

**MANAGEMENT OF HIGH SCHOOL LEARNERS' ACADEMIC PERFORMANCE IN  
CHEMISTRY**

**by**

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UNIVERSITY OF VENDA

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**2017**

## DECLARATION

I, **ALIDZULWI THOMAS NESENGANI**, declare that:

**“Management of High School Learners’ Academic Performance in Chemistry”**

...is my own work and has not been previously submitted in any form whatsoever, by myself or anyone else, to this university for any degree or examination purposes. All resources that I have used or quoted have been indicated and duly acknowledged by means of complete references.

.....  
**ALIDZULWI THOMAS NESENGANI**

.....  
**DATE**

## ABSTRACT

Performance of learners in Chemistry in South Africa has been below the international average. This study intended to investigate the management of high school learners' academic performance in Chemistry as a component of Physical Science. The study employed mixed designs which are qualitative and quantitative. The population of this study comprised learners who were doing Physical Science, Physical Science teachers and school principals. The principals as participants were purposively sampled whereas teachers and learners were stratified random sampled. Data were collected through questionnaires which were distributed to learners and teachers, while school principals were orally interviewed. Data obtained from questionnaires were analysed using SPSS software. Qualitative data were analysed through identification of themes, development of codes and sub-themes. The improvement of teaching and learning will have a positive impact on the academic performance of high school learners in Chemistry. The findings showed that there are factors which affect the management of high school learners like (school location, inadequate physical resources, attitude and anxiety) contribute to the performance of learners in Chemistry. The findings also showed that factors influencing the academic performance of learners in Chemistry like (effective teaching, In-service Training of Chemistry teachers and Chemistry syllabus and content) contribute to the performance of learners in Chemistry. This study will give new insight to curriculum developers and implementers, and researchers regarding emerging issues on performance and influence the Ministry of Basic Education on policy formulation. Improved Chemistry performance will give learners opportunities to pursue science related courses in higher institutions of learning and middle level colleges.

**Key Words:** Chemistry, Academic Performance, Teacher's Attitude, Management and Learners.

## DEDICATION

This thesis is dedicated to the loving memory of my late father, Khosi ERB Nesengani, my dear late mother, Hondwani Mirriam Nesengani and my loving late sister, Mulalo Maureen Mutshaeni who never lived to witness this work.

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## LIST OF ACRONYMS

|        |   |   |
|--------|---|---|
| CAPS   | : | Curriculum and Assessment Policy Statement                                    |
| DBE    | : | Department of Basic Education   |
| ZPD    | : | Zone of Proximal Development  |
| SPSS   | : | Statistical Package for the Social Science                                    |
| PGPT   | : | Post-Graduate Professional Training   |
| EC     | : | European Commission   |
| PK     | : | Pedagogical Knowledge   |
| PCK    | : | Pedagogical Content Knowledge   |
| SAAR   | : | South African Assessment Report   |
| GALC   | : | Guided Active Learning in Chemistry   |
| NEPA   | : | National Education Policy Act   |
| ITE    | : | Initial Teacher Education   |
| HEIs   | : | Higher Education Institutions   |
| PGCE   | : | Post Graduate Certificate in Education  |
| ANC    | : | African National Congress   |
| NGO    | : | Non-Governmental Organisation   |
| PIRLS  | : | Progress in International Reading and Literacy                                |
| SACMEQ | : | Southern and Eastern African Consortium for Monitoring<br>Educational Quality |
| TIMSS  | : | Trends in Mathematics and Science Study                                       |
| ANA    | : | Annual National Assessment  |
| WEF    | : | World Economic Forum  |
| US     | : | United States   |
| NSC    | : | National Curriculum Statement   |
| HSRC   | : | Human Science Research Council  |
| REQV   | : | Relative Education Qualification Value  |
| PUPTs  | : | Professional Unqualified Practicing Teachers                                  |
| DET    | : | Department of Education and Training  |
| NCEE   | : | National Commission on Excellence in Education                                |

SMT : School Management Team

HOD : Head of Department

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## CHAPTER 1

### INTRODUCTION

#### 1.1 BACKGROUND OF THE STUDY

Chemistry has been identified as a very important component of Physical Science, as a subject, and its importance in the scientific and technological development of any nation has been widely reported (Adesoji & Olatunbosun, 2008:14). Ejidike and Oyelana (2015:605) add that Chemistry has become one of the most important disciplines in the school curriculum; its importance in the general education has gained world-wide recognition. In the same vein, Chemistry plays an important role in medical science. This is why many students make an attempt to study Chemistry as a science discipline in high schools.

Chemistry proves to be a difficult science discipline for many learners (Sirhan, 2007:2). The subject commonly incorporates many concepts which are important; however, theories on the discipline cannot be easily understood when such concepts are not sufficiently grasped by the learner. The nature of Chemistry means that learning this discipline would require a high-level skill set (Sirhan, 2007:2).

The researcher has been a teacher of Chemistry at high school for a period of more than twenty years. Despite the importance of Chemistry in scientific and technological development, learner performance in the subject is not encouraging. For example, the overall achievement rate in Physical Sciences from 2010 to 2015 is reflected in Table 1 below:

**Table 1: Extract from the Ministry of Basic Education's 2015 Ministerial Report (DBE, 2015)**

| <b>Year</b> | <b>Number Wrote</b> | <b>Number Achieved at 40% and Above</b> | <b>% Achieved at 40% and Above</b> |
|-------------|---------------------|---|------------------------------------|
| 2010        | 205 364             | 60 917                                  | 29,7%                              |
| 2011        | 180 585             | 61 109                                  | 33,8%                              |
| 2012        | 179 194             | 70 076                                  | 39,1%                              |
| 2013        | 184 383             | 78 677                                  | 42,7%                              |
| 2014        | 167 997             | 62 032                                  | 36,9%                              |
| 2015        | 193 189             | 69 699                                  | 36,1%                              |

It is worth emphasizing at this juncture that the fields of Chemistry as Science and Technology are related to the economic heart of every highly-developed, industrialized and technologically advanced society (Ejidike & Oyelana, 2015:605). The benefit of learning and advancing in science and technology can be intrinsic and extrinsic, and this applies to Chemistry. Teaching and learning of Chemistry have significant roles towards technological development of a developing nation since Chemistry is embedded in economical, ecologic and societal influences (Ejidike & Oyelana, 2015:605).

## **1.2 STATEMENT OF THE PROBLEM**

In 2001, the Department of Education established the Dinaledi School Project to increase the number of matriculants with University acceptance in regard to science passes (O'Connell, 2009:6). In the past, only about half the senior certificate candidates who could pass higher grade science did so. Perceptions of Chemistry as a difficult scientific discipline led some to do Physical Science at standard grade level, while others chose not to take the subject at all. Half of secondary schools did not offer the equivalent of higher grade science, with the result that the option of studying Physical Science at the higher grade level was not available to many young people (O'Connell, 2009:4).

Since the inception of the Curriculum and Assessment Policy Statement (CAPS), grading subject by using higher grade and standard grade is no longer applicable in South Africa under the Department of Basic Education (DBE), (National Curriculum Statement, 2011:4). There is a general perception of Chemistry as a difficult subject. Underlying this perception is the literature that attributes the academic performance of learners in Chemistry to a number of factors, which include learners' attitudes towards the subject, teachers' attitudes towards learners' abilities in the subject, inadequate teaching and learning resources, and poor teaching methodologies. The problem is how school management in Vhembe District address these issues (influential, factors) in managing academic performance of learners. This study, therefore, sought to investigate the management of high school learners' academic performance in Chemistry.

### **1.3 AIM OF THE STUDY**

The aim of the study was to investigate the management of high school learners' academic performance in Chemistry.

In order to achieve this aim, the researcher has developed the following objectives:

- 1.3.1 To identify factors affecting the management of high school learners' academic performance in Chemistry.
- 1.3.2 To investigate factors influencing the academic performance of learners in Chemistry.
- 1.3.3 To identify management strategies that can help to improve learners' performance in Chemistry.
- 1.3.4 To develop appropriate teaching and learning model for improving teachers' and learners' interest in Chemistry.

### **1.4 RESEARCH QUESTIONS**

The main research question was:

What are the management perception of high school learners' academic performance in Chemistry?

In order to answer the research question, the researcher has developed the following subsidiary questions:

- 1.4.1 What are the factors affecting the management of high school learners' academic performance in Chemistry?
- 1.4.2 What factors influencing the academic performance of learners in Chemistry?
- 1.4.3 What are management strategies that can help to improve learners' performance in Chemistry?
- 1.4.4 What are the appropriate teaching and learning models for improving teachers' and learners' interest in Chemistry?

## **1.5 PRELIMINARY LITERATURE REVIEW**

The focus of the research study was to investigate management contribution towards high school learners' academic performance in Chemistry as a component of Physical Science. The relevant theories were used to support the problem to be investigated as it affects the management of high school academic performance in Chemistry. The study employs theoretical framework which will unleash the problem to be investigated.

### **1.5.1 Theoretical Framework**

The research study adopted Vygotsky's theory on social development with the emphasis on the construction of the Zone of Proximal Development.

#### **1.5.1.1 The theory of Vygotsky**

The theory of Vygotsky incorporates into teaching and learning strategies that might increase learner performance. Vygotsky believes in the "activity theory perspective that sees learning as appropriation" (Dahl, 1996:2). His theory promotes gradual changes using social contact and language which gradually changes with development (Utah Education Network, 2005:10).

Social interaction plays an important role in a learner's learning. It is through social interaction that learners learn from each other, as well as adults. Fogarty (1999:77) states, "Vygotsky's theory suggests that people learn first through person-to-person

interactions and then individually through an internalisation process that leads to deep understanding”. Vygotsky’s main construct of the Zone of Proximal Development (ZPD) learning “depends upon outside social forces as much as inner resources” (Palmer, 2001:35). Vygotsky believes that if learners are not improving academically, then their instruction is inappropriate. This belief contradicts Piaget’s reasoning that learners may have “*plateaued*” in a specific developmental stage.

### **1.5.1.2 The use of Vygotsky’s Theory in Education**

Vygotsky’s central topic was the Zone of Proximal Development (ZPD), which uses social interaction with more knowledgeable others to move development forward. A more capable person, such as teacher or peer, provides assistance to the learner; the learner is able to complete the task with this assistance. Learners who are in the ZPD need active teaching. “It’s a waste of time to teach learners what they already know and what they cannot do even with assistance” (Utah Education Network, 2005:11). Therefore, Vygotsky’s theory promotes the belief, “what is learned must be taught” (Wilhelm, 2001:8). Teachers should be explaining, modelling, and using guided practice in the classroom.

When a school manager walks into a teacher’s classroom using Vygotsky’s theory to guide his or her instruction, he or she should see learners engaged in scaffolding, small groups, cooperative learning, group problem-solving, cross-age tutoring, assisted learning, and/ or alternative assessment. Vygotsky’s model of teaching and learning has significantly influenced “*early-literacy*” programmes such as Reading Recovery and Guided Reading. Nonetheless, this theory is in contrast with what is happening in many schools today as too many schools have teacher-centred classrooms. The teacher-centred model is a learning centre in which information possessed by the teacher, flows one way, from teacher to learner (Wilhelm, 2001:8). To counter this prevalent view, Vygotsky maintains meaningful and productive collaborative activities that need to be engaged in by both learners and teachers. Teachers must actively assist and promote the growth of their learners so the learners can develop the skills they need to fully participate in society. In order to counter teacher-centered approach, there are ways in which a teacher can implement classroom management. Some ways are highly effective, whereas some ways may need to be re-addressed. The crucial thing here is that, all teachers have

some form of behaviour management system in place which enables them to control their class, as well as allow a healthy and productive learning environment (Woolfolk, 1990 and McInerney & McInerney, 1998).

According to Woolfolk (1990) a teacher's personality and his/her actual implementation method with regard to management techniques, have a direct bearing on the outcome. It is therefore possible that what may work for one person, may not work for another, or, it is possible that a school's ethos or policy statements, may not allow for a teacher's particular behaviour management style.

The three approaches are listed below, but there are many more and it must be noted that it is often the case that they are not exclusive to one another. These approaches are student centred approach, active listening and moderate approach. McInerney and McInerney (1998) and Woolfolk (1990) state that different behaviour management systems may be overlapped as a teacher establishes the best system for themselves, and significantly, for the particular class under their care. For this study student centred approach will be considered (Woolfolk, 1990).

### **A Student Centred Approach**

A child sees behaviour directed by outside influences of parents and teachers which can be negative. A student centred approach encourages independence and for children to choose their own behaviour. It is a democratic approach where the teacher:

- Shares control and decision making with the class.
- Encourages group initiatives.
- Delegates responsibility of behaviour to the class.
- Works toward establishment of mutual goals and encourages active participation.

**A student centred approach is hinged on understanding the problem in behaviour:**

- Clarify the source of the problem

- Is the teacher affected by the student behaviour?
- The teacher should be listening to what may be the “real problem/message
- Encourage children to speak openly
- Allow student to change behaviour as opposed to reinforcing accusations
- Language development, thoughts, feelings, age, and reasoning ability, may restrict the teacher’s use of logical argument.

### **1.5.1.3 The zone of Proximal Development in Vygotsky’s Theory of Child Development**

We can now use this model of child development, as Vygotsky did, to introduce the idea of Zone of Proximal Development. The Zone of Proximal Development is used for two purposes in the analysis of psychological development (that is transition from one age period to another). One purpose is to identify the kinds of maturing psychological functions (and the social interactions associated with them) needed for transition from one age period to the next. The other is to identify the child’s current state in relation to developing these functions needed for that transition (Chaiklin, 2003:7).

For each age period, there is a group of psychological functions that are maturing in relation to the central formation of new structure. This leads to the restructuring of the existing functions to the formation of a new structure. This new-formation results are in a transition to the next age period. This zone is ‘objective’ in the sense that it does not refer to any individual child, but reflects the psychological functions that need to be formed during a given age period in order for the next age period to be formed. The ‘objective’ zone is not defined *a priori*, but reflects the structural relationships that are historically-constructed and objectively constituted in the historical period in which the child lives (Chaiklin, 2003:7).

One can say that the zone for a given age period is normative in that it reflects the institutionalized demands and expectations that developed historically in a particular societal tradition of practice. For example, school-age children are expected to develop capabilities to reason with academic (that is scientific) concepts. Individuals who do not develop this capability can be said to have a different intellectual

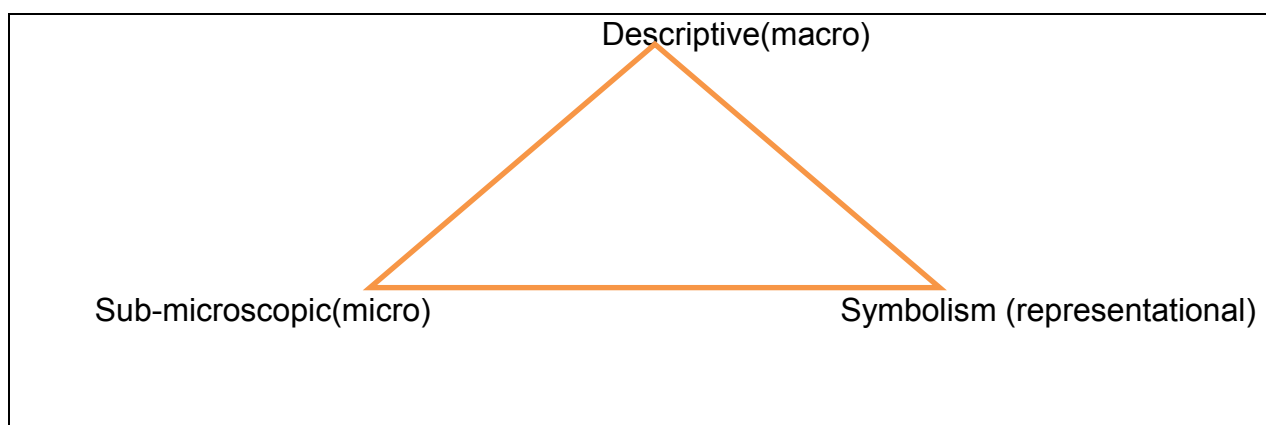
structure from those of other school-age children. Reasoning with concepts is a specific manifestation of the new-formations for this age, which Vygotsky suggests are “*conscious awareness and volition*”. (Chaiklin, 2003:7).

## 1.5.2 Various Facets of the Learning Difficulties in Chemistry

An area of difficulty is presented in the following paragraphs.

### 1.5.2.1 Curriculum content

Much of the school Chemistry taught before 1960 laid great emphasis on descriptive Chemistry, memorization being an important skill needed to achieve examination success. The sub-microscopic interpretation and symbolic representation were left until later. Today, the descriptive is taught alongside both the ‘micro’ and ‘representational’. Johnstone (1982:377) argues that the learner cannot cope with all three levels being taught at once, and Gabel (1999:548) supports this argument. Indeed, today, there is danger that Chemistry depends too much on the representational, with inadequate emphasis on the descriptive.



**Figure 1: The Chemistry Triangle (Sirhan, 2007:5)**

Chemical knowledge is acquired at three levels: “sub-microscopic”, “macroscopic” and “symbolic”, and the link between these levels should be explicitly taught (Johnstone, 1991:75; Gabel, 1992:59).

Johnstone (1991:76) indicates that the nature of Chemistry concepts and the way the concepts are represented (macroscopic, microscopic and representational) make

Chemistry difficult to learn. The methods by which learners learn are potentially in conflict with the nature of science, which, in turn, influences the methods by which teachers have traditionally taught (Johnstone, 1980:365).

### **1.5.2.2 Overload of learners' working memory space**

The working memory space is of limited capacity (Baddeley, 1999:117). This limited shared space is a link between what has to be held in conscious memory and the processing activities required to handle, transform, manipulate, and get it ready for storage in long-term memory.

When learners are faced with a learning situation where there is too much to handle in the limited working space, they have difficulty in selecting important information from the other less important information (Johnstone & Letton, 1991:81). Faced with new and often conceptually complex material, the Chemistry learner needs to develop skills to organise the ideas so that the working space is not overloaded. Without the organising structures available to the experienced teacher, the learner frequently has to resort to rote learning, which does not guarantee understanding. To solve this type of problem, Johnstone (1999:46) has argued that teachers have to look more closely at what is known about human learning and also look at the nature of the discipline of Chemistry and its intellectual structure in an effort to harmonize them.

### **1.5.2.3 Language and communication**

Johnstone (1984:847) indicates that language has been shown to be another contributor to information overload. Language problems include unfamiliar or misleading vocabulary, familiar vocabulary which changes its meaning as it moves into Chemistry, use of high-sounding language, and the use of double or triple negatives (Cassels & Johnstone, 1985). In USA, Gabel (1999:548) has noted that the difficulties learners have with Chemistry may not necessary be related to the subject matter itself, but to the way of talking about it. In Australia, Gardner (1972) conducted a study of the vocabulary skills of pupils in secondary schools. It was found that many words used frequently by science teachers were just not accessible to their learners. In Scotland, similar investigations were conducted; a study by Cassel and Johnstone (1980) showed that the non-technical words associated with

science were a cause of misunderstanding for learners. Words which were understandable in normal English usage changed their meaning (sometimes quite subtly) when transferred into, or out of, a science situation. For example, the word “volatile” was assumed by learners to mean “unstable”, “explosive” or “flammable”. Its scientific meaning of “easily vapourised” was unknown. The reason for the confusion was that “volatile”, applied to a person, does imply instability or excitability, and this meaning was naturally carried over into the science context with consequent confusion.

White (1977:25) argues that learning involves the interaction of the information that the learner receives through his sensory system and the information that he or she already has available in his or her long-term memory. This enables the learner to recognise and organise the incoming information and make sense of it. Furthermore White emphasised that the cognitive process may be considered to involve the interaction of the components of memory: working memory and long-term memory.

Language influences the thinking processes necessary to tackle any task. This is supported by the observations made by Cassels and Johnstone (1984:614). They noted that memory span is not determined by the number of words but by the grammatical structures (e.g. embedded clauses) that may, themselves, load the memory. They stress that the important factor in the sentence is its meaning while sentences with a negative require more of working memory capacity than do otherwise identical sentences lacking the negatives.

The whole area of language, including the use of representational symbolisms, needs careful thought. Language helps or hinders interactions with long-term memory, but it also can be a source of significant information overload. Perhaps this suggests that there has been more opportunity for the learner to verbalise and discuss ideas as they are being presented. This would give opportunities for misunderstanding and confusion to become more apparent, thereby allowing the learner to adjust thinking and clarify ideas.

#### 1.5.2.4 Concept formation

Chemistry learning requires much intellectual thought and discernment because the content is replete with many abstract concepts. Concepts such as dissolution, particulate nature of matter, and chemical bonding are fundamental to learning Chemistry (Abraham, Grzybowski, Renner and Marek, 1992) unless these fundamentals are understood, topics including reaction rate, acids and bases, electrochemistry, chemical equilibrium, and solution Chemistry become arduous. Therefore, inquiring into students' conceptions of the fundamental concepts in Chemistry has been a research focus of several researchers in many countries for the last two decades (Ebenezer & Gaskell, 1995:9).

Real understanding requires not only the grasp of key concepts but also the establishment of meaningful links to bring the concepts into a coherent whole. Ausubel's important work (1968) has laid the basis for understanding how meaningful learning can occur in terms of the importance of being able to link new knowledge onto the network of concepts, which already exist in the learner's mind. Concepts develop as new ideas are linked together, and the learner does not always correctly make such links. This may well lead to misconceptions.

Conception or pieces of intellectual thought either reinforce each other or act as barriers against further learning. To overcome obstacles in learning, learner conception researchers have been focusing on identifying and assessing learners' "*misconceptions*" (Helm, 1980:92), "*alternative frameworks*" (Driver, 1981:93), "*children's science*" (Gilbert et.al., 1982: 625), or "*preconceptions*" (Novak, 1977). These labels are attached when learners' conceptions are different from the scientific ideas and explanations (Nakhleh, 1992:192).

There has been an enormous number of studies on misconceptions in Chemistry, and there are several reviews in this area (Wandersee, Mintzes, and Novak, 1994:198). In addition, various studies indicate that learners' difficulties in learning science concepts may be due to the teachers' lack of knowledge regarding learners' prior understanding of concepts (Driver & Easley, 1978:61 and McDermott, 1984:4). Alternative conceptions may not be just learners' fault. Chemical knowledge structures, for example: in "*combustion*" "*physical and chemical change*", and

dissolving and solutions, by their very nature, lead to alternative conceptions, argues Griffiths (1994:70). Learners' conceptions are constrained both by the perceiver (learner) and the perceived (chemical phenomena) (Ebenezer, 1991). Thus, learning involves knowledge that needs to be restructured, adapted, rejected, and even discarded (Duschl & Osborne, 2002:39).

### **1.5.2.5 Motivation**

There is no doubt that motivation to learn is an important factor controlling the success of learning, and teachers face problems when their learners do not all have the motivation to seek understanding. However, the difficulty of a topic, as perceived by learners, will be a major factor in their ability and willingness to learn it (Johnstone & Kellet, 1980:175).

Learners' motivation to learn is important but does not necessarily determine whether they employ a deep or a surface approach: aspects of learners' motivation to learn can be classified as either intrinsic (example, wanting to know for its own sake) or extrinsic (e.g. wanting to learn what is on an exam syllabus) (Entwistle et al., 1974:379). There is also a third class, called "a motivational" learning, which covers situations where learners do things (like attending lesson) without any conscious belief that this will help them learn anything (Vallerand & Bissonnette, 1992:599).

Resnick (1987:13) has found that learners will engage more easily with problems that are embedded in challenging real-world contexts that have apparent relevance to their lives. If the problems are interesting, meaningful, challenging, and engaging, they tend to be intrinsically motivating learners. However, Song and Black (1991:49) indicate that learners may need help in recognising that school-based scientific knowledge is useful in real-world contexts.

White (1988) argues that the issue of long-term and short-term goal is relevant to the learning of science. The learner who goes to lessons with a short-term goal of passing examinations often has a specific approach to learning. Scientific laws and potentially meaningful facts are learned as propositions unrelated to experience. Too often, examinations reward the recall of such facts. On the contrary, learners who

have a stronger sense of achievement, or who want to learn about science, may attend the lesson with a long-term goal of a deeper understanding and appreciation of science. They may approach it through involving advanced learning strategies of reflection and inter-linking of knowledge. With the pace of normal lessons, there is, unfortunately, little opportunity for this to occur during the lessons. Ames and Ames (1984:536) have pointed out that learners' motivation for learning from lessons has important consequences for what they are attending to, how they are processing information, and how they are reacting to the lessons.

## 1.6 DEFINITION OF KEY TERMS

Key concepts are worth defining for the purpose of clarity. In this section, I have defined terms so that readers can understand the context in which the words are being used (Creswell, 1994:106). The terms are defined sequentially as follows:

- **Chemistry**

According to the Department of Education (2003), Chemistry is a study which focuses on investigating chemical phenomena through scientific inquiry by applying scientific model, theories and laws; it seeks to explain and predict events in our physical environment (Department of Education, 2003:9).

- **Academic Performance**

This refers to a successful accomplishment or performance in a particular subject area. It is indicated by marks and scores of descriptive commentaries. It includes how learners deal with their studies and how they cope with or accomplish different tasks given to them by their teachers in a fixed time or academic year. In order to avoid monotony, different terms such as *academic achievement*, *learner achievement* and *learner performance* are used in this study. All are meant to refer to academic performance (Pintrich & V. de Groot, 1990:33).

- **Teacher's attitude**

This is an acquired internal state or feeling influencing the choice of liking something or disliking it. In this study, the teacher's attitude is seen in the way the teacher views his work and his/her learners' behaviour in class (Avramidis & Norwich, 2010).

- **Management**

Management is the division of the education system in schools that initiates and makes available what is needed to ensure quality teaching and learning adhered. In this study, principals are the ones who manage the smooth running of the school. Management which is a school-based, student-centred and quality-focus. Through the devolution of responsibilities, schools are provided with enhanced flexibility and autonomy in managing their own operation and resources for the school development so as to develop an environment that facilitates continuous improvement (Education and Manpower Bureau, 2006:1).

