton, 2007; Cox, Dyer, Robinson-Pant & Schweisfurth, 2009; Osborne & Collins, 2001; Rudduck & Flutter, 2000; Sjøberg & Schreiner, 2005). In this study, therefore, it was particularly important to involve learners in the selection of contexts for developing genetics context-based teaching materials. It was also important to implement these materials using a specific context-based approach, designed to fully exploit the potential of the materials to motivate learners and improve their performance in science (De Jong, 2008; Gilbert, 2006).

1.3 THE PROBLEM OF THE STUDY

South African educational institutions have been characterised by poor performance in science and low enrolments in science-related courses for several years (section 1.2.1 and figures 1.1 and 1.2). The way in which science subjects (including life sciences) are taught has been identified by many researchers (EC, 2007; Holton, 1992; King, 2007; Kyle, 2006; Onwu, 2000, 2009; Schwartz, 2006; Van Aalsvoort, 2004) as one of major factors that could affect performance in science.

A review of the literature suggests that science teaching, worldwide, lacks explicit connections of science content with learners' day-to-day experiences (EIRMA, 2009; Kyle, 2006). This could account for the perception of science education by many learners as irrelevant, difficult and uninteresting (Anderson, 2006; CEI, 2009; EIRMA, 2009; IET, 2008; Jenkins & Pell, 2006; Schayegh, 2007). Research findings (George & Lubben, 2002; Lubben et al., 1996; Suela et al., 2010) (see section 1.2.2) suggest that learners appreciate explicit links between the science they learn and their daily life experiences. In addition, anecdotal evidence – for instance the researcher's own observations of first-year university learners – indicates that learners were more interested and performed better in life sciences lessons in which the link between what was learned in class and their day-to-day experiences was clearly discernible. This was particularly true of topics that had direct applications to their own lives and their communities. This evidence necessitated an inquiry into the efficacy of context-based teaching approaches in enhancing learner performance.

Context-based teaching approaches have been used extensively in many countries for learner motivation and improved performance in science (Bennett, 2003). In South Africa, the content and learning outcomes of the former National Curriculum Statement (NSC) and the current Curriculum Assessment Policy Statement (CAPS) for science subjects, including life sciences, promote contextualised teaching and learning (Department of Basic Education [DoBE], 2011; DoE, 2008). However, research findings show that context-based approaches to the teaching of science have not been fully adopted by South African educators (Lubben & Bennett, 2009; Rogan, 2004, 2000).

Lotz-Sisitka (2006) points out that classroom practice in the South African education system is hardly influenced by contexts. This assertion is reiterated by Rogan (2007), who found that the specific outcomes of the South African Curriculum Statement for science subjects that deal with the interface of science and society were largely absent from science lessons, which are dominated by knowledge transmission practices. It could therefore be surmised that although contextualized teaching and learning is encouraged in the South African national science curriculum, its use in schools has not been ascertained.

Although existing literature suggests that context-based approaches have a positive influence on learner motivation (Ramsden, 1998, 1992; Reid & Skryabina, 2002; Yager & Weld, 1999), their effect on conceptual understanding of science has not been unequivocally established. Some studies (Bloom & Harpin, 2003; Gutwill-Wise, 2001; Sutman & Bruce, 1992; Yager & Weld, 1999) have found that context-based approaches enhance conceptual understanding significantly more than traditional teaching approaches do, while others (Barber, 2001; Barker & Millar, 1996; Ramsden, 1997, 1992; Taasoobshirazi & Carr, 2008) found non-significant differences in the conceptual understanding of learners exposed to context-based and traditional teaching approaches. The lack of consensus on the effectiveness of context-based teaching approaches in enhancing learners' comprehension of science concepts calls for further research to gain more insights into the usefulness of these approaches in enhancing achievement.

A variety of factors – such as the use of contexts selected by adults only, to develop learning materials (Bennett & Holman 2002; Osborne & Collins, 2001), and the use of different models of contextualised teaching (Gilbert, 2006) could somewhat explain this lack of consistency in the findings. In this study, contexts identified by learners themselves as relevant, interesting and accessible to the study of genetics were used to develop context-based materials.