- **Learners**

The Free dictionary defines a learner as someone (especially a child) who learns (as from a teacher) or takes up knowledge or beliefs. A learner is also a person who is still learning something (Cambridge Advanced Learner's Dictionary and Thesaurus, 2004). According to the study, a learner is a school child who wants to learn from the teacher.

## **1.7 RESEARCH DESIGN AND METHODOLOGY**

In the following paragraphs, the research design and the methods of data collection are delineated:

### **1.7.1 Research Paradigm**

Research paradigm is the set of common belief and arrangements shared between scientists about how problems should be understood and addressed. In this study, for quantitative approach the positivism research paradigm was used in which its ontology there exist a single reality. For qualitative approach the constructivism (Anti-positivism) research paradigm was used in which there is no single reality. Therefore, reality is created by individuals in groups.

### **1.7.2 Research Design**

According to Creswell (2009:3), research design is a set of guidelines and instruments to be followed in addressing the research problem. A mixed methods research design was employed in this research. Mixed method study combines characteristics of both qualitative and quantitative approaches to research. This mix could emphasize one set of characteristics or the other (McMillan & Schumacher, 2010:11).

### **1.7.3 Methodology**

Research methodology refers to a process whereby the researcher collects and analyses data (Henning, Van Rensburg & Smith, 2004:36). Research methodology depends on the nature of data to be collected and the nature of the problem of research. In this research, the researcher used literature review and a combination of qualitative and quantitative methods, as highlighted.

According to De Vos et al. (2005:123), literature review refers to the material that has been published and contributes towards a clear understanding of the nature and meaning of the problem that has been identified. Literature review was conducted in Chapter 2. Recent books, journal sources, newspapers and internet sources relevant to managing high school learners' performance in Chemistry were reviewed.

### **1.7.3.1 Qualitative method**

The researcher used interview questions to collect qualitative data from school principals. As Chemistry is not offered in all schools, the purposive sample was used to sample school principals in order to gather data. This means that interviews were conducted from principals where Chemistry is offered. According to Tuckman (1994:216), interviews may be used by researchers to convert into data the information directly given by a person. Thus, an interview protocol was duly developed and included the following components: heading, instructions to interviewee, key research questions, probes to follow up on key questions, recording of the interviewees' comments, and space in which the researcher could record reflective notes. The information from such interviews were recorded by using note-taking and an audiotape.

### **1.7.3.2 Quantitative method**

Questionnaires were used to collect quantitative data from learners and teachers where Chemistry is offered. A questionnaire is a data gathering instrument through which participants answer questions in writing (Leedy & Ormrod, 2010:166). The purpose of using the questionnaire was that facts and opinions about a phenomenon from teachers and learners could be obtained, and given the large numbers, it was impossible to interview all of them. Therefore, stratified random sample was employed to gather data.

## **1.7.4 Population and Sample**

This section discusses population and sampling procedures.

### **1.7.4.1 Population**

According to McMillan and Schumacher (2010:129), a population is a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalise the results of the research. In this study, the population was composed of all Chemistry learners, Physical Science teachers and principals of selected schools in the circuits (Luvuvhu, Mvudi and Sibasa Circuits) in Vhembe District under Limpopo Province.

#### **1.7.4.2 Sampling procedures**

According to McMillan and Schumacher (1993:382), a sample is a subset of the population to which the researcher intends to generalize the results. As pointed out by Neuman (1997:201), sampling should be viewed as the process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected.

In this study, qualitative research design used purposive sampling as it is not all schools which offer Chemistry in three circuits mentioned above. Purposive sampling represents a group of different non-probability sampling techniques. In this study, principals from selected schools were purposively sampled. This was done to increase the utility of information obtained from small samples. The main goal of purposive sampling was to focus on a population of interest, which best enabled the researcher to answer research questions (Laerd, 2015).

On the other hand, quantitative design used stratified random sampling in which the population was divided into sub-group, or strata on the basis of a variable chosen by the researcher such as at the same level of education (McMillan & Schumacher, 1993:162). In this study, learners who are in Grade 10, 11, and 12 and Chemistry teachers were stratified random sampled to represent the entire population of twelve (12) schools from three circuits (Luvuvhu, Mvudi, and Sibasa).

#### **1.7.4.3 Sample**

For this research study, the qualitative sample comprised twelve (12) principals from purposively sampled schools which offer Physical Sciences. The quantitative sample comprised one hundred and twenty (120) learners and twenty-four (24) teachers from schools which offer Physical Sciences in three circuits (Luvuvhu, Mvudi and Sibasa) stratified random sampled.

#### **1.7.5 Data Collection Instruments**

As the study was using mixed design or method, data were collected through interview schedules and questionnaires.

### **1.7.5.1 Interview Schedule**

Rubin and Rubin in Arksey and Knight (1999:33) suggest that structured interviews are a way of uncovering and exploring the meanings that underpin people's lives, routines, behaviours, and feelings.

According to Tuckman (1994:216), interviews may be used by researchers to convert into data the information directly given by a person. Thus, an interview protocol was duly developed and includes the following components: heading, instructions to interviewee, key research questions, probes to follow key questions, recording of the interviewees' comments, and space in which the researcher can record reflective notes. The information from such interviews was recorded by using note-taking and an audiotape.

### **1.7.5.2 Questionnaire**

Questionnaires are preferred due to economic reasons, as McMillan and Schumacher (2001:257) show that the use of a questionnaire is economical; it contains standard questions, and questionnaires use a uniform procedure, thus ensuring comparability of results. Another advantage of questionnaires is that they can ensure anonymity to maintain and ensure confidentiality, thus giving the respondents more confidence in giving accurate information.

In preparing questionnaires, researchers should, nonetheless, be cautious. The following should be asked of each question (Tuckman, 1994:216):

- To what extent might the question influence participants to show themselves in a good light?
- To what extent might the question influence participants to attempt to anticipate what researchers want to find out?
- To what extent might the question ask for information about participants that they may not know about themselves?
- Does questionnaire have both open and close-ended questions?

The validity of any questionnaire is limited by all of the above considerations. Questionnaires were distributed to twenty-four teachers who were sampled in stratified random sample.

## **1.7.6 Qualitative Control Measures**

### **1.7.6.1 Trustworthiness of the qualitative approach**

The researcher ensured that transferability, credibility, conformability and dependability are evident in the study.

- **Transferability**

The researcher ensured that the research was used by other researchers, provided proper acknowledgement is made. Transferability refers to whether the research can be transferred by allowing other researchers to make comparisons with the researcher's own work (Creswell, 2009:90).

- **Credibility**

Credibility is the extent to which data collected can be controlled in an objective and reliable manner (Creswell, 2009:91). The researcher interviewed some of the respondents, and others completed the questionnaire. This was done to avoid inaccurate and misleading conclusions.

- **Conformability**

The researcher ensured that similar sample sizes, respondents and similar research instruments were used. This means that the research results would be similar as well. Conformability means achieving the same results even when a different researcher's conduct the research (Creswell, 2009:91).

- **Dependability**

According to Whitemore, Chase and Mandle (2001:534), trustworthiness of the study can also be determined by the dependability of the findings and that the quality in research is dependent on honest and forthright investigations. Evidence of the

field research in the form of research instruments was used to draw the findings, conclusions and recommendations in order to ensure research dependability.

### **1.7.7 Quantitative Control Measures**

#### **1.7.7.1 Validity and reliability of the research instruments**

To ensure validity and reliability, the researcher gave questionnaires to similar participants who were not part of the study for pilot testing. According to Golafshani (2003:41), validity refers to how well the research instrument measures what it sets out to measure. The purpose for pre-testing was to reduce the degree of limitations of certain measures since this study relies on valid, authentic and trustworthy, methods of collecting and presenting information and interpretations.

Measures were taken to enhance design validity for consistency of application. In the instance of this particular study, measurement of validity pertains to the quantitative technique (questionnaire to be administered to learners and teachers). A qualitative technique (where school principals were interviewed) was used to identify the challenges that contribute to the performance of high school learners in Chemistry.

Validity is the degree to which the questionnaire measures what it is supposed to measure (Stenbacka, 2001:552). Reliability ensures that the degree of consistency and accuracy with which a questionnaire measures its variables is maintained. The two instruments (questionnaire and interview schedule) were evaluated for reliability during pre-testing stage.

Validity and reliability are related because:

- A test can be reliable but not valid, but a test cannot be valid without being first reliable (Leedy & Ormrod, 2001:31).

In this study, the researcher used the guidance of the supervisor, co-supervisor and other members of the school to ensure validity and reliability. The research instruments were designed with the literature review in mind. Published articles and

presented papers in accredited journals were acknowledged when preparing the research instruments.

## **1.8 DATA ANALYSIS**

Data analysis is concerned with identifying and analysing data (Gay, 2003:229). Data analysis is the process of bringing order to and unravelling a possibly messy, ambiguous, unstructured and meaningless mass of collected data. Qualitative and quantitative data analyses were used, and data were analysed as follows:

### **1.8.1 Qualitative Data Analysis**

Although time-consuming, data analysis can be a creative and fascinating process. Moreover, qualitative data analysis is primarily an inductive process of systematically organizing the data into categories and identifying patterns among categories. Most categories and patterns emerge from data, rather than being imposed on the data collection (McMillan & Schumacher, 1993:480). Accordingly, since this study utilised interviews, data obtained through interviews were analysed using themes and coding processes that enabled the researcher to identify the sub-themes Strauss and Corbin (1998).

### **1.8.2 Quantitative Data Analysis**

Quantitative data were analyzed using a standard Statistical Package for the Social Science (SPSS) Version 23, thus enabling the results to be widely understood and, where required, duplicated.

## **1.9 DELIMITATION OF THE STUDY**

This study was conducted in the District of Vhembe in three circuits (Sibasa, Luvuvhu and Mvudi) for the selected secondary schools which offer Physical Sciences under Vhembe District in the Limpopo Province.

## **1.10 MODEL DEVELOPMENT AND VALIDATION**

This area of model development and validation of the study was addressed by objective number four (4) which requires a researcher to develop appropriate teaching and learning model for improving teachers' and learners' interest in Chemistry. The framework of Dickoff, James and Wiedenbach (1968:426) was modified to classify the concepts and describe them with six survey list which formed the basis for model development.

## **1.11 ETHICAL CONSIDERATION**

According to McMillan and Schumacher (1993:183), information obtained about the subjects must be held confidential unless otherwise agreed on, in advance, through informed consent. This means that in this study, no one has access to individual data or the names of the participants except the researcher, and the subjects were informed prior to their participation on who will access the data. Confidentiality was ensured by making certain that the data cannot be linked to individual subjects by name.

Permission to conduct research in schools was obtained by means of a letter to the Senior District Manager of the Department of Education in the Vhembe District. In addition, all participants signed a consent form for their participation, which also ensured willingness to participate.

## **1.12 SIGNIFICANCE OF THE STUDY**

According to Creswell (1994:113) the significance of a study lies in how the importance of a study may be described for selected audiences. The study will broaden learners' knowledge, steer their interest towards Chemistry and improve the learning skills of learners and the teaching skills of teachers in various high schools in the study area and South Africa at large. It is hoped that the findings of this study will build a proper link between learners' academic performance in Chemistry in Vhembe District and the quality needed for learner's effectiveness as well as teacher's effectiveness in handling this subject across the country. The Department

of Basic Education will also benefit by having excellent Chemistry teachers and best Chemistry learners from this study.

### 1.13 OUTLINE OF THE STUDY

This study is outlined as follows:

**Chapter 1:** This chapter, introduced the study and stated the focus of the study; it began with background information regarding the problem under investigation.

**Chapter 2:** The purpose of this chapter is to provide the reader with a comprehensive review of the literature related to the problem under investigation based on international perspective.

**Chapter 3:** The purpose of this chapter is to provide the reader with a comprehensive review of the literature related to the problem under investigation based on Chemistry teaching in South African.

**Chapter 4:** This chapter presents the method of research, population of study, sample and sampling procedure, instruments of the research and data collection.

**Chapter 5:** This chapter discusses the data analysis and interpretation of results, as well as the themes that emerged as a result.

**Chapter 6:** This chapter presents a summary of the study and findings, conclusions drawn from the findings, discussion and recommendations for further study.

## CHAPTER 2

### TEACHING CHEMISTRY IN INTERNATIONAL PERSPECTIVE

#### 2.1 INTRODUCTION

This chapter presents the review of the relevant literature to the study. The literature reviewed for the purpose of this study was based on international and national perspectives on the management of high school learners' academic performance in Chemistry. Therefore, this chapter reviewed factors affecting, influence on learners' academic performance and the intervention management strategies that can help to improve learners' performance in Chemistry.

#### 2.2 SCHOOL FACTORS ON LEARNERS' ACADEMIC PERFORMANCE

Several school factors have generally been identified as affecting and influencing high school learners' academic performance. These include availability of school location, school types, laboratory adequacy and practical classes. It is on this awareness that this present study is based on some school factors considered to be influencing learners' academic performance in Chemistry (Oginni, Awobodu, Alaka & Saibu, 2013:1516).

##### 2.2.1 School Location

There is an agreement among psychologists and educationists that a child's environment can put forth considerable influence on his or her intellectual development (Oginni et al., 2013:1516). Based on previous studies, it is believed that there is need to determine the efficiency of school location on learner's learning outcomes in Chemistry. Many authors have explained the prominence of school location which affects the performance of learners particularly in Chemistry (Oginni et al., 2013:1517). In the same tone, Oginni et al. (2013:1517) note that schools located in urban areas were better positioned to attract more quality learners and teachers who display the readiness to take academic business seriously. Oginni et al. (2013:1517) advocate, in their separate studies on school location, that an

improved environment could result in better performance of learners. Furthermore, research work by Orji shows that the environment in which a school is located, in fact, brings about different responses and behaviour from learners (Oginni et al., 2013:1517).

Studies have revealed, for instance, that location of school can affect performance in Chemistry, Mathematics or other science subjects (Oginni et al., 2013:1517). The difference, however, is that unlike preceding studies which suggest that the effect of location is in favour of urban learners, the result in Okonkwo's study suggests the opposite (Okonkwo, 2002:44). This might suggest, according to him, that the effect of location might not be absolute. It was, therefore, part of the thrust of this study to investigate the influence of school location among other factors on learner achievement in Chemistry.

### **2.2.2 School Type**

Children who attended private primary schools generally come into secondary schools more 'ready' for junior secondary school Mathematics and Chemistry than do their public schools counterparts (Okonkwo, 2002:45). Moreover, Okonkwo in his study concludes that some 10 percent (10%) of variance in the subjects' Mathematics scores is uniquely accounted for by the type of school, after the location effect had been statistically controlled for. The notion that pupils in private primary schools are better academic achievers than their counterparts in public primary schools is dependent on the assumption that private schools are adequately equipped with human and material resources and that those resources are channeled towards some purposeful educational objectives authoritatively (Okonkwo, 2002:45).

### **2.2.3 Laboratory Adequacy**

The place of laboratories in science teaching is not a neglected issue (Oginni et al., 2013:1517). Several studies of the social interactions within which lessons in the laboratories are constituted also exist (Oginni et al., 2013:1517). Oginni et al. (2013:1517) found significant association between the nature of the Chemistry

laboratory classroom environment and the learners' learning outcomes; they uncover several interesting high school pedagogical experiences that appear to be linked with varying laboratories for understanding associated with higher learners' grade. Overemphasis on laboratory procedures in high school Chemistry is associated with lower grades in college. These results suggest that high school teachers' pedagogical choice may have a link to future learners' performance.

Tai, Sadler and Loehr (2005:988) also affirm that learners report more instances of repeating laboratory tasks to enhance their understanding, and they earn higher Chemistry grades than their peers who report few or no instances of repeating laboratory tasks for understanding. They emphasize, therefore, that laboratory work holds greater promise in helping to prepare learners for higher level studies. Oginni et al. (2013:1517) further state that where there are little resources, they are not usually in good condition while the few ones that are in good condition are not enough to go round those who need them. This poses a great challenge to government on the need to raise the funding for schools where science subjects such as Chemistry are being offered. This is because where the materials are not available in large quantities to meet the demand, effective teaching and learning in science, especially Chemistry which is the mother of sciences, becomes very difficult (Oginni et al., 2013:1517). In this case, only the most creative, resourceful, committed and dedicated Chemistry teachers can resort to improvisation of scarce resources. Effiong-Edem (2001:205), in his study, is of the view that to avoid the prospects of a possible negative background, there should be provision of adequate Chemistry laboratories and equipment. This study, therefore, probed more into this.

#### **2.2.4 Practical Classes**

Frequency of practical classes is also an important school factor since scientific process skills such as observation and prediction involves "doing" and doing means practical activity. According to Oginni et al. (2013:1517) and Kokaia (2015) it is assumed that frequent use of Chemistry laboratory for practical lessons by the teacher can translate chemical knowledge to the understanding of scientific facts, laws and theories. Learners' Acquisition of Practical Skills with reasonable accuracy in laboratory-based teaching in the heart of experimental subjects like Chemistry

(Oginni et al., 2013:1517 and Kokaia, 2015) outweighs other methods of Chemistry teaching. This is to show that the efficacy of frequency of practical teaching to unravel the mystery behind perception of Chemistry concepts is not in doubt (Oginni et al., 2013:1517).

Oginni et al. (2013:1518) and Kokaia (2015) observe that the “talk and chalk” method hardly increased learners’ enthusiasm and interest. It is observed that learners “develop conceptual understanding through engagement in hands-on-activity”. This has been a major emphasis of Piagetian constructivism, it assumes that learners are exposed to a variety of hands-on-experiences where they understand what they do and are able to construct new level of understanding. It demands active involvement of learners to reflect on their learning, make inferences and to experience conflict. When this happens, learners become aware of their own cognitive process a situation with Garner refers as metacognition.

Furthermore, learners’ reactions to practical work often confirm the view of critics in that learners find that Chemistry laboratory classes are boring and that they go through the motion of experimentation without stimulation and often without any clear purpose. Nonetheless, since research has not been comprehensive, we simply do not know enough about the effects of Chemistry laboratory instruction upon learners’ learning. Laboratory work is an accepted part of Chemistry instruction (Oginni et al., 2013:1518).

### **2.3 TEACHERS AS FACTORS IN LEARNERS’ ACADEMIC PERFORMANCE**

Scholars and researchers generally agree that the teacher factors, which include teacher qualification and administration, perform a more critical role in educational achievement than other factors (Kosgei, Mise, Odera & Ayugi, 2013:76). Teachers’ practices influence their learners through their instructional practices. Teachers should have and apply specific skills without which their practice may not be reflected in their learners’ performance in the subject Chemistry. For learners to be able to make a connection between what is taught in school and its application in problem solving in real life, the Chemistry teacher has to be effective in his/her teaching of Chemistry. There has been consensus on the importance of specific

teacher factors, leading to the common conclusion that the existing empirical evidence does find a strong role for teachers in the determination of academic achievement (Kosgei et al., 2013:76). This study, therefore, relates perfectly to the importance of teachers' factors on learners' academic performance in Chemistry.

The school management is entrusted with the leadership and supervision of classroom instructions, with an aim of transforming theories into practice in order to achieve the school goals (Babalola & Hafsatu, 2016:29). In this regard, teaching is observed as a triadic process which involves the teacher and the learner involving in the activities of discussing the Chemistry subject matter. Why is there poor academic performance? This question has caused a lot of arguments among educational scholars. Many of them posit that the problem is from the teacher-related factors such as lack of motivation, the professional nomenclature, unqualified teachers, and lack of interest in teaching and poor teaching methodology.

### **2.3.1 Teacher Qualification**

According to Abe (2014) the quality of education of a nation could be determined by the quality of her teachers. The most important factor in improving students' achievement is by employing seasoned qualified teachers in all schools (Abe & Adu, 2013).

The question remains, who are these qualified teachers? Kosgei et al. (2013:77) define a well-qualified teacher as one who is fully accredited and holds the equivalent of a major in the field being taught. Although the formal qualification of teachers is an important indicator for their knowledge and competence in teaching, it has only limited utility in analysing how well-prepared teachers are for what they have to teach in schools. More detailed knowledge of the courses they have taken during their training needs to be compared to the actual content and skills required to teach the high school's curriculum. Kosgei et al., (2013:77) refer to teacher qualification in two ways – traditional and alternative qualification routes. Traditional certification is when an individual completes an undergraduate degree or postgraduate program in education. Alternative routes of certification are based on coursework in pedagogy and subject area without a degree in education. Kosgei et

al. (2013:77) cite short-term activities such as mentoring, peer evaluations and workshops as ways other than formal qualifications for improving teaching. More often, graduates teachers with first degree content go into teaching if they cannot find another job right away. Although they often get somewhat lower salary than a fully qualified teacher, they choose not to enroll in the one-year Post-Graduate Professional Training (PGPT) and therefore lack a basic foundation for teaching (Kosgei et al. 2013:77).

Haider and Hussain (2014:466) found that “a large number of factors affect the achievement or success interaction of learners”. In Dunn, Giannitti, Murray and Rossi (1990) and Duke (2002) as quoted by Cardoso, Ferreira, Brantes, Seabra and Costa (2011) learning performance is commonly associated with a more positive attitude toward the environment, namely subjects and teachers. They go on and state that it is believed that when students have more positive attitudes toward learning and instruction they are more likely to get a higher academic achievement.

In addition to what has been stated before, teachers’ academic and professional qualification, experience, age, assessment interval, training, and many other factors all affect learners’ learning discourse, and all should function properly for the quality of education. In many studies, the effect of teachers’ qualifications on learners’ learning performance has been estimated and several efforts were made to determine whether teachers’ qualifications might have any direct or indirect effect on learner performance. It is also important to indicate that the relationship between teacher characteristics (both qualifications and demographic characteristics) and student performance is important. Ensuring that teachers who are best suited and most able to enhance student performance are employed (Amstrong, 2015).

According to Centre for Public Education (2017) research consistently shows that teacher quality, whether measured by content knowledge, experience, training and credentials, or general intellectual skills is strongly related to student achievement: in other words, simply, skilled teachers produce better student results.

Haider and Hussain (2014:466) have found a positive relationship between teachers’ qualifications and content knowledge with learner performance. Many studies have

noticed that teachers' academic and professional qualifications have a significant effect on learners' performance (Haider & Hussain, 2014:466). Teachers continuously learn from one another, so any negative effect associated with low-quality teaching might be minimized if other fellow teachers are cooperative in sharing valuable knowledge and expertise. According to Haider and Hussain (2014:466) a great number of researchers show that without proper and continuous learning of teachers, instructors, and school employees, no one can attain high levels of achievement. Haider and Hussain (2014:466) state that in the teaching profession, providing high-quality teachers with higher qualifications is more important than anything else, and it can only be possible by preparing them professionally and improving their working condition.

A teacher's qualification shows the educational attainments of the teacher. Many studies have examined which qualification of teachers positively relate to learners' performance. Teachers having a higher qualification or those with an advanced degree in their teaching subject have a positive effect on learner achievement (Haider & Hussain, 2014:466 and Abe, 2014). Haider and Hussain (2014:466) claim that a large number of school teachers are not well qualified in schools. They suggest that well qualified teachers always make significant difference, and their learners are impartial, tolerant, adoptable and challenging. Therefore, it proves that there is a positive relationship between learner performance and teacher qualifications. However, the teaching force is not only governed by the qualifications; many other factors such as teaching skills, pedagogical knowledge, experience, training, assessment interval, dedication, and commitment to the profession also have a great influence on the performance of learners (Haider & Hussain, 2014:466 and Abe, 2014).

The professional qualification of a teacher ensures that the individual has the required knowledge and skills to instruct learners. Moreover, it is curved to save parents and learners from harm by pointing out which teacher does have and does not have required qualities to teach learners. "Professional qualification of teachers also contributes to learners' performance because professionally qualified teachers can teach and guide skilfully compared to less professionally qualified teachers" (Haider & Hussain, 2014:467). In every profession, practitioners must possess a

license in order to start practicing. Unfortunately, no such compulsion is placed within the education profession; thus, due to this reason, some with no qualifications are legally employed as teachers.

According to Haider and Hussain (2014:467) a large number of teaching standards support claim that professional qualifications and academic specialization were positively associated with increased gain in learner's performance while the opponents declare that available research does not support this assertion. Much recent work state that professional qualification of teachers does not have any effect on learner performance, but do raise huddles, preventing qualified candidates from entering into this profession (Haider & Hussain, 2014:467). The same findings are found in the study of Rowan by Haider and Hussain (2014:467) in which a small-scale research was conducted on the impact of teachers' professional qualifications on the performance of elementary school learners; results revealed no discernable effect.

According to Braun (2005); McCaffrey, Lockwood, Koretz, Louis and Hamilton (2004); Sanders (2000) and Sanders and Rivers (1996) among the teacher related factors, teacher's academic and professional qualification are shown as factors that affect learner performance.

Another factor is teachers' professional development or in-service training which also contributes significantly. Haider and Hussain (2014:467) and Saleem and Zamir (2016) state that teachers' in-service training mainly relates to the opportunities provided to practicing teachers to enhance their skills, knowledge, and innovative approaches to improve their instructional effectiveness in the classroom situation.

Haider and Hussain (2014:467) and Badu, Owusu-Oboateng and Saah (2009) argue that complex challenges involved in the education process, such as diversity of learner production, innovation in technologies, and rigorous academic standards in the teaching-learning process, give rise to the need of continuous in-service training. Haider and Hussain (2014:467) point out that there is a need of continuous teacher training in a teacher's career.

The importance of professional development is evident in the report of the European Commission (EC) (2000), in which, 16 (sixteen) indicators of quality teaching were discussed, and continuous teacher training was among one of them. Haider and Hussain (2014:467) suggest that in-service training that is rooted in subject matter and student learning put a significant effect on learner performance. Many studies indicate that teachers' in-service training can improve learner performance when it caters for the needs of learners' subject matter learning, instructional practice, and their understanding of content of knowledge.

Recent research reports which indicate learners' high level of performance is directly associated with teachers' opportunities to participate in sustainable professional development (Wayne & Young, 2003:89). There is a common assumption that learners who are taught by teachers who undergo continuing teacher perform better.

In the view of Haider and Hussain (2014:467), teachers' qualifications, in-service or professional training and experience are all very important for learner performance. Some research expresses that a teachers' years of experience positively relate to learner performance. More teaching experience is thought to be more effective for learner performance. Hanushek, Rivkin and Kain (2005:24) also supported this concept that "learners taught by experienced teachers perform better than learners of inexperienced teachers". Haider and Hussain (2014:467) found that "Many studies have been agreeing in finding positive correlation between learners' high level of performance and teaching experience". In different studies, teachers' five or more than five years of experience were proved effective in teaching while less or inexperienced teachers proved to have a negative effect on learner performance.

Pedagogical knowledge (PK) or knowledge about the different teaching methods equips teachers with numerous techniques associated with efficient teaching focusing on learners' learning outcome. Myalla (2014) emphasizes the importance of knowledge of the subject matter. "A teacher can't teach what he/she doesn't know". All teachers need not be experts in their fields, but possessing knowledge is important. Many educational experts believe that 5-8 years are required to acquire the knowledge of teaching methodology to reach the expert stage. Deep knowledge

of teaching strategies has always been associated with better lesson planning and implementation in the classroom (Haider & Hussain, 2014:467).

### **2.3.2 Lack of Motivation**

Babalola and Hafsatu (2016:29) posit that once a staff is properly motivated and held in high esteem by management, efficiency at the workplace would be guaranteed, and this will, in turn, accelerate overall growth and development. Babalola and Hafsatu (2016:29) indicate that teachers tend to remain contented and reasonably motivated as long as salaries are paid on time, and they are promoted regularly. Babalola and Hafsatu (2016:29) found that prompt payment of salaries induced greater commitment to teaching.

### **2.3.3 Professional Nomenclature**

Babalola and Hafsatu (2016:30) indicate that teachers, therefore, feel that society is trivializing the profession and so, their commitment is undermined. Therefore, another major source of teacher dissatisfaction arises from disparities between the teaching profession and other professions, with respect to the time and mode of payment of salaries, fringe benefits, promotion prospects and working conditions (Babalola & Hafsatu, 2016:30). This resulted in an inferiority complex among teachers, and they are so ashamed to be called “Teachers”. It is a fact that nowadays, teachers prefer to be given another nomenclature such as academics, educationists or educators rather than “*teachers*”. This is due to the social status accorded the teaching profession in our society.

### **2.3.4 Unqualified Teachers**

Owolabi and Adedayo’s (2012:75) findings show that professional teachers affect the learners’ performance positively more than the unprofessional teachers. The professional teachers’ background training in education is the bane behind this clear-cut differences. Owolabi and Adedayo (2012:75) remark that the success of any educational enterprise depends largely on the availability of professional teachers.

This is possible because trained teachers have been taught the technical knowhow of effective teaching.

According to Khan, Kwaghe and Philip (2015:164) teachers are unqualified, apathetic, uncommitted, uninspired, lazy, unmotivated, and immoral and anti-social, the whole nation is doomed; if they are ignorant in their discipline and share the wrong information, they are not only useless but dangerous. Therefore, the kind of teachers trained and posted to schools may well determine what the next generation will be like. This research serves as a springboard to validate relationship between skills acquisition of teachers and the academic performance of learners.

### **2.3.5 Teachers' Attitude**

Attitude is a hypothetical construct that indicates an individual's likes and dislikes towards an item. It may be positive, negative or neutral. Attitude is an approach, temperament, sensation or situation with regard to a person or thing: inclination or course, especially of the mind. Attitude is a way of looking at things (Khan & Ali, 2012:165). An attitude may be defined as a pre-disposition to respond in a favourable or unfavourable manner with respect to a given attitude object (Khan & Ali, 2012:165). Every science teacher (Chemistry) considers the development of positive attitude towards Chemistry subjects as his centre and responsibility (Cheung, 2009:2185). Yara (2009:336) argue that a teacher's attitude and method of teaching can greatly influence the learners' attitude. A number of factors have been identified as related to learners' attitude towards Chemistry. Such factors include: teaching methods, teacher attitude, influence of parents, gender, age, cognitive style of pupils, career interest, and social implication of Chemistry and achievement (Adesoji, 2008:22).

Yunus and Ali (2013:2) state that teachers' feelings and attitudes about science can affect their learners' feelings and attitudes. Learners who reported having positive experiences during their science class are said to be influenced by their teachers' positive attitudes towards science. This is proven by research done by Yunus and Ali (2013:2) which reports that learners' positive attitude is influenced by the teachers' enthusiasm, effectiveness in teaching and presentation on experiments. In

accordance to Yunus and Ali (2013:2) the attitude of learners towards Chemistry is formed at an early age. At an early age, parents and teachers can observe the learner's attitude towards science. When the child shows negative attitude in learning Chemistry, parents and teachers can take necessary actions to make him/her to develop a positive attitude towards science.

The Chemistry syllabus and content are other factors that contributed towards learners' negative attitude to Chemistry. Learners dislike Chemistry because of the amount of information they have to learn as well as the amount of time spent writing in Chemistry classes (Yunus & Ali, 2013:2). According to Jegede (2007:193) and Edomwonyi-out and Avaa (2011:2) a lot of learners state that Chemistry is too broad for them to learn in a short time. Learners find it a bit difficult to learn Chemistry because of its cramped syllabus. Learners who truly want to learn will have little problem grasping the concepts. However, weak learners will find Chemistry exceedingly dull and dreary. Peers and other learners can also influence the learners' attitude in Chemistry. Other learners' opinions on Chemistry can affect learners' attitude in learning Chemistry (Yunus & Ali, 2013:3). If the majority of the learners in a school have a poor attitude and opinions in Chemistry, other learners are likely to have the same reaction towards the subject. Mostly, learners complain about the course content. They complain that Chemistry is too difficult and takes a lot of time to study because of the weight of information the subject has (Yunus & Ali, 2013:3). Knowing the basics and schemata of the subject is crucial to succeed. The use of a variety of teaching styles and methods can raise the learners' attention and interest in Chemistry. Teachers who fail to use an engaging teaching style during Chemistry class will lose the learners' attention as they can easily get bored.

Some teachers find engaging teaching as a challenge because it is quite difficult to cater for each and every learner's needs. When teachers put more effort in their teaching style, and are concerned about the learners' needs, this may boost the learners' positive attitude towards Chemistry.

Positive attitude towards Chemistry denotes interests or feelings towards studying Chemistry. Positive attitude hand in hand with academic performance are important outcomes of Chemistry education in secondary schools. Learners'

attitudes and interest could play substantial role in learners' decision to study Chemistry (Najdi, 2013:2). Learners' attitudes towards learning Chemistry fuelled many study projects for a long time; in the late 1980s, there was a significant decline in Chemistry education, and towards the turn of the century, the issue of attitudes towards an interest in Chemistry became an international concern; recent publications presented a gloomy picture regarding learners' ignorance in Chemistry, and decline in enrolment in science-based careers (Najdi, 2013:2). A small percentage of learners (about 4%) express the wish to study Chemistry at the University level (Salta & Tzougraki, 2004: 536). Cheung (2009:76) mentions that a thorough and comprehensive review of the literature that he found, over the years, only nine studies (until the year 2009) have examined learners' attitudes towards how Chemistry is taught in secondary schools.

Different attitudes have been investigated by many educational researchers. Najdi (2013:2) mentions that a positive attitude to learn Chemistry benefits all young learners by fostering their chemical perceptions, which is the capability to recognize chemical concepts, define some key-concepts, identify important scientific questions, their understanding of chemical concepts to explain phenomena, their knowledge in Chemistry to read a short article or analyse information provided in commercial adverts or internet resources. Najdi (2013:2) further defines attitude as a pre-disposition to respond in a favourable or unfavourable manner with respect to a given attitude object. Yara (2009:336) states that attitude in science (Chemistry) focuses on scientific approach assumed by an individual for solving problems, assessing ideas and making decisions. It is learners' beliefs and attitudes that have the potential to either facilitate or inhibit learning.

Najdi (2013:3) has found that there is a negative attitude regarding the usefulness of the Chemistry courses for the learner's future career, and a neutral attitude regarding the interest in the Chemistry course itself. Science teachers bear a huge responsibility of promoting and developing learners' positive attitudes regarding Chemistry as a school subject on their shoulders (Najdi, 2013:3). There is a relationship between attitude and methods of instruction and between attitude and performance; it is possible to predict performance from attitude (Adesoji, 2008:21).

## **2.4 LEARNERS AS FACTORS IN ACADEMIC PERFORMANCE IN CHEMISTRY**

Several learners' factors have generally been identified as influencers of their academic performance. These include learners' attitudes and learners' anxiety which affect management of high school learners' academic performance in Chemistry.

### **2.4.1 Learners' Attitude**

Some studies show that the learners who have more positive attitudes towards Chemistry are more likely to be successful in Chemistry classrooms (Kamal & Muideen, 2013:36). The relationship between attitude and achievement is influenced by contextual factors, including classroom organisation, teacher authority, the nature of classroom academic tasks, and evaluation structure. These contextual factors may serve to strengthen the relations between attitudinal constructs and Chemistry learning as well as to weaken those (Kamal & Muideen, 2013:36).

According to Kamal and Muideen (2013:36) learners' positive Chemistry learning experiences affect their attitudes positively, increase their motivation for Chemistry learning, and as a result, lead to higher achievement in Chemistry. Learners also have different attitudes toward different domains of science: Physics, Chemistry and Biology (Kamal & Muideen, 2013:36). Teachers are invariably role models whose behaviours are easily mimicked by learners. What teachers feel about their learning or studies could have a significant effect on the learner. It is important to note that the various dispositions that teachers display at work show their devotion. This has greatly affected the attitude and in a particular, the learning of Chemistry, hence learners' poor performance in the subject. Many have no mastery of the curriculum content, and their organizational skills are highly detestable. Teachers' effective reactions to work are not as good as they should be in many schools, yet teachers are looked upon as instruments of social engineering, progress and change (Kamal & Muideen, 2013:36).

Ogembo et al., (2015:39) opines that learners' attitudes about the value of learning Chemistry may be considered as both an impact and outcome variable because their

attitudes towards the subject can be related to educational achievement in ways that reinforce higher or lower performance. This means that those learners who do well in a subject generally have more positive attitudes towards that subject, and those who have more positive attitudes towards a subject tend to perform better in the subject (Ogembo et al., 2015:39). Studies carried out have also shown that teachers' method of teaching Mathematics and their personality greatly accounted for the learners' positive attitude towards mathematics and that, without interest and personal effort in learning mathematics by the learners, they can hardly perform well in the subject (Ogembo et al., 2015:40).

Learners' attitude towards the learning of Chemistry is a factor that has long attracted the attention of researchers. Ogembo et al. (2015:40) asserted that in spite of realisation of the recognition given to Chemistry among the science subjects, it is evident that learners still show negative attitude towards the subject, thereby leading to poor performance and low enrolment. Learners' academic performance in Chemistry is a function of their attitude (Ogembo et al., 2015:40).

According to Yunus and Ali (2012:296) attitude is the way learners behave and think. However, the attitude is not static because attitudes can be changed depending on the individuals. Learners who have bad attitude can change their attitude by identifying their problem. When the problem is identified, the attitude can be corrected. In a classroom, teachers can identify attitude of learners by observing their behaviour. Learners who always complete their homework and ask question during Chemistry class are said to show positive attitudes in learning Chemistry (Yunus & Ali, 2012:296). Learners who are reported to have positive experiences during their Chemistry class were said to be influenced by their teachers' positive attitudes toward Chemistry. It can be interpreted that when teachers are enthusiastic in teaching the Chemistry subject, the learners will also be enthusiastic towards the subject. When the learners show negative attitude in learning Chemistry, parents and teachers can take necessary action to make the learners have positive attitude towards Chemistry (Yunus & Ali, 2012:296).

### 2.4.2 Learners' Anxiety

Chemistry anxiety is described as involving feelings of tension and anxiety that interferes with the manipulation of scientific equipment in a wide variety of ordinary life and academic situations. Chemistry anxiety can also be described as a state of discomfort which occurs in response to situations involving scientific tasks which are perceived as threatening to the self-esteem (Woldeamanuel, Atagana & Engida, 2013:29). Such feelings are shown to lead to panic, tension, helplessness, fear and loss of ability to concentrate (Woldeamanuel et al., 2013:29). It has been observed that most learners fear Chemistry and perceive Chemistry as difficult to understand, which may be as a result of the abstract nature of Chemistry and the method being used by most Chemistry teachers. Learners' anxiety for Chemistry learning can also be attributed to perception that Chemistry is difficult, as it involves multitude of facts, and its disconnection from reality (Woldeamanuel et al., 2013:29). Learners' anxiety for Chemistry learning leads to loss of interest in the sciences (Woldeamanuel et al., 2013:29). In spite of the long existing fear and its effects on the subject, researchers have done little on the basic psychological factors that could generate and minimise such anxiety.

Anxiety is one of the fundamental sensation of human beings. It is a negative mood state characterised by bodily symptoms of physical tension and by apprehension about the future (Kaya & Yildirim, 2014:518). Kaya and Yildirim (2014:518) report that anxiety has detrimental effects on learners in the classroom. Anxious learners are more likely to have difficulties in learning. Science anxiety is a fear of aversion towards science concepts, scientists, and science-related activities (Kaya & Yildirim, 2014:518). In other words, it is a debilitating interaction of emotions (fear) and cognition (Chemistry learning) because there is a correlation between learners' feelings and their ability to understand the subject matter (Kaya & Yildirim, 2014:518).

The causes of Chemistry anxiety might be "past unpleasant experiences in Chemistry classes, exposure to science-anxious teachers, lack of role models, gender and racial stereotyping and the stereotyping of scientists in the popular media" (Kaya & Yildirim, 2014:518). In addition, the mismatch between teaching

methods used in Chemistry, subjects and learners' level of intellectual development might give rise to Chemistry anxiety. Learners who have Chemistry anxiety usually panic in examinations in science subjects. However, these learners may be calm and productive in their non-science subjects. With this property, Chemistry anxiety differs from general test or performance anxiety (Kaya & Yildirim, 2014:518).

Many studies indicate that there is an inverse relationship between grades and anxiety. That is, learners with high grades have low anxiety and vice versa. Kaya and Yildirim (2014:518) conducted a study to measure anxiety levels among college learners enrolled in an introductory Chemistry course. They found that the anxiety for Chemistry between those learners who are successful and those who are less successful become significantly different as a function of time spent in the course. He also found that no significant difference in Chemistry anxiety between males and females. Kaya and Yildirim (2014:518) also examined the relationship among Chemistry anxiety, success in Chemistry and teacher behaviours such as expectation clarity, elitism and instructional difficulty in 1622 science learners from 86 secondary classes and found that student perceptions of teacher behaviour were related to learner science anxiety.

Kaya and Yildirim (2014:518) conducted a study to investigate the factors affecting science anxiety, as a follow up study to Mallow's work (1994:227) and the exposure to one semester of Chemistry as a factor affecting anxiety. The results of their study show that non-science and gender were found as the main contributors to Chemistry anxiety. Kaya and Yildirim (2014:518) investigated Chemistry anxiety of a cohort consisting mostly of non-science majors taking a variety of science courses. They used Chemistry Anxiety Questionnaire as an instrument. The results of multiple regression analysis indicate that non-science anxiety is the best predictor of Chemistry anxiety; gender is the second predictor of Chemistry anxiety.

They also found statistically significant levels of Chemistry anxiety in humanities and social science learners of both males and females, and gender differences in Chemistry anxiety. They pointed out that the number of females who had Chemistry anxiety were higher than the number of males who had Chemistry anxiety. While there is a good amount of literature on anxiety in general and on ways of reducing

anxiety, there are not many studies specifically on the sources of Chemistry anxiety. The studies on Chemistry anxiety specifically focused on gender difference in Chemistry anxiety (Kaya & Yildirim, 2014:519). Particularly, studies explaining sources of Chemistry anxiety in-depth are rare (Kaya & Cetin, 2012:91).

#### **2.4.2.1 Forms of Learners' anxiety**

Anxiety can be generated on the part of the teacher if he is not certain of the prospects of his line of thought. It is therefore, a key factor in any endeavour because it affects one's ability to endure, concentrate and perceive. It has been observed that many learners fear Chemistry, and such fear is characterised by mass disenchantment among the learners towards the subject. The end product is declining popularity of the subject over the years.

#### **2.4.2.2 Causes of learners' fear**

South African Assessment Report's (SAAR) (2000:36) findings state that the use of unqualified and under-qualified teachers has the tendency to influence teaching negatively with its implication on performance. The learners held the popular notion that the subject is too wide, demanding and rather cumbersome; some of them fear Chemistry because it demands too much calculation while others are of the opinion that it is difficult to understand chemical equations and arithmetic. Learners reveal that there are more failures in Chemistry examinations than passes. Furthermore, other learners say they are scared of Chemistry practical (Jegede, 2007:194).

#### **2.4.2.3 Impact of gender on learners' disposition of anxiety**

Some researchers including Jegede, on the same topic reveal that female learners show more fear or anxiety towards the learning of Chemistry than their male counterparts. The major problems of males centred on the wide syllabus, ill-equipped laboratories, lack of exposure to practical, lack of exposure to excursions and fieldtrips and strictness of the teachers (Jegede, 2007:195). Females are mostly scared of the broadness of the syllabus, too much calculations, and more failure than passes, job opportunities, quality and methodology of Chemistry teachers (Jegede, 2007:195).

#### **2.4.2.4 Impact of school location on learners' anxiety**

A critical analysis of rural and urban learners' attitudes towards the learning of Chemistry shows that learners in rural areas register more fear in learning Chemistry than their counterparts in urban areas (Jegede, 2007:195). Learners in the rural areas are anxious for job opportunities, wide coverage of the syllabus, lack of exposure, teacher's qualities and methodology and more failures than passes. On the other hand, urban learners registered their anxieties in too many calculations, more failure and too wide a syllabus (Jegede, 2007:195).

### **2.5 FACTORS INFLUENCING ACADEMIC PERFORMANCE OF LEARNERS IN CHEMISTRY**

In developed and developing countries school principals, as the leaders, are influential people who can make change in their schools or institutions, take responsibility for technology change and enhance curriculum implementation in their schools due to their position of authority (Ejideke & Oyelana, 2015:606). In countries such as Nigeria, with the take-over of schools from principals by the government due the introduction of free education, schools now depend solely on the government for the provision of funds. Inadequate funding has contributed to inadequate facilities and resources required for the successful implementation of school curriculum (Ejidike & Oyelane, 2015:606).

#### **2.5.1 Influence of Effective Teaching of Chemistry**

The physical condition of classroom and laboratory, instructional arrangement and school management influence the effective teaching of Chemistry which, in turn, plays a vital role in the lives of the learners as it affects their performance (Ejidike & Oyelana, 2015:606). The good looking physical condition of classroom and laboratory at time represent the presence of good ventilation, availability of good chalkboards, preparatory room, enough chairs and tables, charts and a clean environment.

According to Owoeye and Yara (2011:65) there are other factors than good looking physical condition of classroom and/or laboratory. They include the presence of

instructional materials in the laboratory such as apparatus and chemicals. The school and classroom management is another vital factor that may be considered before anticipating a good result. The school management's responsibility includes positioning of the school laboratory, school library and provision of essential services like water supply, light, food, vendors, counsellor services and first aid services (Owoeye & Yara, 2011:66).

A lot of concern has been shown on the inadequacy of science laboratories in South African schools. Laboratories play a central role in science education, and science educationalist have suggested that rich benefits in learning is accumulated from using laboratory activities (Ejidike & Oyelana, 2015:606). The science laboratory is a setting in which learners can work supportively in small groups to investigate scientific occurrences (Aina, 2012:33).

To achieve the desired objective of effective teaching of Chemistry in secondary schools, operational chemistry laboratory equipment has to be provided, but it is disheartening to note that most schools do not have functional laboratories. Ejidike and Oyelana (2015:606) observe that infrastructure is often stressed as a result of the insufficient or incomplete laboratory equipment in most of the public primary and secondary schools, both in the urban and the rural areas.

Harry (2011:34) indicates that even though laboratory activities breed interest in learners' attitude in science education, it does not warrant realization of the goal of science teaching and learning, rather the combination of all the teaching and learning methods should be used for the variation in the learners. According to Ejidike and Oyelana (2015:607) learner activities are completely neglected. Practical classes are not held according to schedule, but according to how convenient it is for the teachers.

## 2.5.2 Influence of In-service Training of Chemistry Teachers

In-service Training is a professional development program or training which enriches the skills of the full-time worker needed to carry out their normal duties with a view of becoming more efficient on the job (Pereira, Ferreira, Silva, Afonso & Barreiro, 2013). In-service training is programme aimed at the provision of updating, improving, conversing and supporting teaching professionals along their careers; the training actions can be drawn by schools, according to the needs of their teachers or, simply, result from the individual teacher initiative (Ejidike & Oyelana, 2015:607).

Continuous teacher training is the cornerstone of improvement and transformation in schools for personal growth and professional development (Ejidike & Oyelana, 2015:607). In-service training can be in the form of on-the-job training, workshops, post qualification courses, formal or informal, structured or unstructured (Ejidike & Oyelana, 2015:607). In-service on the job education creates a conducive environment for further learning which exposes the workers to new development and ideas in their area of study. It could also be refresher courses which make the professional not to lose grip with their skills, attitude or knowledge (Ejidike & Oyelana, 2015:607). In some cases, the reward for such training usually leads to a new rank or the acquisition of better and higher status; hence, absence of this training affects the teachers in delivering of their duties effectively.

The importance of in-service training and professional development of teachers has been given serious thought and effort. Ejidike and Oyelana (2015:607) conducted a study on teacher education, school effectiveness, improvement and stressed that teachers require professional knowledge and professional teaching skills, as well as a broad base of general knowledge in order to carry out instructional processes effectively. Okoro (2011) further suggests that teachers should be both academically and professional trained.

According American Chemical Society (ACC) (2012) higher academic qualification and professional training improves teacher effectiveness on the job. It is a source of enthusiasm and devotion to teach and help them understand learners better than untrained teachers. Chemistry teachers must adopt the stance of lifelong learning

and be willing to collaborate and share their expertise with other education and science professionals. Professional development should encompass disciplinary content knowledge, pedagogical content knowledge, and how students understand content knowledge. Education research finds that the most effective professional development is sustained throughout the teacher's practice, teacher led, and focused on improved student learning.

### **2.5.3 Influence of Teachers' Attitudes on Learners Motivation**

Educationists and employers know that it is essential to motivate learners and employees so that they can work hard to produce good results in whatever they do (Ogembo, Otanga & Yaki, 2015:39). Teachers' attitude and motivation play a pivotal role in the teaching and learning process as well as in shaping the classroom environment which has an impact on a learners' self-efficacy which in turn influences learners' behaviour. According to Ogembo et al. (2015:39), although Chemistry teachers may have positive attitudes, they are beset with problems that frustrate their efforts to teach effectively and efficiently. Teachers play a significant role during the learning process and can directly or indirectly influence learners' attitudes toward Chemistry which, in consequence, can influence learners' achievement. Teachers are, invariably, role models whose behaviours are easily mimicked by learners. What teachers like or dislike, appreciate or disapprove and how they feel about their learning or studies could have a significant effect on their learners. By extension, how Chemistry teachers teach, how they behave and how they interact with learners can be more paramount than what they teach (Ogembo et al., 2015:39).

### **2.5.4 Influence of Chemistry Syllabus and Content**

The Chemistry syllabus and content are other factors that contribute towards learners' negative attitude towards Chemistry. It is assumed that learners dislike Chemistry because of the amount of information they have to learn as well as the amount of time spent for writing in Chemistry classes (Yunus & Ali, 2012:297)

Yunus and Ali (2012:297) further state that a lot of learners are of the opinion that Chemistry is too broad for them to learn in a short time. Learners find it a bit difficult

to learn Chemistry because of its cramped syllabus. Chemistry teachers claim that they have to make extra classes to cover all of the chapters in the syllabus. This issue is challenging to both learners and teachers. Teachers indicate that they do not have enough time to teach and make learners to fully understand Chemistry, concepts during the normal school time. Thus, extra time and energy have to be given to teach Chemistry to the learners.

Brilliant learners will have little problem grasping the concepts. Weak learners will find Chemistry difficult. In order to make learners who have positive attitude in learning Chemistry, people who are around them such as teachers and parents, have to give opportunities and time to engage with the processes and the procedures of Chemistry (Yunus & Ali, 2012:297). Teachers and parents are very influential in the learners' development.

### **2.5.5 Influence of Peers and Parents on Learners' Performance**

Parents have influence in their children's learning Chemistry. Beside parents, peers and other learners can also influence the learners' attitude in learning Chemistry (Berg, Bergendahl, Lundberg & Tibell, 2003:351). Other learners' opinions on Chemistry can affect learners' attitude in learning Chemistry (Yunus & Ali, 2012:297). This is because learners are easily influenced by people of their own age. If the majority of learners in a school have a bad attitude and opinions in Chemistry, other learners are likely to have the same reaction towards the subject. Most of the time, learners complain about the subject content. They complain that Chemistry is too difficult and takes a lot of time to study because of the weight of information the subject has (Yunus & Ali, 2012:297). When a lot of learners complain about the same thing, other learners will have a negative attitude in their mind, which can influence their attitude towards learning Chemistry.

Previous bad or negative experiences with Chemistry can also affect the learners' current approach towards learning Chemistry. Apart from that, learners' assertiveness in mathematics has a connection to their approach in learning Chemistry (Berg et al., 2003:351). Similar to mathematics, Chemistry also involves the understanding of concepts and calculations. Learners who are good in

mathematics may grasp the concepts of Chemistry better than learners who are not good in mathematics. Learners with a negative assertiveness towards Chemistry may not grasp the concept of Chemistry because they do not see the relevance of their interest area (Yunus & Ali, 2012:297).