Context-based approaches to the teaching of science should emphasise, among other things, the enhancement of science inquiry skills, problem solving and decision-making ability, according to various researchers (Bennett & Holman, 2002; Gilbert, 2006, 2008; Schwartz, 2006). The skills are important, not only for academic achievement, but for the effective and functional existence of the youth in the twenty-first century. The question is: Do researchers, developers and implementers of contextualized teaching take into account the development of higher order thinking skills? Unfortunately, there appears to be a dearth in literature about the effectiveness of context-based approaches in enhancing the acquisition of these skills. Therefore, there was a need to investigate the efficacy of context-based teaching approaches in the development of skills such as integrated science inquiry skills, problem-solving and decision-making ability.

Learner performance in science is known to be influenced by a number of intervening variables, including gender, availability of resources, and cognitive preferences (IET, 2008). For instance, several researchers (Alparslan, Tekkaya, & Geban, 2003; Cavallo, Rozman & Potter, 2004; Osborne, et al., 2003) have acknowledged the global prevalence of gender discrepancies in performance in science subjects. The necessity to find out whether boys and girls would perform differently when exposed to a specific context-based approach became apparent.

‘Cognitive preferences’ refer to the ways in which learners acquire, process, and assimilate information (MacKay, 1975). The traditional ways of teaching science often lead to the memorisation of abstract science concepts (Lyons, 2006; Taasoobshirazi & Carr, 2008), which predispose learners to a recall learning style. It may therefore be assumed that learners who had been exposed to the traditional ways of teaching for a long time would have a predominantly recall cognitive preference. Research evidence reveals the possibility of an interactive influence between learners’ cognitive preferences and instructional approaches on performance in science (McNaught, 1982; Okebukola & Gegede, 1989; Tamir, 1988). The researcher wondered whether the developed context-based teaching approach would have adverse effects on learners with particular cognitive preferences. A review of the literature showed a scarcity of studies that assess the interactive influence of cognitive preferences and context-based teaching on the attainment of learning outcomes. It thus became necessary to explore the possibility of this interaction when assessing the efficacy of the new instructional approach.

1.4 PURPOSE OF THE STUDY

The purpose of the study was to determine the relative effectiveness of context-based and traditional teaching approaches in enhancing Grade 11 learners' attainment of genetics content knowledge, science inquiry skills, and decision-making and problem-solving abilities, and in improving their attitude towards the study of life sciences. The interactive influence of gender and cognitive preferences, and treatment on learners' attainment of the stated learning outcomes, if any, was also measured. In addition, learners' and educators' views on learner performance and the approaches used were determined.

1.5 RESEARCH QUESTIONS

The problem statement gave rise to the following research questions:

1 Would there be any differences in the performance of learners exposed to a context-based teaching approach and those exposed to traditional teaching approaches with respect to:

   i. Achievement in genetics?
   ii. Enhancement of science inquiry skills?
   iii. Enhancement of problem-solving ability?
   iv. Enhancement of decision-making ability?
   v. Improvement of learner attitude towards the study of life sciences?

2 Would there be any interactive influence of gender and cognitive preference, and treatment on learners' attainment of the learning outcomes?

3 What are learners' and educators' views on features of the context-based and traditional teaching approaches that could account for differences, if any, in learner performance on the assessed learning outcomes?

1.6 RESEARCH HYPOTHESES

The null hypotheses tested to answer the first two questions were as follows:

Ho1 There is no significant difference between learners exposed to a context-based teaching approach and those exposed to traditional teaching approaches, in their attainment of genetics content knowledge, science inquiry skills, decision-making and problem-solving ability and their attitude towards the study of life sciences.

Ho2 There is no significant interactive influence of gender and treatment on learners' attainment of genetics content knowledge, science inquiry skills, decision-making and problem-solving ability and their attitude towards the study of life sciences.

Ho3 There is no significant interactive influence of cognitive preferences and treatment on learners' attainment of genetics content knowledge, science inquiry skills, decision-making and problem-solving ability and their attitude towards the study of life sciences.

Ho4 There is no significant interactive influence of cognitive preferences and gender, and treatment on learners' attainment of genetics content knowledge, science inquiry skills, decision-making and problem-solving ability and their attitude towards the study of life sciences.

The third research question was answered using qualitative data obtained from learner and educator interviews.