## 2.6 APPROPRIATE TEACHING AND LEARNING STRATEGIES

In the teaching of Chemistry, teachers are expected to have a good level of competence and mastery of the subject before introducing it in the classroom. This enhances effective teaching of the subject in the secondary schools. Teachers need to develop the interest and attitude of learners with regard to the subject through his/her method of teaching De Jong, Driel and Verloop (2005) and (Hannah, 2011:236). Teachers, as experts who have good exposure and experience in Chemistry, are expected to foster the adjustment of learners, matching curricular offerings to levels of mental development, understand learners' basic cognitive and social problems, make curricular specifications relevant and motivate the learners to learn the subject.

Okpala (2006:158) is of the opinion that, to be effective, the teacher should be: a source of information and a guide, an organizer of opportunities for learning, someone who can structure a suitable environment for learning, a superior and a consultant. The teacher has to be aware of the current innovation in teaching so as to determine the most suitable method for a particular situation. The method used in teaching either promotes or inhibits learning. Chemistry as a subject most learners are afraid of, teachers must use appropriate methods so as to arouse the learners' interest and encourage them to develop positive attitude for effective learning outcome. According to Nwachukwu (2009) *"it is well known that a teacher's way of thinking and beliefs guide his or her behaviour and decisions inside and outside the classroom"*. The teacher must have command over a wide repertoire of different teaching methods and strategies and understanding of the learning processes of learner. Teachers' ideas of conception of knowledge and learning are the foundations of which successful teaching is built.

The teacher's knowledge of learners helps in understanding different kinds of learners. Hannah (2011:237) states that "the teacher's conception of knowledge, in turn, underpins his/her conception for learning. It is on this foundation that teachers base all problem-solving in the line of work". Effective teaching connotes the ability of the teachers to communicate effectively, and this cannot be done without knowing the characteristics of a learner and his/her problem and by using the appropriate methods. Hannah (2011:237) further states that if the learners are not assisted, they may not appreciate learning since the main duty of the teacher is to remove obstacles from the learning process and encourage them to learn. If proper adjustments are not made, frustration will set in and learning will not be effective. Therefore, reduction of frustration is very important for effective teaching/learning to take place. The reduction of frustration enables the learners to be more interested in studying Chemistry.

### 2.6.1 Approaches for Effective Teaching of Chemistry

**Learner Centred Approach:** As the centre of all learning and teaching revolves around the learner, it would be unwise if the teaching method fails to recognize the central position of the learner, hence due attention paid to the learner. In this method, the learner is considered to be very important, and all his interests are therefore served. The teacher then directs the teaching to serving the learner best so that he becomes a good and useful citizen with all round education. This type of teaching recognizes the needs and importance of the learner as the centre post of all teaching. The teaching method based on the learner-centred approach allows the involvement of the learner in an open-ended laboratory exercise. According to what the research show students in high school need to be engaged to be successful. This contradicts the traditional teaching style of the teacher standing in front of the class and lecturing. There needs to be more interaction between students and between the teacher and students (Amesbury, 2006). According to Hannah (2011:239), the informal method consists of spontaneous discussion, planned discussion, advisory approach, panel discussion, small group discussion, seminar debate, committee and group work, problem-solving research, case study and so forth.

**Inductive Approach:** The knowledge of the past can best be used to develop the knowledge of the future. According to Okpala (2006:159), the inductive method begins from specific to general, known to unknown, and concrete to abstract. Hannah (2011:239) observes that the inductive method is a method of discovering. The inductive method provides an opportunity for learners to discover new concepts, laws, truths and new methods of solving a particular problem or finding solutions to problems in Chemistry.

**Process Approach:** According to Hannah (2011:239); and Onyia (2017), the process approach is one of the best ways to teach Chemistry. The learners are taken out to observe natural things relating to Chemistry. This process approach involves active participation by all learners. This makes the learners feel at their best instead of finding the lesson boring or dosing in the normal class-room situation. This method allows the learners to feel, touch, see, smell and enquire into things they see.

**Learner Motivation Approach:** Researchers are of the opinion that quality teaching is found in the school and is carried out by qualified teachers who can motivate learners to learn under diverse conditions. Motivation is regarded as one of the qualities of achieving good teaching and learning in schools. According to Hannah (2011:239), learner motivation to learn can be defined as meaningfulness value and benefits the learner regardless of whether or not they are intrinsically interested. Nwachukwu (2009) states that learners are more effective learners if they are intrinsically motivated towards learning than if they are extrinsically motivated. When learners are well motivated teaching/learning to be effective. Appropriate motivational techniques should be used to arouse the interest of learners towards Chemistry learning. Furthermore, the use of appropriate disciplinary measures by teachers can motivate the learners to learn. A teacher should be a good role model for the learners to emulate. A keen and competent teacher is always certain of a good response. He should be punctual and regular to class so as to encourage the learners to learn. A teacher who is always punctual in class will, through this action, encourage even the most perpetual latecomers to keep to time for classes. A teacher should be able to motivate his learners to learn Chemistry concepts. The

teacher should make sure the class is well controlled, otherwise teaching will be ineffective (Cardoso & Colinvaux, 2000 in Amesbury, 2006).

**Socratic Approach:** The Socratic Teaching Method is the technique, which law and medical schools use to get their students to critically analyze information (Saiki, 1993).

This approach involves the use of questions to elicit the hidden ideas of the learners. The learners are asked questions to know how far they have acquired the necessary knowledge and skills imparted to them. This questioning method or Socratic Method is a good method of testing the knowledge of the learners. It also gives the learner the opportunity to demonstrate what they have acquired before or how far they have mastered the imparted new knowledge. According to Hannah (2011:240), this method helps in building a sense of self-expression in the learners and also serves as means of giving practical experience and awareness. This method, if properly applied, has proved to have immense advantages over the lecture method of teaching Chemistry.

### **2.6.2 Develop the Learning Strategy in Chemistry**

Research shows that there is a lack of evidence that traditional teaching as well as traditional laboratory activities in Chemistry lessons contribute to promoting meaningful learning. Innovative learning strategies could be used by teachers at all levels of Chemistry education to enhance the learners' motivation to learn Chemistry (Devetak & Glazar, 2010:400). One such innovation is the GALC (Guided Active Learning in Chemistry) strategy. This approach can be used by teachers in order to facilitate learning to learn strategies in learners to apply them in the future when learning about new chemical phenomena described by more abstract concepts.

Developments in cognitive learning theories and classroom research show that learners generally experience improvements in learning when they are engaged in classroom activities that encourage developing their own knowledge following a learning cycle (Devetak & Glazar, 2010:401). Learners need to work together, not only because of their preparation for team work in science, but because they learn

better through social interactions. Learners should reach their own conclusions and not be called upon to verify, for example, what the textbook or instructor has indicated to be the expected results of the experiment. The learner must be an active learner (Devetak & Glazar, 2010:401).

### 2.6.3 Teachers' Teaching Styles

Teachers' teaching styles are another factor that may influence the learners' attitude towards learning Chemistry. The use of a variety of teaching styles and methods can raise the learners' attention and interest in Chemistry. Chemistry lessons that are not interesting will not inspire the learners to listen, participate and learn in class. This, in turn, will affect their academic performance (Yunus & Ali, 2012:298). Chemistry is not an easy subject to grasp. Because of that, learners have to pay attention to the lesson, specifically the teacher teaching in front, in order to understand what is being taught. It is up to the teacher to make the lesson a fun learning experience to capture the learners' interest in learning Chemistry. Teachers who failed to use an interesting style during Chemistry class will lose the learners' attention as they can easily get bored (Yunus & Ali, 2012:298).

In order for learners to be part and parcel of lesson, highly qualified teachers must know how to organize and teach their lessons in ways that assure diverse students can learn Chemistry. Highly qualified teachers don't just teach well-designed, standards-based lessons: They know how and why their students learn. Most people agree that good teachers are caring, supportive, concerned about the welfare of students, knowledgeable about their subject matter, able to get along with parent and genuinely excited about the work that they do. Effective teachers are able to help students learn. A teacher who is excited about the subject being taught and shows it by facial expression, voice inflection, gesture, and general movement is more likely to hold the attention of students than one who does not exhibit these behaviors. This is true whether or not teachers consciously perceived these behaviors in themselves (Tenaw, 2015).

According to Yunus and Ali (2012:298), there are five types of teaching styles. The teaching styles are: expert teaching style, formal authority teaching style, personal

model teaching style, facilitator teaching style and delegator teaching style. Nevertheless, the choice of teaching styles and methods should be in line with the curriculum content. Besides that, teachers have to take into consideration the learners' abilities, learners' level of intelligence and the availability of resources and infrastructure (Yunus & Ali, 2012:298). Some teachers find this an environmental challenge because it is quite difficult to cater to each and every learners' needs. Schools should at least have the basic infrastructure for teaching and learning of Chemistry which are classrooms, laboratories and libraries. Classrooms must be in good condition and comfortable for the learners to absorb knowledge because a good classroom also influences the learners' moods. Schools should also provide enough Chemistry equipment to ensure learners can carry out many experiments with their teachers. A library can help learners find extra references for their Chemistry homework and reading. When teachers put more effort in their teaching styles as well as put into concern the learners' needs, it can boost the learners' attitude towards Chemistry (Yunus & Ali, 2012:298).

#### **2.6.4 Effect of Collaborative Learning on Chemistry**

Yusuf (2014:800) opined that the concepts in Chemistry, to be taught effectively to Chemistry learners in the secondary schools, collaborative learning has been considered relevant and fruitful. Collaborative learning is a teaching strategy involving learners' participation in small group learning activities that promote positive interaction. Collaborative classrooms have four general characteristics, that is, the first two capture changing relationships between teachers and learners; the third characterizes teachers' new approaches to instruction; the fourth addresses the composition of a collaborative classroom (Yusuf, 2014:44).

Collaborative learning is generally defined as a teaching arrangement in which small, heterogeneous groups of learners work together to achieve a common goal. Learners encourage and support each other, assume responsibility for their own and each other's learning, employ group related social skills, and evaluate the groups' progress (Yusuf, 2014:44). The basic elements are positive interdependence, equal opportunities and individual accountability. According to Yusuf (2014:44), collaborative learning learners assume new roles in the classroom. Their major roles

are collaborator and active participator. It is useful to think how these new roles influence the processes and activities learners conduct before, during and after learning.

### **2.6.5 Self-regulated Learning Strategies**

According to Tunde (2014:800) self-regulation is an integrated learning process consisting of a set of constructive behaviour that affects one's learning. These processes are planned, controlled and adapted to support the pursuit of personal goals in changing learning environment. Self-regulated learners are individuals who are meta-cognitively, motivationally and behaviourally active participants in their own learning process (Tunde, 2014:800). Meta-cognition refers to the awareness, knowledge and control of cognition. The three processes that make up meta-cognitive self-regulatory activities are planning, mentoring, and regulating. Planning involves setting educational goals and outcomes as well as task analysis. Self-monitoring helps learners focus their attention on and discriminate between effective and ineffective performance and reveals inadequate learning strategies (Tunde, 2014:800).

### **2.6.6 Effective Classroom Management on Teaching Chemistry**

According to Mansor, Eng, Rasul, Hamzah & Hanim (2012) in a study conducted by Hattie (2003), besides students themselves (50%), teachers account for 30 percent of the influencing factor in students' achievement, followed by home environment (5-10%), schools (5-10%), and peer effects (5-10%). The teachers' variance is important, as it is what teachers know, do and care that make the difference in this learning equation.

Orji (2014:12) states that classroom success in the form of learners' active involvement in assigned tasks and learners' learning outcomes have been shown to be greatly influenced by several factors broadly classified as context variables, input variables and classroom-processes. The teacher has been regarded as the largest single influence in the classroom transaction (Orji, 2014:12). Learners' learning outcomes are a reflection of the teacher's strategies for effectiveness in managing

classroom transactions. Effective teaching requires, among other things, basic management skills, including understanding of the nature of the classroom. Orji (2014:12) maintains that different classroom sessions required various teacher managerial competences in designing and conducting appropriate engaging learning activities. The nature of the Chemistry classroom and teaching styles in Chemistry bear great implication to management and teacher effectiveness.

## **2.7 POOR PERFORMANCE OF LEARNERS IN CHEMISTRY**

According to Tunde (2014:799) the poor performance of learners in Chemistry has been explained by various researchers. Tunde reported that factors that negatively affect Chemistry achievement include learners' lack of interest, poor study habits and teacher-related factors, like teachers' poor preparation, inadequately qualified Chemistry teachers and application of poor teaching methods. Nbina (2012:324) has added that several factors have been advanced to affect learners' poor performance, such as the learner factor, teacher factor, societal factor, the governmental infrastructural problem, language problem, examination body related variables, and curriculum related variables, textbook related variables and home related variables. Nbina (2012:324) identifies specific variables such as poor primary school background in natural sciences, lack of incentives for tests, lack of interest on the part of learners, learners not interested in hard work, incompetent teachers in the primary school, large classes and fear of the subject psychologically. According to Nbina (2012:324) parents should not expect too little or too much from their children. Too much pressure can lead to failure and dislike of Chemistry. It was found that parental dominance tends to discourage the children in school learning (Nbina, 2012:324). Ogembo, Otanga and Yaki (2015:39) assert that in spite of realization of the recognition given to Chemistry among the science subjects, it is evident that learners still show negative attitudes towards the subject, thereby leading to poor performance and low enrolment.

## **2.8 STRATEGIES FOR MENTORING PEDAGOGICAL KNOWLEDGE**

According to Hudson (2013:2) effective mentoring is considered a way to build capacity in the teaching profession with widespread acceptance. Effective teachers

are well prepared with plans, resources and knowledge of what, when and how to prepare for teaching. The use of teaching strategies allows the teacher to structure learning environments appropriate to the age, level, type of lesson and content knowledge (Hudson, 2013:5). Content knowledge is crucial for teaching any particular subject matter in the classroom, and a teacher's content knowledge can be a predictor of learner achievement; consequently, the importance of a pre-service teacher having content knowledge before teaching cannot be undervalued.

According to Hudson (2013:5), an effective mentor teacher can articulate to the pre-service teacher applicable content knowledge for a lesson and where they sourced this content knowledge. Regardless of the subject area, a key aspect of mentoring is ensuring the pre-service teacher has proficient content knowledge for teaching a lesson (Hudson, 2013:6). Teachers guide their learners' learning through astute questioning that considers the learners' learning levels and needs (Hudson, 2013:6). The mentor's knowledge of how to structure a lesson (e.g. stimulating introduction to the topic, the body of the lesson presents a hands-on activity, and the lesson conclusion capitalizes on determining learners learning of the topic through verbal, written or other forms of communication) also considers the learners' context to assist the mentor's teaching (Hudson, 2013:6).

## **2.9 THE EFFECT OF EXTRINSIC MOTIVATIONAL FACTORS IN LEARNING AMONG STUDENTS**

Noordin, Azizi, Jamaludin, Shahrin and Zurihanmi (2010:129) indicate that teachers do make a difference to motivate learners in learning even though teachers are not as powerful as parents because parents are the first teachers to a baby since birth. Noordin et al. (2010:129) showed that parents appear to be the primary influence on a learners' motivation to learn. The formative effect of parents on the learning motivation of their children has an impact at every stage of development. This influence will last through the high school years and beyond. Noordin et al. (2010:130) indicated that circumstances in the environment can be arranged so that a learner will be encouraged to do something that will result in his learning.

## **2.10 THE IMPACT OF NEW TEACHER INDUCTION ON STUDENT LEARNING**

Thompson, Paek, Goe and Berkeley (2005:1) indicate that induction programs for new teachers have been identified as an important way to promote the intertwined goals of teacher quality, teacher retention and students' learning. New teacher induction provides support to beginning teachers and increases the likelihood that they will stay in their jobs and do their jobs well (Thompson et al., 2005:1). This, in turn, should lead to improved student learning. New teachers simply are not as effective as their more experienced colleagues. When teachers stay in the profession past the first few years, they solidify their teaching skills in ways that translate to better student outcomes (Thompson et al., 2005:2).

Young teachers enter teaching to tackle a professional challenge and expect support to help them succeed. If they do not get that support, they leave. According to Thompson et al. (2005:2), school structures are no longer adequate to support teachers' development or students' learning. They perpetuate private practice, fail to acknowledge the unique developmental needs of new teachers, and, in many cases, leave new teachers to sink or swim on their own. However, some new teachers have the good fortune to work at schools that deliberately and thoughtfully attract and retain them (Thompson et al., 2005:2).

## **2.11 OVERCROWDING IN THE INSTRUCTIONAL SPACE IN CHEMISTRY**

According to West and Kennedy (2014:1), overcrowding in Chemistry classrooms is the number one concern among Chemistry teachers. However, overcrowding, as well as lack of safety training of teachers; lack of appropriate classroom management; and inadequate Chemistry equipment and facilities have all been identified as possible areas of safety concern while teaching science. West and Kennedy (2014:2) identified that increased class enrolment significantly affected the number of accidents in the secondary Chemistry classroom. Major problems with overcrowding include two issues: the teacher's ability to supervise a large number of learners doing science activities and the amount of individual workspace per learner. Overcrowding, with regards to supervision, affects a teacher's ability to properly

manage and oversee the classroom and may prevent adequate supervision of learners doing science activities (West & Kennedy, 2014:2).

## **2.12 EFFECTIVE ROLE OF SCHOOL BASE MANAGEMENT IN CHEMISTRY**

According to Botha, Marishane, Van der Merwe, Van Zyl and Zengele (2013:2) management is not simply a question of following ready-made management recipe but, it is about the acknowledgement of the knowledge, skills and competencies that managers need in order to offer high quality leadership for organizational which is a school effectiveness. Although each school is dependent on principal, teachers and learners for the performance, the degree of success or failure which the school achieves depends on the manager. As soon as two or more people have to perform a task together, management becomes necessary, because it must be decided who will do what, in what order the steps will be done, how the work should be coordinated. Botha et al. (2013:4) refer to management as a process encompassing certain elements. The following paragraphs will discuss the role of principals as designer and leader of curriculum and teachers in classroom management.

### **2.12.1 Principal as an Instructional Programme Designer for Chemistry**

According to Marishane (quoted in Botha et al., 2013:135) show that principal as a transformational leader design an instructional programme by firstly need to ensure that all teachers share the same level of understanding of the curriculum to be implemented. Principal as an instructional leader must have knowledge of subject (Chemistry), assessment strategies, learning outcomes, instructional approaches and resources needed to facilitate teaching and learning of Chemistry in the school. Botha et al. (2013:136) indicate that School Base Management is a transformation strategy aimed at learner performance, the school principal in collaboration with Chemistry teachers should set goals for improving learner performance. In addition, the principal should identify the knowledge and skills base of the Chemistry teacher and explore any existing gaps. In other words, the principal as a leader should assess what Chemistry teachers know and are able to do to meet the learning needs of learners (Botha et al., 2013:136).

### **2.12.2 Principal as Programme Director and Manager for Chemistry**

According to Botha et al. (2013:136) point out that principal gives direction with regard to how the instructional programme should be implemented. Firstly, the principal allocates work to Chemistry teachers in line with their knowledge and abilities. This involves creating a match between content knowledge and practice. Secondly, since principal as an instructional programme focuses on continued improvement, its implementation demands the ongoing professional development of Chemistry teachers. For this reason, the principal should initiate a professional development programme that is tailored to their special instructional needs. This will serve the dual purpose of closing the existing knowledge and skills gaps and improving performance in Chemistry teaching and learning. Thirdly, effective instructional programme implementation requires continued monitoring of the teaching and learning activities by the principal. This suggests the need for the principal to be visible and ensure that activities included in the instructional programme are continuously focused on goal achievement, which is the positive performance of learners in Chemistry.

Fourthly, to facilitate the programme, the principal is actively involved in supporting Chemistry teachers by encouraging and motivating them and being readily available to share the instructional workload when the need arises (Botha et al., 2013:136). Fifthly, the principal coordinates the various teaching and learning activities to ensure that there is a collective and sustained effort towards goal achievement, and lastly, the principal creates a climate of stability by ensuring that the instructional programme follows a schedule, that tasks are completed within a specified time, and that the programme is securely protected from external interferences and disturbances that might derail smooth progress towards goal attainment in Chemistry teaching and learning (Botha et al., 2013:136).

### **2.12.3 Classroom Management**

A Chemistry teacher teaches students in an ordinary classroom as any other teacher who teaches any subject. In affluent schools where there are laboratories, classes may take place in laboratories. In order for a teacher to offer subject without

interruptions, the teacher should know the subject matter, and should possess skills of managing classroom. Classroom management is about creating inviting and appealing environments for student learning. Classroom management strategies are tools that the teachers can use to help create such an environment, ranging from activities to improve teacher-student relationships to rules to regulate student behaviour (Korpershoek, Harms, de Boer, Van Kuijk & Doolaard, 2014).

According to Education Reform (2014) classroom management refers to the wide variety of skills and techniques that teachers use to keep students organized, orderly, focused, attentive, on task, and academically productive during a class. When classroom-management strategies are executed effectively, teachers minimize the behaviors that impede learning for both individual students and group of students, while maximising the behaviours that facilitate or enhance learning. Generally speaking, effective teachers tend to display strong classroom-management skills, while the hallmark of the inexperienced or less effective teacher is a disorderly classroom filled with students who are not working or paying attention.

Jones and Jones (2012); Marzano, Marzano, and Pickering, (2003) as quoted by Korpershoek, Harms, de Boer, Van Kuijk and Doolaard (2014) state that effective teaching and learning cannot take place in poorly managed classrooms. Effective classroom management strategies support and facilitate effective teaching and learning. Korpershoek, Harms, de Boer, Van Kuijk and Doolaard (2014) describe five types of actions in order to attain a high quality of classroom management, teachers must:

- Develop caring, supportive relationships with and among students.
- Organize and implement instruction in ways that optimize students' access to learning. The importance of developing favourable teacher-student relationships is also expressed by Marzano et al. (2003).
- Encourage students' engagement in academic tasks, which can be done by using group management methods (for example establishing rules and classroom procedures).
- Promote the development of students' social skills and self-regulation.
- Use appropriate interventions to assist students with behavior problems.

## 2.13 CONCLUSION

In conclusion, literature has been reviewed on issues related to the study. These included factors affecting high school learners' academic performance Chemistry, factors influencing performance of learners in Chemistry, and management strategies that can help to improve learners' performance in Chemistry.

## CHAPTER 3

### TEACHING CHEMISTRY IN SOUTH AFRICA

#### 3.1 INTRODUCTION

This chapter presents the review of the relevant literature to the study. The literature reviewed is based on Chemistry teaching in South Africa related to management of high school learners' academic performance in Chemistry. Hence this chapter reviewed factors affecting high school learners' academic performance in Chemistry, factors influencing learners' performance in Chemistry, and the management strategies that can help to improve learners' performance in Chemistry within the South African perspective.

#### 3.2 HISTORICAL BACKGROUND OF SCIENCE EDUCATION IN SOUTH AFRICA

At present, South Africa does not have the capacity to expand economically without importing foreign scientific and technological expertise (Makgato, 2007:91). It is an unfortunate reality in South Africa that past imbalances in the education system continue to perpetuate poorly resourced schools and inadequately skilled teachers, particularly in the field of mathematics and Chemistry (Marais & Mji, 2009:343). In addition to this, the government has embarked upon complete transformatory change to the entire education system. The new system is resource demanding, so the problems are exacerbated in resource disadvantaged schools (Marais & Mji, 2009:343).

Education and training during apartheid was characterised by the under-development of human potential, generally, and that of blacks in particular (Mji & Makgato, 2006:253). The teaching and learning of mathematics, science and technology were the hardest hit. Outdated teaching practices and lack of basic content knowledge have left South Africa with a situation where poor, under-qualified and unqualified Chemistry teachers teach learners in classrooms that are not only overcrowded but also under-equipped. This, in turn, has produced a new generation

of Chemistry teachers who are further perpetuating the cycle of mediocrity (Makgato, 2007:91).

Heeralal (2013:203) indicates that in South African schools, the subject Physical Science at Grade 10, 11 and 12 covers both Physics and Chemistry topics. There are factors that cause poor performance of learners at high school (Heeralal, 2013:204). The key causes of poor performance are: lack of facilities and material resources, high teacher and administrator turnover, teacher's workload, shortage of qualified teachers, poor teaching methods, inadequate communication ability of learners and teachers in the language of instruction, unmotivated teachers and a tendency to place the greatest demand on teachers' time and energies in terms of discipline, lesson planning, unproductive paperwork and time management (Heeralal, 2013:204).

Heeralal (2013:204) discusses the issue of knowledge and skills, particularly in Chemistry and emphasizes the fact that many South African science teachers have little content knowledge of how to teach Chemistry. Concerning the language of Chemistry, South Africa is a multilingual country with 11 (eleven) official languages. Heeralal (2013:205) explains the factors that influence poor performance in Chemistry and reports that native English speakers performed best in Chemistry of all language groups while the Afrikaans speaking attained the next highest score. Chemistry teachers must consider a number of issues, including their teaching approaches, techniques and interpersonal interactions to ensure the effectiveness of Chemistry teaching, so that they motivate their learners towards acquiring necessary scientific skills, scientific knowledge, values and attitudes and provide high quality of Chemistry education for all learners.

### **3.3 THE QUALITY OF TEACHERS IN SOUTH AFRICA**

Maphoso and Mahlo (2015:52) maintain that all teachers must possess instructional and intervention skills to maximize the learner's outcomes. Policies adopted by the state regarding teacher education, licensing, hiring and professional development may make an important difference in the learning and teaching and capacities that teachers bring to their work. In South Africa, the criteria for the recognition and

evaluation of qualifications for employment in education based on the norms and standards for teachers are stipulated in the National Education Policy Act (NEPA) (Act 27 of 1996). Maphoso and Mahlo (2015:52) maintain that there is a significant correlation between a teacher's knowledge and attitude towards Chemistry. The quality of a teacher is crucial in teaching and learning. School fixed effects are strong determinants of learner performance, and these fixed effects are shown to be highly correlated with teacher qualifications. Teachers have powerful effects on reading and Chemistry achievement, although little of the variation in teacher quality is explained by observable characteristics such as education or experience.

In order to achieve educational progress, South Africa needs an instructional structure (encompassing teacher pay, bursary programmes and other interventions targeting exiting teachers) that promotes good teaching and attracts and retains the best teachers (Van der Berg, Taylor, Gustafsson, Spaul & Armstrong, 2011:2). The McKinsey and company Report on successful education systems concludes that the quality of a school system is equal to the quality of its teaching force. Low teacher effort is often considered one of the most serious problems in South African schooling, perhaps even bigger than weak teacher content knowledge and pedagogical skills to successfully teach the curriculum (Van der Berg et al., 2011:4). Although teacher time-on-task has often raised a serious concern, existing evidence regarding the impact of teaching time on learner performance is not compelling in either direction. Some studies have not found evidence that insufficient teaching time is a key factor behind under-performance (Taylor, 2011:27). On the other hand, Shepherd (2011:26) finds that extra classes offered by teachers outside the normal school day are associated with better learner results.

A closely related matter is that of teacher absenteeism. It was found that around 11% of teaching time was lost due to teacher absenteeism, although this was not exceptionally poor by developing country standards. Instances of one-day leave were substantially more common on Mondays and Fridays than on other days of the week, indicating an abuse of the leave system to extend weekends (Van der Berg et al., 2011:2).

The Department of Basic Education's (DBE) existing strategy of short training courses does not seem to be particularly effective. Taylor (2008:25) concludes that short courses of the order of 3-5 days have little impact. It is becoming apparent that intensive in-service training, in the order of weeks per year, is required to equip teachers with the knowledge they need to teach effectively. Such extensive in-service training may, however, not be feasible.

Van der Berg et al. (2011:5) indicate that the biggest downfall in South Africa is the fact that the system hardly differentiates between better and worse performing Chemistry teachers. In South Africa, the main response from government to the need to attract more Chemistry teachers has been the Funza Lushaka Bursary Programme, EDTP/SETA. Funza Lushaka represents an important new strategy and should be strengthened and expanded (Van der Berg et al., 2011:5). In order to get a better sense of its effectiveness on recruiting science teachers, Funza Lushaka bursary scheme attract more high-achieving students into teaching than was previously. Bursaries alone will not attract enough top-achieving students into Chemistry teaching and are powerless to retain good teachers. Therefore, some form of teacher incentives are needed to attract and retain the best Chemistry teachers.

### **3.4 QUALIFICATION OF TEACHERS IN SOUTH AFRICA**

The poor qualification of teachers is a major problem in African Schools. Maphoso and Mahlo (2015:52) state that in the past, the South African education system reinforced the social structure by disempowering teachers and learners alike. Teachers were poorly qualified, knew little about creative style of teaching Chemistry and had few alternatives other than to cooperate with a conservative authoritarian system, and this restrictive environment encouraged an authoritarian teaching style which hinders learners' performance in Chemistry (Maphoso & Mahlo, 2015:52).

A well-qualified has command of subject matter. The teacher is able to identify the weaknesses and strengths of learners. This teacher makes learning and teaching of Chemistry simpler. To embark on a satisfactory and effective public education reform, it is essential that Chemistry teachers must well qualified.

Hofmeyr and Draper (2015:1) indicate that one of the greatest challenges facing the South African education system is the production of sufficient qualified, competent Chemistry teachers, who can provide quality teaching in science subjects. Through Initial Teacher Education (ITE) programmes offered at Higher Education Institutions (HEIs), student teachers obtain either a four-year Bachelor of Education (B.Ed.) degree or a one-year Post Graduate Certificate in Education (PGCE) after a three-year undergraduate degree. Just like both of these four-year qualifications, the current official requirement for a qualified teacher in South Africa is known as M+4, a matric certificate plus four years of ITE. Until fairly recently, however, M+3 (matric plus three years of ITE) was the official requirement, and so most teachers in the country are qualified with M+3 (Hofmeyr & Draper, 2015:1). However, a qualified teacher is not necessarily a good teacher. Not all qualified teachers are competent professionals able to provide quality teaching and learning. It is common cause that the quality of most ITE programmes leaves a lot to be desired, and the result is that most of the current teaching force has been inadequately educated and trained, whether during apartheid or in the recent past.

Teachers are at the centre of any education system, and their equality affects learner achievement. Unless ITE programmes prepare teachers with all the competencies needed to provide quality teaching and learning, all the resources poured into ITE will not achieve what must be the absolutely a fundamental goal of a schooling system, namely: improve learner achievement, especially in language, Mathematics and Sciences. Hofmeyr and Draper (2015:11) maintain that high quality ITE is not a sufficient condition for improving learner achievement. Even if existing and new teachers possess all the necessary knowledge and skills, their professionalism and commitment to fulfilling their teaching responsibilities in the best interests of the learners is of paramount importance.

### **3.5 TEACHERS' EXPERIENCE IN ACADEMIC ACHIEVEMENT**

The twin factor of a teacher's qualifications and experience is necessary. Maphoso and Mahlo (2015:53) are of the opinion that a teacher's experience is consistently associated with achievement. In South Africa, learner achievement increases with

teacher experience, but the link is weak and largely reflects poor outcomes for teachers during their first year or two in the classroom. In South Africa, behaviourist strategies have preserved prevalently in Chemistry classes where learners are not exposed to real life situation knowledge re-enforced by textbook content (Dumbrais, de Jager & Bergstron-Nyberg, 2013:41).

Indigenous knowledge in science curricula enables teachers to understand learners in relation to their environment and how they organise knowledge, cultural beliefs and history to enhance their lives. New education policies in South Africa include indigenous knowledge in the curricular but are not prescriptive. This implies that Chemistry teachers should explicitly provide opportunities for learners to engage and explore with formal scientific concepts in their own limited social context with scarce resources (Dumbrais et al., 2013:41).

### **3.6 THE IMPACT OF SOCIO-ECONOMIC FACTORS ON THE ACADEMIC PERFORMANCE OF LEARNERS IN CHEMISTRY**

Bayat, Louw and Nena's (2014:183) state that many people are concerned by the state of education in South Africa. These concerns have increased since the establishment of democracy in 1994 when the African National Congress (ANC) became the dominant, party in the government of national unity. The ANC made a commitment in terms of housing, education and health, and those areas were targeted specifically to redress the legacy of apartheid. The strong legacy of apartheid and the consequent correlation between education and wealth have meant that, generally speaking, poorer learners perform worse academically (Bayat et al., 2014:183). Unfortunately, little has changed in the last two decades of democracy. It is important to note that the links between affluence and educational quality can partially explain this outcome since the poor receive a far inferior quality of education when compared to their wealthier counterparts (Bayat et al., 2014:183).

According to Bayat et al. (2014:183), the government of South Africa has acknowledged that "the quality of school education for black people is poor" across the country. It was found that "education quality in historically black schools-which constitute 80% of enrolment and are thus central to educational progress-has not

improve significantly in Chemistry since political transition”. Teachers, principals, school management teams and school governing bodies in South Africa repeatedly stress the view that primary schools are continuously failing to lay a solid educational foundation, especially with regard to numeracy and literacy. Experts often say that the government of South Africa has to overcome years of under investment in black education under apartheid. With the aim of promoting learner achievement in Chemistry, the government of South Africa embarked on many educational reform changes. These reforms have met with limited success (Bayat et al., 2014:184).

Prior to the South Africa’s first democratic government in 1994, school improvement in the country was dominated by Non-Governmental Organisation (NGO) projects, generally small in scale and focusing largely on teacher development in the field of Chemistry. Since 1994, school improvement and effectiveness has become pluralized, with government entering the fray, and the introduction of a variety of programmes, including systematic and standards-based approaches (Bayat et al., 2014:184). Some learners do not have proper clothing, lack study facilities, parental support, study motivation, self-esteem and language proficiency, and move frequently from school to school. It is difficult for them to concentrate in class under such circumstances. Subject like Chemistry which needs total concertation can be difficult for such children.

Lee and Madyun (2009:159) established that learners living in neighbourhoods with low crime and low poverty showed higher achievement in both mathematics, science and reading than learners in other types of neighbourhoods. Conversely, learners living in neighbourhoods with high crime and high poverty lagged behind in these three subjects when compared with their peers in other neighbourhoods. They also found a significant interaction effect between neighbourhood type and ethnic on achievement. These results suggest that the school performance in Chemistry of blacks and whites was affected differently based on neighbourhood type (Bayat et al., 2014:185).

Bayat et al.’s (2014:186) curriculum coverage and the frequency of mathematics, Chemistry and literacy exercises are extremely low and strongly associated with poor performance. Other causes are that “the difficulty level of what is covered in

class (some of which is rooted in weak teacher subject knowledge) is simply too low, the pace too slow, there are too many interruptions and most principals are not really interested enough in how much teaching and learning is happening in classrooms.

South Africa's history of apartheid, its resultant high levels of poverty and extreme social and economic distance between rich and poor, and continues to play out education in complex ways (Graven, 2013:1). South Africa's extreme income inequality within a context of widespread and absolute poverty has not been sufficiently interrogated in terms of its impact on education. There are many poor countries, including our neighbouring states, achieving better in Chemistry and mathematics performance. None of them have such high levels of inequality or a history in which the education of the majority of the people seems to be undermined (Graven, 2013:9).

South Africa provides an 'extreme' case of Chemistry performance gaps between high and low learners even while political will and resource allocation for redressing inequality are identified as a national priority (Graven, 2013:1). South Africa differs from other contexts in several respects, including its extreme levels of inequity and the recent apartheid history that systematically disempowered the majority of South Africans. Our extreme levels of social and economic distance between rich and poor continue to manifest in Chemistry education in complex ways. Graven (2013:2) indicates that 60% of South African children live in poverty, and this has long been one of the most unequal countries in the world. Almost 20 years after the first democratic election, poverty levels are somewhat lower compared with the apartheid era, but inequality has worsened.

Inequality extended into Chemistry education in deep ways prior to democracy where seventeen (17) Education Departments existed, each with their own budget. The continued dominance of English as the language of power, commerce, government and education reinforced these inequalities. Democracy did not change the reality that the majority of students learn Chemistry in a language that is not their primary language (Graven, 2013:2). The assumption that inequality in education can be addressed through curriculum change is problematic, and some might argue that rapid and repeated curriculum change is partly responsible for the worsening crisis.

The jargonized rhetoric of the policies and the unrealistic demands on under-resourced schools with little sustained Chemistry teacher support further worsened the educational gaps between the rich and the poor (Graven, 2013:3). Teachers are often reported to be at the heart of the crisis. Teacher morale is at an all-time low with a large percentage of Chemistry teachers indicating that they would leave the profession if they could. Teacher attrition is greater in Mathematics and Sciences as these skills are highly sought after. Furthermore, it is becoming increasingly difficult to attract students into teaching as it holds low status as a profession.

### **3.7 THE CURRENT LEVEL OF LEARNER ACHIEVEMENT IN CHEMISTRY IN SOUTH AFRICA**

According to Spaul (2015:34) quality education can be defined as the acquisition of the knowledge, skills and values that society deems valuable, usually articulated in the curriculum. While it is difficult to get reliable information on whether learners are acquiring appropriate values at school, there is considerable information on the extent to which they are acquiring the knowledge and skills expressed in the curriculum.

South Africa participates in a number of cross-national assessment of educational achievement, which makes it possible to compare the level of learning and knowledge of learners in South Africa with those from other countries. These assessments include Progress in International Reading and Literacy Study (PIRLS), Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ), and Trends in Mathematics and Science Study (TIMSS). Although one might be tempted to use either the matric results (Grade 12) or the Annual National Assessment (ANA) results Grade (1-9) to determine what learners in South Africa know and can do, it is inadvisable (Spaul, 2015:34). The TIMSS studies showed no improvement in Grade 8 science achievement between 1995, 1999 and 2003. Subsequently, it was decided that the international Grade 8 tests were too difficult for South Africa's Grade 8s; thus, in 2003, both Grade 8 and 9 learners wrote the Grade 8 test internationally (Spaul, 2015:35).

### 3.8 TEACHER JOB SATISFACTION AND LEARNER PERFORMANCE IN CHEMISTRY

The South African education system is in crisis. This is attested to by the FW de Klerk Foundation and Modisaotsile, who affirm that there are many indicators of this (Iwu, Gwija, Benedict & Tengeh, 2013:838). These are manifested in high enrolment rates and increasingly poor Grade 12 output each year. It is, therefore, imperative that there should be an elevated focus on the quality of Chemistry education. An improved focus on the quality of education will positively impact the socio-economic development of South Africa. In fact, the FW de Klerk Foundation believes that poor education is to blame for most of South Africa's problems, including unemployment, poverty and inequality. South Africa's education system was ranked 133<sup>rd</sup> out of 142 countries in the World Economic Forum (WEF). The forum pointed out that one of the contributing factors to the system's failure was the poor quality of Chemistry teachers (Iwu et al., 2013:838).

Teacher motivation is defined within the context of this study as the extent to which a Chemistry teacher perceives intrinsic and extrinsic job characteristics. According to Iwu et al. (2013:838) learners' poor performance in Chemistry is not unique to South Africa. In fact, many developed countries have had to introduce policies and programmes to deal with this problem. For instance, given the decline in learner performance in Chemistry, many countries such as the United States (US) and Israel instituted what they called incentive-based or market-driven educational reforms and performance-related incentives pay to improve school quality.

In Israel, there was a remarkable improvement in learners' pass rates whereas in the US, there was surprisingly little evidence of its effectiveness in raising learner achievement in Chemistry. It must be noted, however, that in Israel, the improvements appeared to have been derived from changes in teaching methods, after-school teaching and increased responsiveness to learners' needs. One can make an argument here that this remarkable improvement emerged as a result of performance-related pay, suggesting that Chemistry teachers felt motivated. It must, therefore, be noted that pay has shown direct association with job satisfaction (Iwu et al., 2013:839).

In South Africa, Naidoo, Botha and Bisschoff's (2013:178) state that teacher dissatisfaction in a designated province reveals that some of the reasons for Chemistry teacher job dissatisfaction include job demands (overloads), a lack of growth opportunities, job insecurity and a lack of control. Mji and Makgato (2006:254) state that that lack of teacher motivation have caused high school learners' poor performance in Chemistry. This means that desirable teacher qualities were lacking. Desirable teacher qualities are linked to good subject knowledge, teaching skills and classroom management, relationships with learners, dedication, accessibility, and hard work (Iwu et al., 2013:840). South African Chemistry teachers were largely ignored by the government when policies were formulated. Employees enjoy a sense of recognition and self-worth when they are involved in the decision-making process of their organizations. In other words, feeling a sense of belonging can extend one's commitment to one's job and organisation.

### **3.9 LEARNERS' PERFORMANCE AGAINST LABORATORY INVESTIGATION**

According to Kibirige and Hodi (2013:425), many schools in South Africa do not have science laboratories and where they do exist, they are not used effectively. Learners with a positive attitude towards science are more likely to be found in classrooms that use laboratory investigation. This implies that positive attitude towards science may also lead to better performance. For example, learners' performance in problem solving depends on teachers' methods and attitudes towards science (Chemistry). For instance, in Nigeria, there are insufficient laboratory facilities; consequently, secondary school learners are taught Chemistry using guided discovery notes, demonstrations and expository teaching approaches. These methods are highly effective in improving learners' attitude towards Chemistry in such under-resourced schools (Kibirige & Hodi, 2013:426). Similar to Nigeria's experiences, many rural schools in South Africa do not have access to laboratories or do not use laboratories when teaching sciences (Chemistry) (Mji & Makgato, 2006:260).

According to Mji and Makgato (2006:260), it is clear that South Africa and Nigeria have a challenge in using laboratories to teach Chemistry. This makes it difficult for learners in South Africa to perform experiments in an investigation Chemistry

classroom. Consequently, such schools report a low performance rate in Grade 12 results and learners lose interest in Chemistry. According to Kibirige and Hodi (2013:426) in order to improve pass rates in Chemistry, there is a need to use a method that will increase learners' interest and conceptual development. Laboratories investigations are envisaged to improve learners' performance in Chemistry subjects in under-resourced schools, yet they are rarely used in South Africa.

Currently, science teachers agree that laboratory work is synonymous with laboratory investigations and is indispensable in developing an understanding of science (Kibirige & Hodi, 2013:426). Laboratory work provides learners with an opportunity to experience Chemistry by employing scientific research procedures. Thus, in order to attain meaningful learning to understand scientific theories and their application methods, learning should be done using Chemistry laboratory investigations. Moreover, engaging in practical work should encourage the development of critical thinking skills and create interest in Chemistry (Kibirige & Hodi, 2013:426). However, there are concerns about the effectiveness of Chemistry laboratory work in aiding learners to understand various aspects of scientific investigations.

On the other hand, creative and critical thinking is needed in a Chemistry laboratory to develop logical thinking processes. Therefore, Chemistry laboratory investigation could provide a rich context for creativity (Kibirige & Hodi, 2013:427). According to Kibirige and Hodi (2013:427), laboratory work in Pakistan improved learners' performance in Chemistry. Similarly, Adesoji and Olatunbosun (2008) described how a Chemistry workshop using laboratory investigations was adequate to enhance learners' performance in Chemistry. Engaging learners in inquiry can provide powerful learning experiences where learners not only learn about Chemistry content but also gain research skills. Although the use of laboratory work appears to be the most effective way to teach Chemistry meaningfully, there is a dearth of data on the success of laboratory investigations in under-resourced schools in developing countries like South Africa (Kibirige & Hodi, 2013:427).

### **3.10 THE CHANGING ROLES OF SOUTH AFRICAN SCIENCE TEACHERS IN AN ERA OF INTRODUCING A REFINED AND REPACKED CURRICULUM**

According to Dudu (2014:547), for a curriculum to be a success, it should be concerned with certain critical considerations such as the redefining of Chemistry teachers' role. South Africa in 2009 introduced the National Curriculum Statements (NSC), with a view to simplifying the original documents and the subsequent supporting documents for all subjects. The aim was to produce National Curriculum and Assessment Policy Statement (CAPS) as a refined and repackaged version of the original documents and not create new curricula (Dudu, 2014:547).

According to Dudu (2014:547), for a subject such as Natural Science, the CAPS specifies the teaching time, content, skills, Learning and Teaching Support Materials (LTSM) needed and the assessment weightings and prescriptions. However, a great deal of learning on the part of Chemistry teachers is required if changes of this magnitude are to be a success. Given that the current curriculum advocates for learning and teaching of Chemistry through inquiry, the role of the Chemistry teacher should be looked at in the context of the notion of the learner-centred classroom, a kind of classroom in which the focus is on the active involvement of the learners in the learning process (Dudu, 2014:548). Moreover, the role to be adopted by the learner in the classroom also hinges on the role adopted by the Chemistry teacher, that is, the role of the Chemistry teacher in the classroom is of paramount significance as it is central to the way in which the classroom environment evolves (Dudu, 2014:548). Chemistry teaching is supposed to be learner centred as it requires learners to also apply their pre-knowledge of the subject.

The role of a Chemistry teacher being an instructional specialist implies that a teacher helps colleagues implement effective teaching strategies. This help might include ideas for differentiating instruction or planning lessons in partnership with fellow Chemistry teachers (Dudu, 2014:548). As a curriculum specialist, the role entails that Chemistry teachers understand content standards, understand how various components of the curriculum link together, and how to use the curriculum in planning instruction; assessment is essential to ensuring consistent curriculum implementation throughout a school. According to Dudu (2014:550), the role of the

Chemistry teacher as a classroom supporter entails working inside classroom to help other Chemistry teachers implement new ideas, often by demonstrating a lesson, co-teaching, or observing and giving feedback.

### **3.11 THE RURAL CONTEXT IN THE SOUTH AFRICAN EDUCATION SYSTEM**

According to Mukeredzi (2013:3), in the South African context, the Human Science Research Council (HSRC, 2005) define rural Traditional Authority land composed of community-owned portions and commercial farms in former White areas of South Africa as well as the former “homeland” areas. Under apartheid, policies such as the Land Act, the Group Areas’ Act of 1953 and the Separate Development Act forced native Black South Africans to live in “homelands” areas, which continues to have poor infrastructure and inadequate service and facilities which affect the teaching and learning of Chemistry (Mukeredzi, 2013:3). These former homelands are generally characterized either by considerably dense or sparsely populated village-style settlement. Mukeredzi (2013:3) has observed that the poorest and least developed South African communities are those located in the former homelands of the Eastern Cape, Limpopo, and KwaZulu-Natal, where the conditions of poverty and under-development continue to be reflected in the poor quality of education mainly in teaching and learning of Chemistry.

According to Mukeredzi (2013:3), most South African rural schools lack material and infrastructure resources, basic service and facilities to enable Chemistry teaching to take place effectively. In response to global movements such as Education for all, these schools also experience increased class size, multi-grade teaching, and pressures of performativity in terms of rendering quality teaching and learning in Chemistry. Rural secondary schools lack toilets on site, rely on borehole or rainwater harvesting, and have no source of electricity for practical session in Chemistry classroom. Mukeredzi (2013:3) indicates that due to poor physical infrastructure, public transport is limited and expensive, which forces children to walk long distances to the nearest school. Working in rural contexts presents unique challenges in Chemistry teachers, according to Mukeredzi (2013:3).

The farther a school is from the city, the harder it is to recruit Chemistry teachers. Competent, qualified and experienced Chemistry teachers shun postings in rural contexts because of geographical isolation, socio-economic conditions, cultural differences, and the dominant discourse of deficiency that conceptualizes teaching in rural schools as inferior and undesirable (Mukeredzi, 2013:3). In KwaZulu-Natal province of South Africa alone, in 2010, approximately 14% (about 12 000) of the 86 017 teaching corps were completely unqualified. They had Relative Education Qualification Value (REQV) of 9, 10, 11 or 12 which implies that they had no professional teaching training and suggest that the majority is in rural schools (Mukeredzi, 2013:4).

### **3.12 TEACHERS' PROFESSIONAL DEVELOPMENT IN SOUTH AFRICA**

According to Mukeredzi (2013:5), teacher professional development has become a dominant theme in the quest for improving education quality. Professional development has been broadly viewed as the growth of individual teachers in their profession. Mukeredzi (2013:5) indicates that professional development draws on constructivism. That is, teachers are viewed as active learners for whom there is an active meaning-making process of transforming understandings. In this process, teachers, as learners, are motivated to learn, assuming an active role for professional development to occur. Moreover, according to Mukeredzi (2013:5), professional development is conceived as collaborative. The most effective teacher professional development occurs through interaction and debate not only among teachers but with other stakeholders like (administrators, parents).

Professional development takes place within a particular context and is related to the daily activities of Chemistry teachers and learners (Mukeredzi, 2013:6). In this regard, context becomes central to learning itself. Context should support and challenge Professionally Unqualified Practicing Teachers (PUPTs) thinking and assists them in becoming effective professionals capable of handling and experiencing real-world complexities. Mukeredzi (2013:6) emphasizes that a Chemistry teacher is conceived as a reflective practitioner who enters the profession with some knowledge. Professional development will aid (PUPTs) in building pedagogical theories and practices, thus helping them to develop expertise in

science. PUPTs will acquire or improve their theoretical and teaching ideas, trying them out and evaluating them with critical reflection and through receipt of support and feedback.

### **3.13 THE PERCEIVED ROLES AND FUNCTIONS OF SCHOOL SCIENCE SUBJECT ADVISORS**

In South Africa, teachers, particularly in the Department of Education and Training (DET), criticised the subject advisory services and the appraisal system (Dilotsothle, Smit & Vreken, 2001:305). Subject advisors in the DET had no powers but only rendered an advisory service to teachers. Despite the negative attitude portrayed towards subject advisors, the Physical Science teachers at North West Province felt that a solution to their teaching problems lay in the formation of study groups to share expertise and to call on subject advisors and university specialist for guidance.

Dilotsothle et al. (2001:305) further indicate that despite numerous levelled at subject advisors' functions, generally, the DET Physical Science subject advisors conceptualized their roles prior 1994. The main emphasis was that the subject advisor was not to be seen as an inspector as his/her role was to advise and not to criticize. The following main areas were identified: knowledge of the subject, innovation, community involvement on science issues, writing skills, confidence, upgrading of unqualified teachers, field and administrative work, identification of good teachers, communicating and establishing good relations with teachers and curriculum development (Dilotsothle et al., 2001:306).

In the United State of America (US), since early 70s Chemistry teachers are assisted by science consultants/ coordinators. This is contrary to what is happening in South Africa. Curriculum Advisors cannot cover all schools as they are fewer than schools (Dilotsothle et al., 2001:306). The US unlike in South Africa use survey results in which the participants were asked to rank the roles of the science advisors in the order that would most closely fit their needs. The seven universal perceived roles in US in order of preference were:

- **Instruction:** assistance in the development of instructional materials; implementation of curriculum changes; encouragement of learner involvement in extracurricular programme; review and refinement of methods of instruction;
- **Curriculum:** facilitation of teacher involvement in curriculum development; evaluation of new methods and materials; communication of significant new developments and of the status; accomplishments and needs of the science programme;
- **Staff development:** initiation of in-service programme; co-ordination with other school personnel; communication of opportunities for staff development; research in curriculum and long-range programme objectives;
- **Implementation:** initiation of opportunities for teacher exchange and co-operative teaching; dissemination of information on funding; co-ordination of teachers' ideas on the design or remodelling of facilities and development of proposals for new instructional projects;
- **Management:** requisition of supplies; co-ordination of information about laws, liabilities, district policies, safety regulations, financial status and budgets;
- **Assessment:** analysis of test results; maintenance of data on learner achievement, examination of teaching objectives based on test results and assistance to teachers in self-evaluation; and
- **Assignment, transfer, load:** assistance in assignment; equalization of teaching load; resolution of conflict and selection of staff.

These methods can be adopted to serve as key points of improving teaching and learning of Chemistry in South Africa (Dilotsohle et al., 2001:306).