1.7 SIGNIFICANCE OF THE STUDY – SCIENTIFIC MERIT

This study sought to determine the achievements and experiences of learners who were exposed to context-based and traditional approaches to the teaching of a life sciences topic. Information on the effectiveness of these approaches in enhancing learner performance could provide helpful insights into the use of context-based approaches to teaching life sciences. This is particularly important since the current South African life sciences curriculum emphasises the use of real-life issues in teaching the subject. It is therefore hoped that the outcome of this study will benefit life sciences educators by providing them with a prototype from which future teaching materials could be developed.

The study was premised on the use of contexts identified as relevant, interesting and accessible by the learners themselves to develop context-based materials for teaching genetics. This study is therefore likely to first, provide insights into the contexts that are considered important for studying genetics, by South African learners. Secondly, to provide insights into the effectiveness of teaching materials that are relatable to learners not only in motivating learners, but also in enhancing conceptual understanding and the development of higher order thinking skills.

Lastly, the study sought information on the interactive influence of gender and cognitive preference, and the instructional approaches used, on learners' attainment of the assessed learning outcomes. This knowledge is important in providing insights into whether the developed materials and approach are accessible by both genders and by learners with different cognitive preferences.

1.8 CONTEXT OF THE STUDY

The schools involved in the study were public schools situated in suburban residential areas in Pretoria, South Africa. The schools cater for both General Education and Training (GET) and Further Education and Training (FET) phases (from Grade 8 to 12). The majority of the learners in the schools are 'black Africans', with isolated cases of 'coloured' learners. English is used as the official medium of instruction. However, learners usually use 'seTswana' and 'sePedi' (local languages) outside the classroom, and occasionally during lessons.

Learners in the participating schools come mostly from low to medium socio-economic status groups. Owing to the poor socio-economic status of most of the learners, the schools have feeding schemes where learners are given a meal at lunch time. After lunch, learners in most of the schools attend lessons for about 1 hour 30 minutes, and afterwards engage in extramural activities, such as sport and remedial lessons, or are allowed to go home. The researcher used the time for extramural activities to conduct the study because this was the time recommended by the respective schools and the Department of Education. Participating learners were given an hour to rest and prepare themselves before commencing with the study lessons. All the activities related to the study were done during this duration.

1.9 DELIMITATION OF THE STUDY

The study was conducted with Grade 11 learners from six schools in Pretoria, South Africa. In addition, the materials were based on one life sciences topic – genetics. While the researcher recognises the potential of the materials to enhance performance in a diversity of settings, topics, and subjects, it is acknowledged that the use of more diverse schools and a variety of topics was necessary for generalization of finding from a quantitative study. Care must therefore be taken when applying the findings of this study to other situations, such as a different level of education, and other science topics and subjects.

1.10 MAIN ASSUMPTIONS

It was assumed in this study that the Grade 12 learners who participated in the selection were able to choose contexts that most learners considered relevant, interesting and accessible in studying genetics. It was also assumed that the educators who taught genetics using the traditional approaches would use any teaching approach, which could include the occasional use of contexts.

1.11 SUMMARY

This chapter set out to highlight the global declining intake of learners into science-related courses and the pursuit of science-oriented careers. The poor performance of South African learners in science subjects was acknowledged. Traditional ways of teaching science were identified as a possible determinant of poor performance and low enrolment rates in science programmes. The focus of the chapter was to expound on the need to assess the relative efficacy of context-based and traditional ways of teaching in improving learner performance in genetics, a life science topic which is considered difficult for learners to learn.

More specifically, the chapter explicated the need for using contexts that are identified by learners as relevant, interesting and accessible in the study of genetics to develop context-based materials and to use an appropriate approach to implement them. The chapter included the problem of the study and research questions, as well as the significance, delimitations and assumptions of the study.

1.12 ORIENTATION TO FORTHCOMING CHAPTERS.

The study report is organised in six chapters. The current chapter presents an introduction to the study, followed by Chapter Two, in which literature related to the study and the conceptual framework of the study are discussed. Chapter Three provides a description of the methodology used in the study. This includes a description of the approaches used to develop the teaching materials and the instruments for collecting data. The pilot study, the main study and data analysis procedures are also described in the same chapter. Chapter Four presents the quantitative and qualitative results of the study, which are discussed in Chapter Five. Chapter Six provides the summaries, conclusions, and the educational implications of the study, as well as suggestions for further research.