### 3.14 CONCLUSION

In conclusion, this chapter reviewed the historical background of Chemistry education in South Africa and consider the reports, curriculum documents, national reports and Science education research literature in regards to management of high school learners' academic performance in Chemistry.

## CHAPTER 4

### RESEARCH DESIGN AND METHODOLOGY

#### 4.1 INTRODUCTION

This study explored the problem of management of high school learners' academic performance in Chemistry. This chapter explains the research design, presents the research strategy chosen for the study and discusses the methods used in collecting and analysing data about managing high school learners' academic performance in Chemistry in Vhembe District of Limpopo Province, South Africa.

The main research questions addressed reveal the picture of the management of high school learners' academic performance in Chemistry, and these are subsidiary questions:

- 4.1.1 What are the factors affecting the management of high school learners' academic performance in Chemistry?
- 4.1.2 What factors influencing the academic performance of learners in Chemistry?
- 4.1.3 What are management strategies that can help to improve learners' performance in Chemistry?
- 4.1.4 What are the appropriate teaching and learning models for improving teachers' and learners' interest in Chemistry?

#### 4.2 RESEARCH PARADIGM

Research paradigm is the set of common belief and arrangements shared between scientists about how problems should be understood and addressed. In this study, for quantitative approach the positivism research paradigm was used in which its ontology there exist a single reality. Positivists believe that there is a single reality, which can be measured and known, and therefore they are more likely to use quantitative methods to measure this reality.

For qualitative approach, the constructivism (Anti-positivism) research paradigm was used in which there is no single reality. Therefore, reality is created by individuals in groups. Constructivists believe that there is no single reality or truth, and therefore reality needs to be interpreted, and therefore they are more likely to use qualitative methods to get those multiple realities.

### **4.3 RESEARCH DESIGN**

According to Creswell (2009:3), research design is a set of guidelines and instruments to be followed in addressing the research problem. A mixed methods research design was employed in this research study. Mixed method study combines characteristics of both qualitative and quantitative approaches to research. This mix could emphasize one set of characteristics or the other (MacMillan & Schumacher, 2010:11).

In this study, qualitative and quantitative designs were used in order to achieve better understanding of dimensions and severity among the highly selected secondary school, it was felt necessary to converge, both broad numeric descriptions of quantitative research and in-depth naturalistic inquiries of qualitative research. The use of two research paradigms enabled the researcher to triangulate results found in this study.

Mixed methods research is a systematic integration of qualitative and quantitative methods in a single study for the purposes of obtaining a fuller picture and deeper understanding of a phenomenon. Mixed methods can be integrated in such a way that qualitative and quantitative method retain their original structures and procedures. Alternatively, these two methods can be adapted, altered, or synthesized to fit the research and cost situations of the study (Johnson, Onwuegbuzie & Turner, 2007:119).

Importantly, the study involved both qualitative and quantitative approaches. The qualitative approach involved principals' interviews that help to investigate the management of high school learners' academic performance in Chemistry. In

addition, interviews were conducted with principals of selected schools which were purposively sampled and who have management responsibility in their schools.

The quantitative approach, on the other hand was used in order to collect data from teachers and learners. Teachers were sampled in stratified random sample to represent the population of Chemistry teachers in their respective schools. Learners' survey also assists the researcher to gather learners' views on learners' academic performance in Chemistry. Learners were also sample in stratified random sampling to represent the population of learners in their respective schools.

A mixed method approach involving a combination of qualitative and quantitative data from different sources was used to corroborate findings in this study. Ogunmade (2005:61) indicates that qualitative methods help to provide answers to questions by examining various social settings and individuals who inhabit the settings, thus allowing the researchers to share in the understandings and perceptions of others and to explore how people structure and give meaning to their daily lives. Ogunmade (2005:61) notes that qualitative methods help elucidate the frames of meaning of the actor and investigate the context of action. Findings of qualitative methods have a quality of undeniability because they help create concrete, vivid and meaningful flavor to the descriptions of incidents and events.

According to Ogunmade (2005:62), quantitative methods essentially help to identify and assess the bounds of knowledgeability of the participants and to assess the participant's attitudes, values, beliefs or opinions. Ogunmade (2005:62) indicates that questionnaires in quantitative research give more precise, explicit, and pre-determined measure and identification of relevant variables in advance. Ogunmade (2005:62) further claims that questionnaires are economical and very simple to administer to sample large groups of participants; give better potential to generalize findings because samples are large; ensure efficient gathering of large quantities of baseline data; and the responses gathered can usually be transformed easily by coding into data files that are ready for statistical analysis.

## **4.4 RESEARCH METHODOLOGY**

Research methodology refers to a process whereby the researcher collects and analyses data (Henning, van Rensburg & Smith, 2004:36). Research methodology depends on the nature of data collected and the nature of the problem of research. Somekh and Lewis (2005:346) define methodology as both “the collection of methods or rules by which a particular piece of research is undertaken” and the “principles, theories and values that underpin a particular approach to research”, while Walter (2006:35) argues that methodology is the frame of reference for the research which is influenced by the “paradigm in which our theoretical perspective is placed or developed”. The most common definitions suggest that methodology is the overall approach to research linked to the paradigm or theoretical framework while the method refers to systematic modes, procedures or tools used for collection and analysis of data (Mackenzie & Knipe, 2006:1). This study used mixed design, namely, qualitative and quantitative designs.

### **4.4.1 Qualitative Method**

Qualitative purists support a constructivist or interpretivist paradigm and “contend that multiple-constructed realities abound, that time-and context-free generalizations are neither desirable nor possible, that research is value-bound, that it is impossible to differentiate fully causes and effects, that logic flows from specific to general and that knower and known cannot be separated because the subjective knower is the only source of reality” (Johnson & Onwuegbuzie, 2004:14).

### **4.4.2 Quantitative Method**

Quantitative method (that is a positivist paradigm) has, historically, been the cornerstone of social-science research. Qualitative researchers call to “eliminate their biases, remain emotionally detached and uninvolved with the objects of study and test or empirically justify their stated hypotheses” (Johnson & Onwuegbuzie, 2004:14).

Questionnaires were used to collect quantitative data. A questionnaire is a data gathering instrument through which participants answer questions in writing (Leedy & Ormrod, 2010:166). The purpose of using the questionnaire is that facts and opinions about a phenomenon from teachers and learners were obtained, and given the large numbers, it was impossible to interview all of them.

## **4.5 POPULATION AND SAMPLE**

This section discusses population and sampling procedures.

### **4.5.1 Population**

According to McMillan and Schumacher (2010:129), a population is a group of elements or cases, whether individuals, objects, or events, that conform to specific criteria and to which we intend to generalise the results of the research. In this study, the population is composed of all Chemistry learners, Physical Science teachers and principals of selected schools in the circuits (Luvuvhu, Mvudi and Sibasa Circuits) in Vhembe District of Limpopo Province.

### **4.5.2 Sampling Procedures**

According to McMillan and Schumacher (1993:382), a sample is a sub-set of the population to which the researcher intends to generalize the results. As pointed out by Neuman (1997:201), sampling should be viewed as the process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected.

For this research, the qualitative sample comprised twelve (12) principals from purposively sampled schools which offer Physical Sciences. In this study, quantitative sample comprised hundred and twenty (120) learners stratified random sampled from twelve (12) schools in three circuits of Vhembe District. Twenty-four (24) teachers were stratified random sampled from twelve (12) schools which offer Physical Sciences in three circuits (Luvuvhu, Mvudi, and Sibasa) of Vhembe District.

In this study, for qualitative sampling strategy, researcher use purposive sampling that need interviews of principal from selected schools in the circuits. Purposive sampling method allowed the researcher to acquire information that would build up arguments towards a deeper understanding of participants' reason for management of high school learners' academic performance in Chemistry (Cohen, Manion & Morrison, 2007:114).

In this study, learners and teachers from selected schools were stratified randomly sampled. Stratified random sampling involves dividing the population into homogeneous group, each group containing subjects with similar characteristics. Stratified random sample is, therefore, a useful blend of randomization and categorization thereby quantitative research can be undertaken (Cohen, Manion & Morrison, 2007:115).

## **4.6 RESEARCH INSTRUMENTS**

The research instruments which were used for data collection are questionnaires and interviews.

### **4.6.1 Interview Schedule**

Rubin and Rubin (in Arskey & Knight, 1999:33) suggest that structured interviews are a way of uncovering and exploring the meanings that underpin people's lives, routines, behaviours, and feelings.

Twelve (12) principals respond to a semi-structured interview that focused on the research questions. The interviews were administered through personal visits on appointment with school principals. The interviews were conducted in the school on those visiting days. The duration of the interviews was within 45 minutes to an hour, depending on the responses given during the process. The main questions asked included:

- What are factors affecting the management of academic performance in your school which have a negative effect on learners in Chemistry?
- Do you think teachers' attitudes influence learners' academic performance?

- Do you, as the principal of the school, have appropriate teaching and learning strategies for improving teachers' and learners' interest in Chemistry?
- What relationship is there between the teacher's classroom management effectiveness and learners' achievement in Chemistry?

#### 4.6.2 Questionnaire

Questionnaires are preferred due to economic reasons, as McMillan and Schumacher (2001:257) show that the use of a questionnaire is economical; it contains standard questions, and questionnaires use a uniform procedure, thus ensuring comparability of results. Another advantage of questionnaires is that they can ensure anonymity to maintain and ensure confidentiality, thus giving the respondents more confidence in giving accurate information.

In preparing questionnaires, the researcher was, nonetheless, cautious. The following procedure was done when posing each question:

- To what extent might the question influence participants to show themselves in a good light?
- To what extent might the question influence participants to attempt to anticipate what researchers want to find out?
- To what extent might the question ask for information about participants that they may not know about themselves?

The validity of any questionnaire is limited by all three of these considerations (Tuckman, 1994:216). Taking into consideration these issues, questionnaires were distributed to learners and teachers who were stratified random sampled from selected schools.

- Questionnaire had both open and close-ended questions.

The advantage of this type of instrument is the ease with which it affords the research during analysis. Moreover, they are easy to administer and economical to use in terms of time and money. In addition, open-ended questions were used so as to give the participants complete freedom of response. Open-ended questions were necessary since they gave insight into the challenges facing the teachers and

learners. In the development of the questionnaires, particular attention was given to ensure that questions are unambiguous, unbiased, unloaded, relevant, succinctly conceptualized as well as avoiding vagueness (Ogunmade, 2005:68). In particular, care was taken to ensure questions were appropriate for the culture and context of Vhembe District of Limpopo Province in South Africa.

- **Teacher survey**

The teacher questionnaire comprised two (2) sections. The first section elicited information on biographical data regarding the teacher's age, qualifications, gender, teaching experience and school information. The second section focused on factors affecting performance, influencers of Chemistry performance, and management strategies that can help improve performance in Chemistry.

- **Learner survey**

The purpose of the learner survey was to investigate learners' perception of the management of academic performance in Chemistry. The questionnaire comprised of two (2) sections. The first section required biographical data regarding learners' gender, grade, and age. The second section focused on factors affecting performance, influencers of Chemistry performance, and the strategies that can be followed to improve on performance in Chemistry.

#### **4.7 DATA COLLECTION**

Official permission to conduct the research was sought from the District Senior Manager from Vhembe District and reference letters from the University of Venda. At the schools, the researcher obtained permission from the principals to hand over the questionnaires to Chemistry teachers who would, in turn, distribute to selected Chemistry learners. The learners were required to answer the questionnaires and return them immediately to the Chemistry teacher who handed them together with teachers' responses to the researcher. This was done to avoid discussion amongst the learners, which might lead to change of opinion.

#### **4.7.1 Pilot Testing of the Research Instruments**

Teacher and learner survey questionnaires were pilot tested with science teachers and learners from two secondary schools in the Vhembe District for both the content and construct validity. To add, interview questions were pilot tested with principals from a different circuit to determine the level of understanding of the questions raised in the study. Based on the responses in the survey questionnaires and comments from the interviews, appropriate corrections were made by the researcher in agreement with his promoters. Therefore, the instruments were considered appropriate for the research study.

### **4.8 QUALITATIVE CONTROL MEASURES**

#### **4.8.1 Trustworthiness of the Qualitative Approach**

The researcher ensured that transferability, credibility, conformability and dependability were evident in the study.

- **Transferability**

The researcher ensured that the research was used by other researchers provided proper acknowledgement is made. Transferability refers to whether the research can be transferred by allowing other researchers to make comparisons with the researcher's own work (Creswell, 2009:90).

- **Credibility**

Credibility is the extent to which data collected can be controlled in an objective and reliable manner (Creswell, 2009:91). The researcher interviewed some of the participants which are principals, while learners and teachers complete the questionnaires. This was done to avoid inaccurate and misleading conclusions.

- **Conformability**

The researcher ensured that similar sample sizes, respondents and similar research instruments were used. This means that the research results would be similar as

well. Conformability means achieving the same results even when different researchers conduct the research (Creswell, 2009:91).

- **Dependability**

According to Whitemore, Chase and Mande (2001:534), trustworthiness of the study can also be determined by the dependability of the findings and that the quality in research is dependent on honest and forthright investigations. Evidence of the field research in the form of research instruments was used to draw the findings, conclusions and recommendations in order to ensure research dependability.

## **4.9 QUANTITATIVE CONTROL MEASURES**

### **4.9.1 Validity and Reliability of the Research Instruments**

To ensure validity and reliability, the researcher gave questionnaires to similar participants who were not part of the study for pilot testing. According to Golafshani (2003:41), validity refers to how well the research instrument measures what it sets out to measure. The purpose for pre-testing was to reduce the degree of limitations of certain measures since this study relies on valid, authentic and trustworthy, methods of collecting and presenting information and interpretations.

Measures were taken to enhance design validity for consistency of application. In the instance of this particular study, measurement of validity pertains to the quantitative technique (questionnaire to be administered to learners and teachers). A qualitative technique (principals of schools) was used to identify the challenges that contribute to the management of high school learners' performance in Chemistry.

Reliability is the degree to which the questionnaire measures what it is supposed to measure (Stenbacka, 2001:552). It ensures that the degree of consistency and accuracy with which a questionnaire measures its variables is maintained. The two instruments (questionnaire and interview schedule) were evaluated for reliability during pre-testing stage.

Validity and reliability are related because:

- A test can be reliable but not valid, but a test cannot be valid without being first reliable (Leedy & Ormrod, 2001:31).

In this study, the researcher used the guidance of the supervisor, co-supervisor and other members of the school to ensure validity and reliability. The research instruments were designed with the literature review in mind. Published articles and presented papers in accredited journals were acknowledged when preparing the research instruments.

#### **4.10 DATA ANALYSIS**

The results obtained from the interviews with principals were analysed using themes and sub-themes. Results obtained from questionnaires with teachers and learners analysed by use of both descriptive and inferential statistics by Statistical Package for Social Sciences (SPSS). From the analysis, the researcher was able to discuss the findings, make conclusions and suggest any recommendations for future related research. The statistical techniques used were mean, percentages, and chi-square.

##### **4.10.1 Mean**

Mean is one of the measures of central tendency. It shows the most representative score in a set of observations. Based data on normal distribution, mean is the most stable measure of central tendency.

##### **4.10.2 Percentages (%)**

Percentages are proportions expressed out of 100. They provide a proportion of the total sum. They were used by the researcher to establish the proportion of the subjects in various areas of the study samples and their responses.

### 4.10.3 The Chi-square ( $\chi^2$ )

This is a non-parametric statistical test. It is used to analyse data that is in the form of frequencies, percentages, proportions and percentiles. It also tests hypotheses about associations (relationships), that is, how two or more variables are related to each other. It was used by the researcher since the data was in percentages in order to establish relationship that existed between the variable under study.

## 4.11 CONCLUSION

This chapter described the research design and methodology that the researcher used to generate data for this study. Description of the study area, sampling procedure, research instruments used; data collection procedure, qualitative and quantitative control measures were all aspects of the research that were discussed in this chapter.

## CHAPTER 5

### DATA ANALYSIS, RESULTS AND DISCUSSION

#### 5.1 INTRODUCTION

This chapter aims at presenting and discussing the data collected from participants by means of questionnaires and obtained from the interviews. The participants of the study were learners, teachers and principals. The questionnaires were distributed to learners and teachers while the interviews were conducted with the principals only. The analysis of the data was done in the light of the objectives and/or research questions.

#### 5.2 QUANTITATIVE DATA ANALYSIS

The questionnaires were distributed to 24 teachers and 120 learners from three selected circuits: Mvudi, Sibasa and Luvuvhu. They were distributed to 12 schools in the Vhembe District of Limpopo Province in South Africa. The results obtained were then analyzed by use of both descriptive and inferential statistics by Statistical Package for Social Sciences (SPSS) programme. The statistical techniques used were frequency distributions, percentages and Chi-square to consider whether relationships between variables were statistically significant.

A total of 24 (twenty-four) questionnaires were distributed to Chemistry teachers from 12 (twelve) secondary schools in Vhembe District of the Limpopo Province in South Africa, and all 24 questionnaires for teachers (100% returned) as well as 120 questionnaires for learners (100% returned) were completed and used for analysis.

## 5.2.1 A: Biographical Information - Teacher's Analysis

**Table 5.1: Age of the Educators**

| Age          | Frequency | Percent     |
|--------------|-----------|-------------|
| >50yrs       | 5         | 20%         |
| 41-50yrs     | 12        | 50%         |
| 31-40yrs     | 4         | 17%         |
| 20-30yrs     | 3         | 13%         |
| <b>Total</b> | <b>24</b> | <b>100%</b> |

Table 5.1 shows that 5 (20%) Science teachers, were above 50 years of age, whereas 12 (50%) teachers were in the 41-50 years' group, 4 (17%) Science teachers were in the 31-40 years' group followed by 3 (13%) teachers who were in 20-30 years' age group. This implies that the majority of Science teachers were at the ages of 41-50. This result shows that Science teachers are well mature to make changes on the performance of learners in Chemistry.

**Table 5.2: Highest Qualifications of the Participants**

| Qualification     | Frequency | Percent     |
|-------------------|-----------|-------------|
| Diploma           | 2         | 8%          |
| Bachelor's Degree | 11        | 46%         |
| Honours Degree    | 10        | 42%         |
| Masters           | 1         | 4%          |
| <b>Total</b>      | <b>24</b> | <b>100%</b> |

In Table 5.2 are the qualifications of participants, which shows that the majority of the participants, 11 (46%) have a Bachelor's degree, 10 (42%) have an Honours degree, 2 (8%) have a Diploma and only 1 (4%) has a Master's degree. This implies that Science teachers are not highly qualified because only one Science teacher has

a Master's degree. According to the literature, Maphoso and Mahlo (2015:52) mentioned that poor qualifications of teachers is a major problem in African Schools.

**Table 5.3: Gender of the Participants**

| Gender       | Frequency | Percent     |
|--------------|-----------|-------------|
| Female       | 12        | 50%         |
| Male         | 12        | 50%         |
| <b>Total</b> | <b>24</b> | <b>100%</b> |

Table 5.3 shows that out of the 24 teachers, 12 (50%) were males and 12 (50%) were females. This implies that the study has an equal number of males and females which makes the findings unbiased.

**Table 5.4: Teaching Experience of the Participants**

| Experience   | Frequency | Percent     |
|--------------|-----------|-------------|
| 1-5yrs       | 3         | 13%         |
| 6-10yrs      | 2         | 8%          |
| 11-15yrs     | 4         | 17%         |
| 16-20yrs     | 5         | 21%         |
| >21yrs       | 10        | 41%         |
| <b>Total</b> | <b>24</b> | <b>100%</b> |

Table 5.4 shows that the majority of the teachers had more than 21 years teaching experience. That is, 10 (41%), 5 (21%) had 16-20 years teaching experience, 4 (17%) had 11-15 years teaching experience, 3 (13%) had 1-5 years and 2(8%) had 6-10 years teaching experience. These results imply that 10 teachers (41%) had adequate experience in teaching Science at school. In South Africa, learner achievement increases with teacher experience, but the linkage is weak and largely

reflects poor outcomes for teachers during their first year or two in the classroom (Maphoso & Mahlo, 2015:53).

**Table 5.5: Number of Years as a Teacher in the School**

| Number       | Frequency | Percent     |
|--------------|-----------|-------------|
| 1-5yrs       | 7         | 29%         |
| 6-10yrs      | 9         | 37%         |
| 11-15yrs     | 3         | 13%         |
| 16-20yrs     | 2         | 8%          |
| >21yrs       | 3         | 13%         |
| <b>Total</b> | <b>24</b> | <b>100%</b> |

Table 5.5 shows that the majority of the participants, 9 (37%), have been in their current schools for 6-10 years, 7 (29%) 1-5 years, 3 (13%) 11-15 years, 3 (13%) >21 years, and 2 (8%) have been in their current schools for 16-20 years. This implies that only 3 (13%) of the teachers have been teaching in the same school for more than 21 years.

#### **Your employer:**

All teachers indicated that they are employed by the Department of Basic education. This implies that all 24 Science teachers are employed by the Limpopo Department of Education 24 (100%).

**Table 5.6: Distance from School**

| Distance                | Frequency | Percent     |
|-------------------------|-----------|-------------|
| In school premises      | 1         | 4%          |
| Within walking distance | 6         | 25%         |
| 10-20km away            | 7         | 29%         |
| >20km away              | 10        | 42%         |
| <b>Total</b>            | <b>24</b> | <b>100%</b> |

Table 5.6 shows that 10 (42%) of the educators stayed more than 20 kms from the schools they teach in, 7 (29%) stayed 10-20 kms away from the schools, 6 (25%) walked to their workplace, and only 1 (4%) stays within the school premises. This implies that majority of science teachers stayed more than twenty kilometres from school. Therefore, it would be difficult for them to stay much longer with the learners unlike if they stayed closer to the school where they can even organize to teach learners as early as they wish and even at later hours.

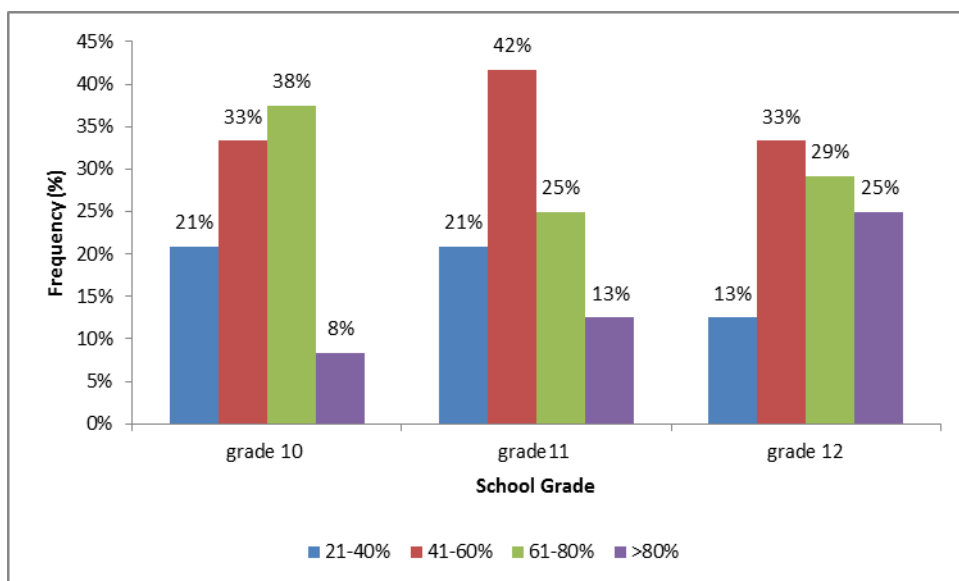
**Table 5.7: Rating of Teachers' Ability**

| Ability      | Frequency | Percent     |
|--------------|-----------|-------------|
| excellent    | 5         | 20%         |
| fair         | 3         | 13%         |
| good         | 16        | 67%         |
| <b>Total</b> | <b>24</b> | <b>100%</b> |

Table 5.7 shows that when teachers were asked to rate their teaching ability, the majority, 16 (67%), rated it as "good", 5 (20%) as 'excellent' and 3 (13%) as fair. None of the teachers rated their teaching ability as 'bad'. This implies that almost all teachers rated themselves as good, fair and even excellent. It also implies that not all teachers are excellent in the teaching of Chemistry.

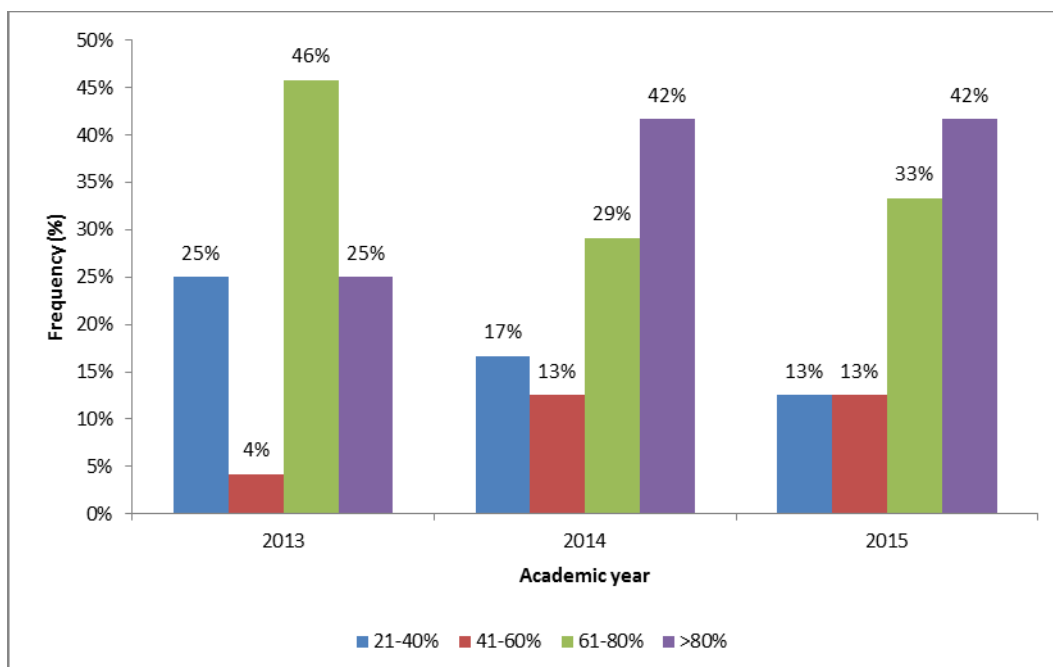
### 5.2.2 B: School Information

Participants were asked to indicate their school average mean marks in Chemistry in the Grades 10, 11 and 12. Figure 5.1 shows that the majority of the Grade 10 marks are in the range of 41-80%, with 38% in the 61-80% category and 33% in the 41-60% range. The majority of Grade 11s (42%) are in the 41-60% range. For Grade 12s, the 41-60% category is the most common (33%), followed by the 61-80% (29%), and a quite significant proportion in the >80% category, and only 13% are in the 21-40% mean mark category.



**Figure 5.1: School Average Mean Mark in Grades 10, 11 & 12 in Chemistry**

Figure 5.2 shows the schools trends in performance in Chemistry in the academic years 2013, 2014 and 2015. In the year 2013, the majority of the schools had a 61-80% pass in Chemistry (46%). In the 2014 and 2015 academic years, the majority of the schools (42%) had >80% pass.



**Figure 5.2: Performance in Chemistry in the Years 2013, 2014, 2015**

**Table 5.8: Laboratory Facilities in the School**

| Laboratory   | Frequency | Percent     |
|--------------|-----------|-------------|
| None         | 15        | 63%         |
| One          | 5         | 20%         |
| Two          | 3         | 13%         |
| Three        | 1         | 4%          |
| <b>Total</b> | <b>24</b> | <b>100%</b> |

Table 5.8 shows that the majority of the schools, 15 (63%), have no laboratory facilities at all, 5 (20%) have one laboratory, 3 (4%) have two laboratories, and 1 (4%) has three laboratories. This implies that majority of schools have no laboratories where experiments and practicals are done. Chemistry teaching needs teachers and learners to perform experiments every time after or before each topic is introduced. Oginni et al. (2013:1517) found significant association between the nature of the Chemistry laboratory classroom environment and the learners' learning outcome; they uncovered several interesting high school pedagogical experiences that appeared to be linked with varying laboratories for understanding associated with higher learners' grades.

### 5.2.3 Factors Affecting the Management of High School Learners' Academic Performance in Chemistry (N = 24)

#### 5.2.3.1 School factor

**Table 5.9: I am Comfortable teaching some Topics in Chemistry more than others**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 3         | 13         |
|              | Disagree          | 2         | 8          |
|              | Undecided         | 1         | 4          |
|              | Agree             | 10        | 42         |
|              | Strongly Agree    | 8         | 33         |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.9 shows that the majority of teachers, 10 (42%), agree that they are comfortable teaching some topics in Chemistry while 8 (33%) strongly agree with the idea, 3 (13%) strongly disagree and 2 (8%) disagree with teachers comfortable teaching some topics in Chemistry more than others. Only 1 (4%) is undecided on the idea. On average (75%) of teachers agree that they are comfortable teaching some topic in Chemistry more than other. This implies that teachers teach mostly the topics which were simple to them and avoid the difficult topics.

**Table 5.10: I Prefer to Teach Chemistry most, than Teaching other Subjects (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Disagree          | 6         | 25         |
|       | Undecided         | 3         | 13         |
|       | Agree             | 6         | 25         |
|       | Strongly Agree    | 8         | 33         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.10 shows that most teachers 8 (33%) strongly agree that they prefer teaching Chemistry more than teaching other subjects while 6 (25%) agree with the idea of preferring teaching Chemistry than other subjects. On the other hand, 6 (25%) disagree with while 1 (4%) strongly disagrees; 3 (13%) are undecided. On average (58%) of teachers agree that they prefer to teach Chemistry most than teaching other subject. This indicates that most science teachers prefer to teach Chemistry and dislike teaching other subjects.

**Table 5.11: I have Full Support of Management and Administration in Teaching Chemistry (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Disagree          | 3         | 13         |
|       | Undecided         | 4         | 16         |
|       | Agree             | 9         | 38         |
|       | Strongly Agree    | 7         | 29         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.11 shows that the majority of teachers 9 (38%) agree as well as 7 (29%) strongly agree that they have full support of management and administration in teaching Chemistry. Only 4 (16%) were undecided to the question. But 3 (13%) disagree while 1 (4%) strongly disagree about having support from the management and administration. It shows that (67%) of teachers agree and strongly agree that they have support from management and administration in the teaching of Chemistry.

**Table 5.12: I would be more Motivated if I Teach High Ability Learners (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 3         | 13         |
| Disagree                | 3         | 13         |
| Undecided               | 1         | 4          |
| Agree                   | 8         | 33         |
| Strongly Agree          | 9         | 37         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.12 shows that the majority of teachers 9 (37%) strongly agree, and 8 (33%) agree that teachers will be more motivated if they can teach high ability learners. Other teachers 3 (13%) strongly disagree, and 3 (13%) disagree on the notion that they can be motivated if they teach high ability learners. However, 1 (4%) was undecided on the issue. It implies that (70%) of teachers agree that they like to teach gifted or highly ability learners.

**Table 5.13: Chemistry should be made Optional (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 8         | 33         |
| Disagree                | 5         | 21         |
| Agree                   | 8         | 33         |
| Strongly Agree          | 3         | 13         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.13 shows that the majority of teachers 8 (33%) strongly disagree together with 5 (20.8%) who disagree that Chemistry should be made optional. Surprisingly 8 (33%) agree while 3 (13%) strongly agree to the idea of making Chemistry optional to learners. This implies that the majority says Chemistry must be made optional whether a learner chooses to do it or not.

**Table 5.14: Chemistry Syllabus is not Too Wide (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 3         | 13         |
| Disagree                | 8         | 33         |
| Undecided               | 5         | 21         |
| Agree                   | 7         | 29         |
| Strongly Agree          | 1         | 4          |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.14 shows that the majority of teachers 8 (33%) disagree together with 3 (13%) who strongly disagree that the Chemistry syllabus is not too wide. About 7 (29%) agree as well as 1 (4%) who strongly agree that Chemistry syllabus is not too wide. Only 5 (21%) teachers were undecided. This implies that the Chemistry

syllabus is wide, and it is difficult to finish the syllabus in stipulated period, and teachers make their own time in order for them to complete the syllabus.

**Table 5.15: Some Learners do not have the Ability to Learn Chemistry (N = 24)**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 3         | 12         |
|              | Disagree          | 4         | 17         |
|              | Undecided         | 4         | 17         |
|              | Agree             | 7         | 29         |
|              | Strongly Agree    | 6         | 25         |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.15 shows that the majority of teachers 7 (29%) agree together with 6 (25%) who strongly agree that some learners do not have the ability to learn Chemistry, 4 (17%) disagree while 3 (12%) strongly disagree with the idea that some learners do not have the ability to learn Chemistry. Only 4 (17%) teachers were undecided. This shows that (54%) of teachers agree and also strongly agree that some learners do not have the ability to learn Chemistry. This, in turn, impacts on their effectiveness in teaching.

**Table 5.16: The Laboratory has Few Chemicals (N = 24)**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 6         | 25         |
|              | Disagree          | 2         | 9          |
|              | Undecided         | 1         | 4          |
|              | Agree             | 8         | 33         |
|              | Strongly Agree    | 7         | 29         |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.16 shows that the majority of teachers 8 (33%) agree, and 7 (29%) strongly agree that their laboratories have few chemicals. Then some teachers, 6 (25%), strongly disagree while 2 (9%) disagree that laboratories have few chemicals and 1 (4%) was undecided. This shows that (62%) of teachers agree and strongly agree that their laboratories have few chemicals that would promote teaching and learning of Chemistry.

**Table 5.17: The Laboratory has Few Apparatus (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 5         | 21         |
|       | Disagree          | 4         | 17         |
|       | Undecided         | 3         | 12         |
|       | Agree             | 6         | 25         |
|       | Strongly Agree    | 6         | 25         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.17 shows that the majority of teachers, 6 (25%), strongly agree and 6 (25%) agree that their laboratories have few apparatuses. Then some teachers, 5 (21%), strongly disagree, and 4 (17%) disagree that laboratories have few apparatuses while 3 (12%) were undecided. This shows that (50%) of teachers agree and strongly agree that their laboratories have few apparatuses to promote teaching and learning of Chemistry.

### 5.2.4 Influencers of Learners' Performance in Chemistry (N = 24)

**Table 5.18: Most Chemistry Teachers are in the Teaching Profession not by Choice**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 3         | 13         |
|       | Disagree          | 3         | 13         |
|       | Undecided         | 4         | 17         |
|       | Agree             | 9         | 37         |
|       | Strongly Agree    | 5         | 20         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.18 shows that the majority of teachers 9 (37%) agree and 5 (20%) strongly agree that Chemistry teachers are in the profession not by choice. Some teachers, 3 (13%), strongly disagree and 3 (13%) disagree with the fact that Chemistry teachers are in the profession not by choice. Only 4 (17%) of the teachers were undecided. This implies that (57%) of teachers agreed that, are in the teaching profession because they fail to get better career opportunities.

**Table 5.19: Most Chemistry Teachers are in the Teaching Profession because they Consider it as a Waiting Ground for Better Jobs (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 3         | 13         |
|       | Disagree          | 3         | 13         |
|       | Undecided         | 7         | 28         |
|       | Agree             | 8         | 33         |
|       | Strongly Agree    | 3         | 13         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.19 shows that the majority of teachers 8 (33%) agree and 3 (13%) strongly agree that Chemistry teachers are in the teaching profession because they consider it as a waiting ground for better job. Some teachers 3 (13%) strongly disagree, and 3 (13%) disagree to the fact that Chemistry teachers are in the teaching profession because they consider it as a waiting ground for better job. Only 7 (28%) of teachers were undecided. This shows that (46%) of teachers agreed are in the profession not because they like it but as a place to wait for greener pastures (better jobs).

**Table 5.20: Some Chemistry Teachers are Incompetent (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 4         | 16         |
|       | Disagree          | 3         | 13         |
|       | Undecided         | 3         | 13         |
|       | Agree             | 11        | 45         |
|       | Strongly Agree    | 3         | 13         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.20 shows that the majority of teachers, 11 (45%), agree, and 3 (13%) strongly agree that some teachers are incompetent. Some teachers 4 (16%) strongly disagree, 3 (13%) disagree. Only 3 (13%) were undecided. This implies that (58%) of teachers agreed that they are incompetent and results in poor performance of learners in Chemistry.

**Table 5.21: Some Teachers are not graduates of Chemistry, but Circumstances Allow them to Teach it (N = 24)**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 1         | 4          |
|              | Disagree          | 2         | 8          |
|              | Undecided         | 3         | 13         |
|              | Agree             | 14        | 58         |
|              | Strongly Agree    | 4         | 17         |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.21 shows that the majority of teachers 14 (58%) agree, 4 (17%) strongly agree that some teachers are not qualified for teaching Chemistry but circumstances allow them to teach. Some teachers 2 (8%) disagree, 1 (4%) strongly disagree. Only 3 (13%) were undecided. This implies that (75%) of teachers agreed that they are not qualified to teach Chemistry but because of shortage of Science teachers, they are requested due to circumstances of not having qualified Science teachers and as a result, learners perform poorly.

**Table 5.22: The Emotional State of the Chemistry Teacher Affects his Teaching (N = 24)**

|              |                | Frequency | Percent    |
|--------------|----------------|-----------|------------|
| Valid        | Disagree       | 2         | 8          |
|              | Undecided      | 4         | 17         |
|              | Agree          | 14        | 58         |
|              | Strongly Agree | 4         | 17         |
| <b>Total</b> |                | <b>24</b> | <b>100</b> |

Table 5.22 shows that the majority of teachers, 14 (58%), agree while 4 (17%) strongly agree that emotional state of the Chemistry teachers affects his teaching. Some teachers 2 (8%) disagree. Only 4 (17%) were undecided. On average (75%) of teachers agreed that if teachers are emotionally unstable, it affects their teaching of Chemistry.

**Table 5.23: A Noisy Environment Retards Learners' Concentration while Teaching (N = 24)**

|              |                | Frequency | Percent    |
|--------------|----------------|-----------|------------|
| Valid        | Disagree       | 1         | 4          |
|              | Undecided      | 2         | 8          |
|              | Agree          | 6         | 25         |
|              | Strongly Agree | 15        | 63         |
| <b>Total</b> |                | <b>24</b> | <b>100</b> |

Table 5.23 shows that the majority of teachers 15 (63%) strongly agree, 6 (25%) agree that a noisy environment retards learners' concentration during teaching. Only 1 (4%) disagree while 2 (8%) were undecided. On average (88%) of teachers agreed that a noisy environment affects learners' concentration during teaching and results in poor performance.

**Table 5.24: Chemistry Teaching Environments do not Properly Accommodate Learners during Teaching (N = 24)**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 2         | 8          |
|              | Disagree          | 3         | 13         |
|              | Undecided         | 2         | 8          |
|              | Agree             | 9         | 38         |
|              | Strongly Agree    | 8         | 33         |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.24 shows that the majority of teachers 9 (38%) strongly agree while 8 (33%) agree that Chemistry teaching environments do not properly accommodate learners during teaching. Some teachers, 3 (13%), disagree while 2 (8%) strongly disagree with the idea. Only 2 (8%) were undecided. On average (71%) of teachers agreed that if the environment is not conducive to accommodate learners during teaching and learning, it will be difficult for learners to perform.

**Table 5.25: Conducive Learning Environments Promote Teaching (N = 24)**

|                | Frequency | Percent    |
|----------------|-----------|------------|
| Valid Agree    | 8         | 33         |
| Strongly Agree | 16        | 67         |
| <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.25 shows that the majority of teachers 16 (67%) strongly agree, and 8 (33%) agree. On average (100%) of teachers agreed that if the environment is conducive for learning, it promotes positive teaching and results for good performance in Chemistry. According to Ogembo et al. (2015:39), teachers play a significant role in shaping the classroom environment, which has an impact on a learners' self-efficacy which, in turn, influences learners' behaviour.

**Table 5.26: Sometimes Practicals are not done for Learners due to Unavailability of the Equipment Needed in the School (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 4         | 17         |
| Disagree                | 1         | 4          |
| Undecided               | 1         | 4          |
| Agree                   | 7         | 29         |
| Strongly Agree          | 11        | 46         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.26 shows that the majority of teachers, 11 (46%) strongly agree, 7 (29%) agree that practicals are not done for learners due to unavailability of the equipment. Some teachers 4 (17%) strongly disagree, and only 1 (4%) disagrees while only 1 (4%) was undecided. On average (75%) of teachers agreed that due to unavailability of equipment, practicals cannot be done, and this result in poor performance of learners in Chemistry.

**Table 5.27: Chemistry Laboratories Lack Qualified Lab – Technicians (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Agree             | 7         | 29         |
|       | Strongly Agree    | 16        | 67         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.27 shows that the majority of teachers 16 (67%) strongly agree, 7 (29%) agree that Chemistry laboratories lack lab Technicians. Only 1 (4%) strongly disagrees. On average (96%) of teachers agreed that lab. Technicians must be available to assist during laboratory practical sessions to integrate practical work with theory in their teaching.

**Table 5.28: My Learners Like Coming to me with Chemistry Problems for Assistance (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 4         | 17         |
|       | Disagree          | 2         | 8          |
|       | Undecided         | 1         | 4          |
|       | Agree             | 12        | 50         |
|       | Strongly Agree    | 5         | 21         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.28 shows that the majority of teachers 12 (50%) agree, 5 (21%) strongly agree that learners consult the teachers with Chemistry problems for assistance. Some teachers 4 (17%) strongly disagree, and 2 (8%) disagree while only 1 (4%) was undecided. On average (71%) of teachers agreed that learners have a strong interest in Chemistry since they seek assistance from teachers.

**Table 5.29: Most Learners Choose Chemistry in my School because they have no Alternative (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 8         | 33         |
| Disagree                | 9         | 37         |
| Undecided               | 1         | 4          |
| Agree                   | 3         | 13         |
| Strongly Agree          | 3         | 13         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.29 shows that the majority of teachers 9 (37%) disagree, and 8 (33%) strongly disagree that most learners choose Chemistry because they have no alternative. Some teachers, 3 (13%), strongly agree, and 3 (13%) agree with the statement. Only 1 (4%) was undecided. On average (70%) of teachers disagree that learners choose to do Chemistry not because they have no choice but because of their willingness.

**Table 5.30: The Majority of my Learners Spend very Little Time Studying Chemistry (N = 24)**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 4         | 17         |
|              | Disagree          | 4         | 17         |
|              | Undecided         | 6         | 25         |
|              | Agree             | 9         | 37         |
|              | Strongly Agree    | 1         | 4          |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.30 shows that the majority of teachers 9 (37%) agree, and 1 (4%) strongly agree that the majority of learners spend very little time studying Chemistry. However, some teachers 4 (17%) strongly disagree, 4 (17%) disagree. Only 6 (25%) were undecided. On average (41%) of teachers agreed that learners spend little time studying Chemistry and as a result, they perform poor.

**Table 5.31: Most of my Learners Consider Chemistry to be a Difficult Subject (N = 24)**

|              |                   | Frequency | Percent    |
|--------------|-------------------|-----------|------------|
| Valid        | Strongly Disagree | 2         | 8          |
|              | Disagree          | 4         | 17         |
|              | Undecided         | 4         | 17         |
|              | Agree             | 11        | 45         |
|              | Strongly Agree    | 3         | 13         |
| <b>Total</b> |                   | <b>24</b> | <b>100</b> |

Table 5.31 shows that the majority of teachers 11 (45%) agree while 3 (13%) strongly agree that most learners consider Chemistry to be a difficult subject. Some teachers, 4 (17%), disagree while 2 (8%) strongly disagree with the statement.

Some teachers 4 (17%) were undecided. On average (58%) of teachers agreed that apart from getting assistance, learners consider Chemistry to be a difficult subject. Ogembo et al. (2015:40) asserted that in spite of the recognition given to Chemistry among the science subjects, it is evident that learners still show negative attitudes towards the subject, thereby leading to poor performance and low enrolment.

**Table 5.32: The Learners' English Language Competence Affects their Performance in Chemistry Negatively (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 3         | 12         |
| Agree                   | 11        | 46         |
| Strongly Agree          | 10        | 42         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.32 shows that the majority of teachers 11 (46%) agree, 10 (42%) strongly agree that learners' English language competence affects their performance in Chemistry. Nonetheless, some teachers 3 (12%) strongly disagree. On average (88%) of teachers agreed that learners' English language competence can affect their performance in Chemistry if not detected earlier in lower grades.

**Table 5.33: Learners' Mathematical Competence Affects their Performance in Chemistry Negatively (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 2         | 8          |
| Disagree                | 2         | 8          |
| Undecided               | 1         | 4          |
| Agree                   | 9         | 38         |
| Strongly Agree          | 10        | 42         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.33 shows that the majority of teachers 10 (42%) strongly agree, and 9 (38%) agree that learners' mathematical competence affects their performance in Chemistry. Some teachers, 2 (8%), strongly disagree, 2 (8%) disagree with the statement. Only 1 (4%) was undecided. On average (80%) of teachers agreed that learners who are good in mathematics show good performance in Chemistry.

**Table 5.34: The use of Unqualified and Under-Qualified Teachers has the Tendency to Influence Teaching Negatively with its Implication on Performance (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 1         | 4          |
| Disagree                | 1         | 4          |
| Undecided               | 2         | 9          |
| Agree                   | 6         | 25         |
| Strongly Agree          | 14        | 58         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.34 shows that the majority of teachers 14 (58%) strongly agree, and 6 (25%) agree that the use of unqualified and under-qualified teachers has a tendency to influence teaching negatively regarding performance. Only 1 (4%) strongly disagrees, and 1 (4%) disagrees while 2 (9%) were undecided. On average (83%) of teachers agreed that teachers who are unqualified and under-qualified contribute towards poor performance of learners in Chemistry. Khan, Kwaghe and Philip (2015:164) indicate that if teachers are unqualified, apathetic, uncommitted, uninspired, lazy, unmotivated, immoral and anti-social, the whole nation is doomed; if they are ignorant in their discipline and share the wrong information, they are not only useless, but dangerous.

**Table 5.35: Female Learners Show more Fear or Anxiety Towards the Learning of Chemistry than their Male Counterparts (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 5         | 21         |
| Disagree                | 10        | 42         |
| Undecided               | 2         | 8          |
| Agree                   | 5         | 21         |
| Strongly Agree          | 2         | 8          |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.35 shows that the majority of teachers 10 (42%) disagree, 5 (21%) strongly disagree that female learners show more fear or anxiety towards the learning of Chemistry than their male counterparts. Some teachers 5 (21%) agree, and 2 (8%) strongly agree. Only 2 (8%) were undecided. On average (63%) of teachers disagree that female learners perform equally if not more than the male learners. Gender towards the learning of Chemistry does not have any impact of learner performance.

**Table 5.36: Learners in Rural Areas Registered more Fear in Learning Chemistry than their Counterparts in Urban Areas (N = 24)**

|                         | Frequency | Percent    |
|-------------------------|-----------|------------|
| Valid Strongly Disagree | 3         | 13         |
| Disagree                | 2         | 8          |
| Undecided               | 6         | 25         |
| Agree                   | 9         | 37         |
| Strongly Agree          | 4         | 17         |
| <b>Total</b>            | <b>24</b> | <b>100</b> |

Table 5.36 shows that the majority of teachers 9 (37%) agree, 4 (17%) strongly agree that learners in rural areas register more fear in learning Chemistry than their counterparts in urban areas. Some teachers 3 (13%) strongly disagree, and 2 (8%) disagree. About 6 (25%) of teachers were undecided. On average (54%) of teachers agreed that urban learners do have an interest in Chemistry than rural learners who show fear and anxiety towards the subject.

**Table 5.37: Higher Academic Qualifications and Professional Training Improve Teacher Effectiveness on the Job (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 2         | 8          |
|       | Agree             | 11        | 46         |
|       | Strongly Agree    | 11        | 46         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.37 shows that the majority of teachers 11 (46%) strongly agree, and 11 (46%) agree that higher academic qualification and professional training improve teacher effectiveness on the job. Some teachers 2 (8%) strongly disagree with the statement. On average (92%) of teachers agreed that academic qualifications of teachers and professional training increase the performance of learners in Chemistry, and they are always hands on in the subject.

**Table 5.38: Learners who Reported to have Positive Experiences during their Chemistry Class were said to be Influenced by their Teachers' Positive Attitudes Towards Chemistry (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 1         | 4          |
|       | Agree          | 10        | 42         |
|       | Strongly Agree | 13        | 54         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.38 shows that the majority of teachers 13 (54%) strongly agree, and 10 (42%) agree that learners who reported positive experiences during Chemistry class were said to be influenced by their teachers' positive attitudes towards Chemistry. Only 1 (4%) was undecided. On average (96%) of teachers agreed that learners reported positive experience in Chemistry class due to being positively influenced by their teachers' positive attitudes towards Chemistry.

**Table 5.39: Teachers said that they do not have Enough Time to Teach and make the Learners Fully Understand the Concept of Chemistry during the Normal School Time (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 3         | 13         |
|       | Disagree          | 4         | 17         |
|       | Undecided         | 2         | 8          |
|       | Agree             | 10        | 42         |
|       | Strongly Agree    | 5         | 20         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.39 shows that the majority of teachers 10 (42%) agree, and 5 (20%) strongly agree that teachers do not have enough time to teach and make the learners fully understand the concept of Chemistry during the normal school time. Some teachers 4 (17%) disagree, and 3 (13%) strongly disagree. Only 2 (8%) were undecided. On average (62%) of teachers agreed that teachers need to have enough time to teach their learners in Chemistry. They need extra hours to be in contact and interact with learners, which will bring changes in the performance of learners in Chemistry.

## 5.2.5 Management Strategies that can Improve Learners' Performance in Chemistry

**Table 5.40: In the Teaching of Chemistry, Teachers are Expected to have a Good Level of Competence (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Agree             | 10        | 42         |
|       | Strongly Agree    | 13        | 54         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.40 shows that the majority of teachers 13 (54%) strongly agree, and 10 (42%) agree that teachers are expected to have a good level of competence. Only 1 (4%) strongly disagree. On average (96%) of teachers agreed that teachers must be competent on the know-how of Chemistry as a subject in order to unleash their potential.

**Table 5.41: Teachers Need to Develop the Interest of the Learners with Regard to the Subject through their Methods of Teaching (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Agree          | 8         | 33         |
|       | Strongly Agree | 16        | 67         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.41 shows that the majority of teachers 16 (67%) strongly agree, and 8 (33%) agree that teachers need to develop the interest of the learners with regard to the subject through teaching methods. On average (100%) of teachers agreed that

teachers' development of interest to the subject must be through teaching methods which suit the ability of learners to understand.

**Table 5.42: Teachers Need to Develop the Attitude of the Learners with Regard to the Subject through their Methods of Teaching (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Agree          | 12        | 50.0       |
|       | Strongly Agree | 12        | 50.0       |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.42 shows that the majority of teachers 12 (50%) strongly agree, and 12 (50%) agree that teachers need to develop the attitude of the learners with regard to the subject through teaching methods. On average (100%) of teachers agreed that teachers should develop learners' attitude with regard to subject Chemistry through teaching methods.

**Table 5.43: The Teacher has to be Aware of Current Innovations in Teaching so as to Determine the most Suitable Method for a Particular Situation (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Disagree       | 1         | 4          |
|       | Undecided      | 1         | 4          |
|       | Agree          | 10        | 42         |
|       | Strongly Agree | 12        | 50         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.43 shows that the majority of teachers 12 (50%) strongly agree, and 10 (42%) agree that the teacher has to be aware of current innovations in teaching so as to determine the most suitable method for a particular situation. Only 1 (4%)

disagrees while 1 (4%) was undecided. On average (92%) of teachers agreed that teachers should contribute and be aware of current innovations in teaching based on the suitable method for particular situation. Devetak and Glazar (2010:400) indicate that innovative learning strategies could be used by teachers at all levels of Chemistry education to enhance the learners' motivation to learn Chemistry.

**Table 5.44: The Teacher must have Command over a Wide Repertoire of Different Teaching Methods (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 1         | 4          |
|       | Agree          | 12        | 50.0       |
|       | Strongly Agree | 11        | 46         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.44 shows that the majority of teachers 12 (50%) agree, and 11 (46%) strongly agree that teachers must have command over a wide repertoire of different teaching methods. Only 1 (4%) was undecided. On average (96%) of teachers agreed that in order for the teachers to have learners who perform well in Chemistry, they (teachers) must be acquainted with different teaching method.

**Table 5.45: Teachers must have Strategies of Teaching (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Agree          | 9         | 38         |
|       | Strongly Agree | 15        | 62         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.45 shows that the majority of teachers 15 (62%) strongly agree, and 9 (38%) agree that teachers must have strategies for teaching. On average (100%) of

teachers agreed that teachers must apply good strategies which will make learners to perform better in Chemistry.

**Table 5.46: Teachers must have an Understanding of Learning Processes of Learners (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 1         | 4          |
|       | Agree          | 8         | 33         |
|       | Strongly Agree | 15        | 63         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.46 shows that the majority of teachers 15 (63%) strongly agree, and 8 (33%) agree that teachers must have an understanding of learning processes of learners. Only 1 (4%) was undecided. On average (96%) of teachers agreed that teachers should encourage better understanding of learning processes of learners in the subject Chemistry.

**Table 5.47: Effective Teaching Connotes the Ability of the Teachers to Communicate Effectively (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 1         | 4          |
|       | Agree          | 10        | 42         |
|       | Strongly Agree | 13        | 54         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.47 shows that the majority of teachers 13 (54%) strongly agree, and 10 (42%) agree that effective teaching connotes the ability of the teachers to communicate effectively. Only 1 (4%) was undecided. On average (96%) of teachers

agreed that effective teaching promotes the ability for the teachers to communicate effectively during their lesson presentations.

**Table 5.48: Effective Teaching cannot be done without Knowing the Characteristics of a Learner and his Problem (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Undecided         | 1         | 4          |
|       | Agree             | 12        | 50         |
|       | Strongly Agree    | 10        | 42         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.48 shows that the majority of teachers 12 (50.0%) agree, and 10 (42%) strongly agree that effective teaching cannot be done without knowing the characteristics of a learner and his problem. Only 1 (4%) strongly disagrees and 1 (4%) was undecided. On average (92%) of teachers agreed that effective teaching can be done well if a teacher knows the characteristics of learners and their problems in the classroom.

**Table 5.49: Innovative Learning Strategies could be used by Teachers at all Levels of Chemistry Education to Enhance Learners' Motivation to Learn Chemistry (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Disagree       | 1         | 4          |
|       | Undecided      | 1         | 4          |
|       | Agree          | 12        | 50         |
|       | Strongly Agree | 10        | 42         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.49 shows that the majority of teachers 12 (50%) agree, and 10 (42%) strongly agree that innovative learning strategies could be used by teachers at all levels of Chemistry education to enhance learners' motivation to learn Chemistry. Only 1 (4%) disagrees while 1 (4%) was undecided. On average (92%) of teachers agreed that the teacher's innovative learning strategies should be used at all levels of Chemistry education to motivate learners.

**Table 5.50: Learners Generally Experience Improvements in Learning when they are Engaged in Classroom Activities that Encourage Developing their Knowledge Following a Learning Cycle (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 1         | 4          |
|       | Agree          | 9         | 38         |
|       | Strongly Agree | 14        | 58         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.50 shows that the majority of teachers 14 (58%) strongly agree, and 9 (38%) agree that learners generally experience improvements in learning when they are engaged in classroom activities that encourage developing their knowledge following a learning cycle. Only 1 (4%) was undecided. On average (96%) of teachers agreed that when learners are engaged in classroom activities that encourage their development in knowledge, their performance in Chemistry improves.

**Table 5.51: The use of a Variety of Teaching Styles and Methods can Raise the Learners' Attention and Interest in Chemistry (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Agree          | 10        | 42         |
|       | Strongly Agree | 14        | 58         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.51 shows that the majority of teachers 14 (58%) strongly agree, and 10 (42%) agree that the use of a variety of teaching styles and methods can raise the learners' attention and interest in Chemistry. On average (100%) of teachers agreed that a variety of teaching styles and methods can raised learners' attention and interest in Chemistry during teaching and learning process. The use of a variety of teaching styles and methods can raise the learners' attention and interest in Chemistry (Yunus & Ali, 2012:298).

**Table 5.52: Teachers have to Take into Consideration the Learners' Abilities, Learners' Level of Intelligence and the Availability of Resources and Infrastructure (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Agree             | 13        | 54         |
|       | Strongly Agree    | 10        | 42         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.52 shows that the majority of teachers 13 (54%) agree, and 10 (42%) strongly agree that teachers have to take into consideration the learners' abilities, learners' level of intelligence and the availability of resources and infrastructure. Only 1 (4%) strongly disagrees. On average (96%) of teachers agreed that learners'

abilities, learners' level of intelligence and availability of resources and infrastructure improve the performance of learners in Chemistry as a subject.

**Table 5.53: Collaborative Learning is a Teaching Strategy Involving Learners' Participation in Small Group Learning Activities that Promote Positive Interaction (N = 24)**

|       |                   | Frequency | Percent    |
|-------|-------------------|-----------|------------|
| Valid | Strongly Disagree | 1         | 4          |
|       | Agree             | 16        | 67         |
|       | Strongly Agree    | 7         | 29         |
|       | <b>Total</b>      | <b>24</b> | <b>100</b> |

Table 5.53 shows that the majority of teachers 16 (67%) agree, and 7 (29%) strongly agree that collaborative learning is a teaching strategy involving learners' participation in small group learning activities that promote positive interaction. Only 1 (4%) strongly disagrees. On average (96%) of teachers agreed that collaborative learning as a teaching strategy promotes positive interaction among learners, which results in good performance in the subject. Yusuf (2014:800) states that for the concepts in Chemistry to be taught effectively to Chemistry learners in the secondary schools, collaborative learning has been considered relevant and fruitful.

**Table 5.54: Self-regulated Learners are Individuals who are Meta-cognitively, Motivationally, and Behaviourally Active Participants in their own Learning Process (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 4         | 16         |
|       | Agree          | 10        | 42         |
|       | Strongly Agree | 10        | 42         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.54 shows that the majority of teachers 10 (42%) strongly agree, and 10 (42%) agree that self-regulated learners are individuals who are meta-cognitively, motivationally and behaviourally active participants in their own learning process. Only 4 (16%) were undecided. On average (84%) of teachers agreed that self-regulated learners perform well and have self-motivated behaviour and active participants during learning process. According to Tunde (2014:800), self-regulation is an integrated learning process consisting of a set of constructive behaviour that affects one's learning.

**Table 5.55: Effective Teaching Requires, among other things, Basic Management Skills, including Understanding of the Nature of a Classroom (N = 24)**

|       |                | Frequency | Percent    |
|-------|----------------|-----------|------------|
| Valid | Undecided      | 1         | 4          |
|       | Agree          | 9         | 38         |
|       | Strongly Agree | 14        | 58         |
|       | <b>Total</b>   | <b>24</b> | <b>100</b> |

Table 5.55 shows that the majority of teachers 14 (58%) strongly agree, and 9 (38%) agree that effective teaching requires, among other things, basic management skills-including understanding of the nature of a classroom. Only 1 (4%) was undecided. On average (96%) of teachers agreed that teacher effectiveness requires skills for basic classroom management when the teaching and learning process takes place. According to Orji (2014:12), learners' learning outcomes are a reflection of the teacher effectiveness in managing classroom transactions.

### 5.2.6 Results on the Analysis of Teachers Based on Management of Learners' Performance in Chemistry, which Includes Factors, Influences and Strategies

Chi-square ( $\chi^2$ ) test was used to associate teachers' qualifications with mean marks in Chemistry for the Grades 10, 11 and 12. The  $p < 0.05$  was considered significant. In these results the Chi-square ( $\chi^2$ ) analyses revealed no association of teacher qualification ( $p > 0.05$ ) and learners' mean marks in Chemistry for the Grades 10, 11 and 12 ( $p > 0.05$ ) with mean marks in Chemistry for the Grades 10, 11 and 12 (Figure 5.1).

**Table 5.56: Teacher Qualification as a Factor Associated with Learners' Mean Marks in Chemistry for Grades 10, 11 & 12**

| School average mean mark per grade                | Chi-square         | df* | p-value |
|---|--------------------|-----|---------|
| School average mean mark in Grade 10 in Chemistry | 6.162 <sup>a</sup> | 9   | .724    |
| School average mean mark in Grade 11 in Chemistry | 8.451 <sup>a</sup> | 9   | .489    |
| School average mean mark in Grade 12 in Chemistry | 4.605 <sup>a</sup> | 9   | .867    |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate teachers' qualifications with trends in the performance of Chemistry in the schools in 2013, 2014, 2015. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed no association of teacher qualification ( $p > 0.05$ ) with trends in the performance of Chemistry in the schools in 2013, 2014, 2015 (Figure 5.1).

**Table 5.57: Teacher Qualification as a Factor Associated with Trend in the Performance of Chemistry in the Schools in 2013, 2014 and 2015**

| Trends in the performance of Chemistry   | Chi-square          | df* | p-value |
|--|---------------------|-----|---------|
| How was the trend in the performance of Chemistry in your school been since 2013 | 13.177 <sup>a</sup> | 9   | .155    |
| How was the trend in the performance of Chemistry in your school been since 2014 | 8.178 <sup>a</sup>  | 9   | .516    |
| How was the trend in the performance of Chemistry in your school been since 2015 | 7.913 <sup>a</sup>  | 9   | .543    |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate teachers' gender with learners' mean marks in chemistry for Grades 10, 11 & 12. The  $p < 0.05$  was considered significant. In these results the Chi-square ( $\chi^2$ ) analyses revealed no association of teachers' gender ( $p > 0.05$ ) with learners' mean marks in Chemistry for Grades 10, 11 & 12 (Figure 5.1).

**Table 5.58: Teacher Gender as a Factor Associated with Learners' Mean Marks in Chemistry for Grades 10, 11 and 12**

| School average mean mark                          | Chi-square         | df* | p-value |
|---|--------------------|-----|---------|
| School average mean mark in Grade 10 in Chemistry | 2.311 <sup>a</sup> | 3   | .510    |
| School average mean mark in Grade 11 in Chemistry | 2.533 <sup>a</sup> | 3   | .469    |
| School average mean mark in Grade 12 in Chemistry | 1.643 <sup>a</sup> | 3   | .650    |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate teachers' gender with trend in the performance of Chemistry in the schools in 2013, 2014, 2015. The  $p < 0.05$  was considered significant. In these results the Chi-square ( $\chi^2$ ) analyses revealed no

association of teachers' gender ( $p > 0.05$ ) trends in the performance of Chemistry in the schools in 2013, 2014, 2015 (Figure 5.1).

**Table 5.59: Teacher Gender as a Factor Associated with Trends in the Performance of Chemistry in the Schools in 2013, 2014, 2015**

|  | Chi-square         | df* | p-value |
|--|--------------------|-----|---------|
| How was the trend in the performance of Chemistry in your school been since 2013 | 4.485 <sup>a</sup> | 3   | .214    |
| How was the trend in the performance of Chemistry in your school been since 2014 | 1.876 <sup>a</sup> | 3   | .598    |
| How was the trend in the performance of Chemistry in your school been since 2015 | 5.333 <sup>a</sup> | 3   | .149    |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate teachers' experience with learners' mean marks in Chemistry for Grades 10, 11 & 12. The  $p < 0.05$  was considered significant. In this results the Chi-square ( $\chi^2$ ) analyses revealed no association of teachers' experience ( $p > 0.05$ ) with learners' mean marks in Chemistry for Grades 10, 11 & 12 (Figure 5.1).

**Table 5.60: Teachers' Experience as a Factor Associated with Learners' Mean Marks in Chemistry for Grades 10, 11 & 12**

|   | Chi-square          | df* | p-value |
|---|---------------------|-----|---------|
| School average mean mark in Grade 10 in Chemistry | 11.336 <sup>a</sup> | 12  | .500    |
| School average mean mark in Grade 11 in Chemistry | 14.267 <sup>a</sup> | 12  | .284    |
| School average mean mark in Grade 12 in Chemistry | 11.083 <sup>a</sup> | 12  | .522    |

\*df=degree of freedom, †statistically significant

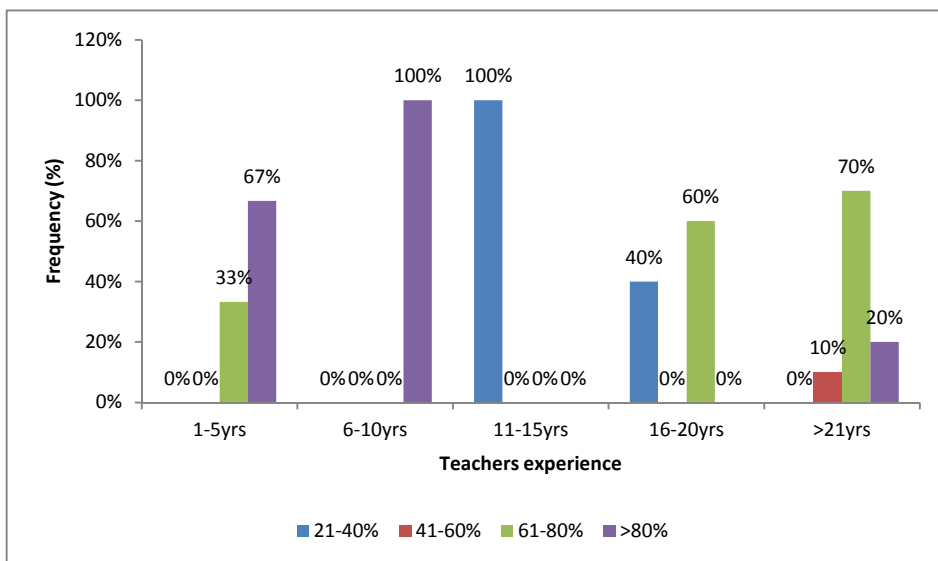
Chi-square ( $\chi^2$ ) test was used to associate teachers' experience with trend in the performance of Chemistry in the schools in 2013, 2014, 2015. The  $p < 0.05$  was considered significant. In these results the Chi-square ( $\chi^2$ ) analyses revealed a significant association of teachers' experience with trend in the performance of Chemistry in the schools in 2013, 2014 ( $p < 0.05$ ), whilst there was no association of teachers' experience ( $p > 0.05$ ) with performance in Chemistry at schools in the year 2015 (Figure 5.2).

**Table 5.61: Teachers' Experience as a Factor Associated with Trend in the Performance of Chemistry in the Schools in 2013, 2014, 2015**

|  | Chi-square          | df* | p-value           |
|--|---------------------|-----|-------------------|
| How was the trend in the performance of Chemistry in your school been since 2013 | 27.879 <sup>a</sup> | 12  | .006 <sup>†</sup> |
| How was the trend in the performance of Chemistry in your school been since 2014 | 22.140 <sup>a</sup> | 12  | .036 <sup>†</sup> |
| How was the trend in the performance of Chemistry in your school been since 2015 | 16.997 <sup>a</sup> | 12  | .150              |

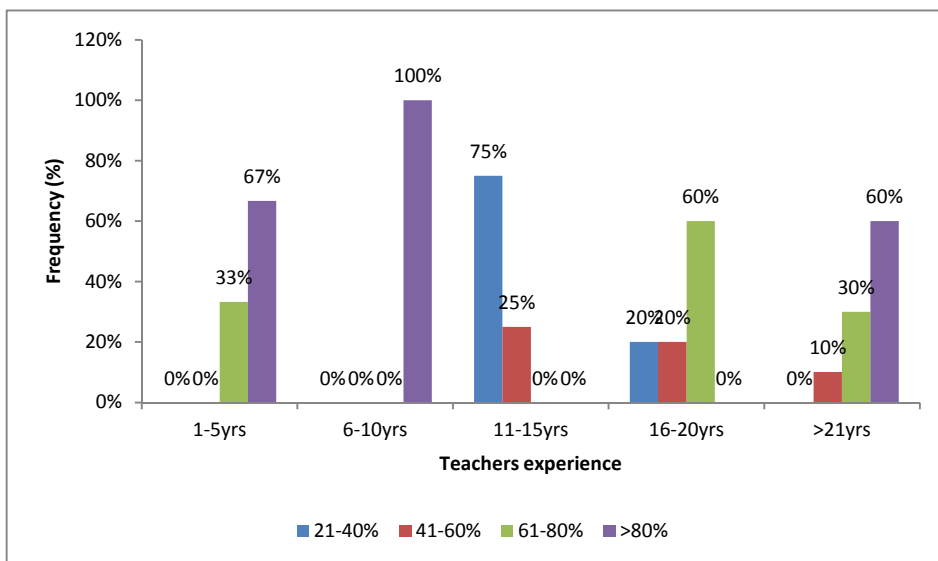
\*df=degree of freedom, †statistically significant

Figure 5.2 shows that there is no clear trend in the performance of the represented schools in chemistry. However, it is clear that all the teachers with 6-10 years teaching experience indicated that their schools achieved passes of  $>80\%$  in Chemistry and this can be compared to  $0\%$  of the teachers in the 11-15 years' category;  $0\%$  in the 16-20 years' category and  $20\%$  in the  $>21$  years' category who indicated that their schools achieved similar pass rates.



**Figure 5.3: Comparison of Schools' Performance in Chemistry in the Year 2013 by Teachers' Experience**

As reported in the 2013 academic year pass rates in Chemistry, there is no clear trend in the pass rates in Chemistry by teacher experience in the 2014 academic year. All the teachers (100%) with 6-10 years' experience indicated that they recorded >80 pass rates in Chemistry, this can be compared to 67% in the 1-5 years; 0% in the 11-15 years; 0% in the 16-20 years and 60% in the >21 years teaching experience categories reported similar pass rates of >80%. Based on that, it is clear that there is no distinctive pattern in the pass rates by teaching experience.



**Figure 5.4: Comparison of Schools' Performance in Chemistry in the year 2014 by Teachers' Experience**

Chi-square ( $\chi^2$ ) test was used to associate teachers' traveling distance from schools with learners' mean marks in Chemistry for Grades 10, 11 & 12. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed no association of teachers' traveling distance ( $p > 0.05$ ) with learners' mean marks in Chemistry for Grades 10, 11 & 12 (Figure 5.1).

**Table 5.62: Teachers' Distance from School as a Factor Associated with Learners' Mean Marks in Chemistry for Grades 10, 11 & 12**

|   | Chi-square          | df* | p-value |
|---|---------------------|-----|---------|
| school average mean mark in Grade 10 in Chemistry | 11.877 <sup>a</sup> | 9   | .220    |
| school average mean mark in Grade 11 in Chemistry | 5.074 <sup>a</sup>  | 9   | .828    |
| school average mean mark in Grade 12 in Chemistry | 8.965 <sup>a</sup>  | 9   | .440    |

\*df=degree of freedom, <sup>†</sup>statistically significant

Chi-square ( $\chi^2$ ) test was used to associate teachers' traveling distance from schools with trend in the performance of Chemistry in the schools in 2013, 2014, 2015. The

$p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed no association of teachers' traveling distance ( $p > 0.05$ ) with trends in the performance of Chemistry in the schools in 2013, 2014, 2015 (Figure 5.1).

**Table 5.63: Teachers' Distance from School as a Factor Associated with Trend in the Performance of Chemistry in the Schools in 2013, 2014 and 2015**

|  | Chi-square          | df* | p-value |
|--|---------------------|-----|---------|
| How was the trend in the performance of Chemistry in your school been in 2013? | 7.655 <sup>a</sup>  | 9   | .569    |
| How was the trend in the performance of Chemistry in your school been in 2014? | 12.054 <sup>a</sup> | 9   | .210    |
| How was the trend in the performance of Chemistry in your school been in 2015? | 10.940 <sup>a</sup> | 9   | .280    |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate availability of laboratories in the schools with learners' mean marks in Chemistry for Grades 10, 11 and 12. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed no association of teachers' traveling distance ( $p > 0.05$ ) with learners' mean marks in Chemistry for Grades 10, 11 & 12 (Figure 5.1).

**Table 5.64: Availability of Laboratories as a Factor Associated with Learners' Mean Marks in Chemistry for Grades 10, 11 and 12**

|   | Chi-square          | df* | p-value |
|---|---------------------|-----|---------|
| School average mean mark in Grade 10 in Chemistry | 12.587 <sup>a</sup> | 9   | .182    |
| School average mean mark in Grade 11 in Chemistry | 13.120 <sup>a</sup> | 9   | .157    |
| School average mean mark in Grade 12 in Chemistry | 10.343 <sup>a</sup> | 9   | .323    |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate availability of laboratories in the schools with trend in the performance of Chemistry in the schools in 2013, 2014, 2015. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed no association of teachers' traveling distance ( $p > 0.05$ ) with trends in the performance of Chemistry in the schools in 2013, 2014, 2015 (Figure 5.1).

**Table 5.65: Availability of Laboratories as a Factor Associated with Trend in the Performance of Chemistry in the Schools in 2013, 2014 and 2015**

|  | Chi-square          | df* | p-value |
|--|---------------------|-----|---------|
| How was the trend in the performance of Chemistry in your school been in 2013? | 11.782 <sup>a</sup> | 9   | .226    |
| How was the trend in the performance of Chemistry in your school been in 2014? | 11.109 <sup>a</sup> | 9   | .268    |
| How was the trend in the performance of Chemistry in your school been in 2015? | 10.080 <sup>a</sup> | 9   | .344    |

\*df=degree of freedom, <sup>†</sup>statistically significant

### 5.2.7 Learner Quantitative Analysis, Section A: Biographical Information

**Table 5.66: Gender of the Learners (N = 120)**

| Gender       | Frequency  | Percent     |
|--------------|------------|-------------|
| Female       | 69         | 58%         |
| Male         | 51         | 43%         |
| <b>Total</b> | <b>120</b> | <b>100%</b> |

Table 5.66 shows that the majority of learners as participants are 69 (58%) females and 51 (43%) males. This implies that female learners are more involved in scientific activities than male learners. Previously, science subjects were male dominated.

**Table 5.67: Schools Grades of the Participants (N = 120)**

| <b>Grade</b> | <b>Frequency</b> | <b>Percent</b> |
|--------------|------------------|----------------|
| Grade 10     | 36               | 30%            |
| Grade 11     | 38               | 32%            |
| Grade 12     | 46               | 38%            |
| <b>Total</b> | <b>120</b>       | <b>100%</b>    |

Table 5.67 shows that the sample was evenly distributed among the three grades selected for the study, with Grade 12s making up 46 (38%) of the participants, Grade 11s making up 38 (32%) and Grade 10s making up 36 (30%) of the participants.

**Table 5.68: Age of the Learners (N = 120)**

| <b>Age</b>   | <b>Frequency</b> | <b>Percent</b> |
|--------------|------------------|----------------|
| >20yrs       | 3                | 3%             |
| 19-20yrs     | 11               | 9%             |
| 17-18yrs     | 58               | 48%            |
| 15-16yrs     | 48               | 40%            |
| <b>Total</b> | <b>120</b>       | <b>100%</b>    |

Table 5.68 shows that the majority of the learners were in the age group 17-18 years, 58 (48%) followed by 15-16 years, 48 (40%), then 19-20 years, 11 (9%) and only 3 (3%) were above 20 years of age. This implies that the age of learners is related to the grade in which they attend, except a few learners who are over the age of 20 years.

## Section B: Information about Chemistry as a Subject

### 5.2.7.1 Factors affecting the management of high school learners' academic performance in Chemistry

**Table 5.69: Learner Perceptions of Chemistry as a Subject (N = 120)**

|   | SD  | D   | UD  | A   | SA  | Total |
|---|-----|-----|-----|-----|-----|-------|
| School location that enriches the environment could results in better performance of Chemistry.                     | 5   | 13  | 10  | 48  | 44  | 120   |
|   | 4%  | 11% | 8%  | 40% | 37% | 100%  |
| Rural location of a school can affect performance of Chemistry negatively.  | 18  | 22  | 8   | 37  | 35  | 120   |
|   | 15% | 18% | 7%  | 31% | 29% | 100%  |
| Urban location of a school can affect performance of Chemistry positively.  | 7   | 22  | 16  | 32  | 43  | 120   |
|   | 6%  | 18% | 13% | 27% | 36% | 100%  |
| Children who attend private school are better academic achievers than counterparts in public schools.               | 27  | 30  | 13  | 22  | 28  | 120   |
|   | 23% | 25% | 11% | 18% | 23% | 100%  |
| Our laboratory is adequately furnished with equipment and apparatus which are still in good conditions.             | 47  | 41  | 11  | 18  | 3   | 120   |
|   | 39% | 34% | 9%  | 15% | 3%  | 100%  |
| Inadequate resource materials in the laboratory contribute towards poor performance in Chemistry.                   | 18  | 14  | 13  | 41  | 34  | 120   |
|   | 15% | 12% | 11% | 34% | 28% | 100%  |
| Frequency of practical classes is an important factor since skills such as observation and prediction are involved. | 6   | 3   | 9   | 44  | 58  | 120   |
|   | 5%  | 3%  | 8%  | 36% | 48% | 100%  |
| The laboratory classes are boring.  | 47  | 39  | 20  | 6   | 8   | 120   |
|   | 39% | 32% | 17% | 5%  | 7%  | 100%  |
| Learners who have a more positive attitude towards Chemistry would be more successful in Chemistry.                 | 6   | 2   | 9   | 28  | 75  | 120   |
|   | 5%  | 2%  | 8%  | 23% | 62% | 100%  |
| Learners' Chemistry achievement affects their   | 4   | 12  | 26  | 50  | 26  | 118   |

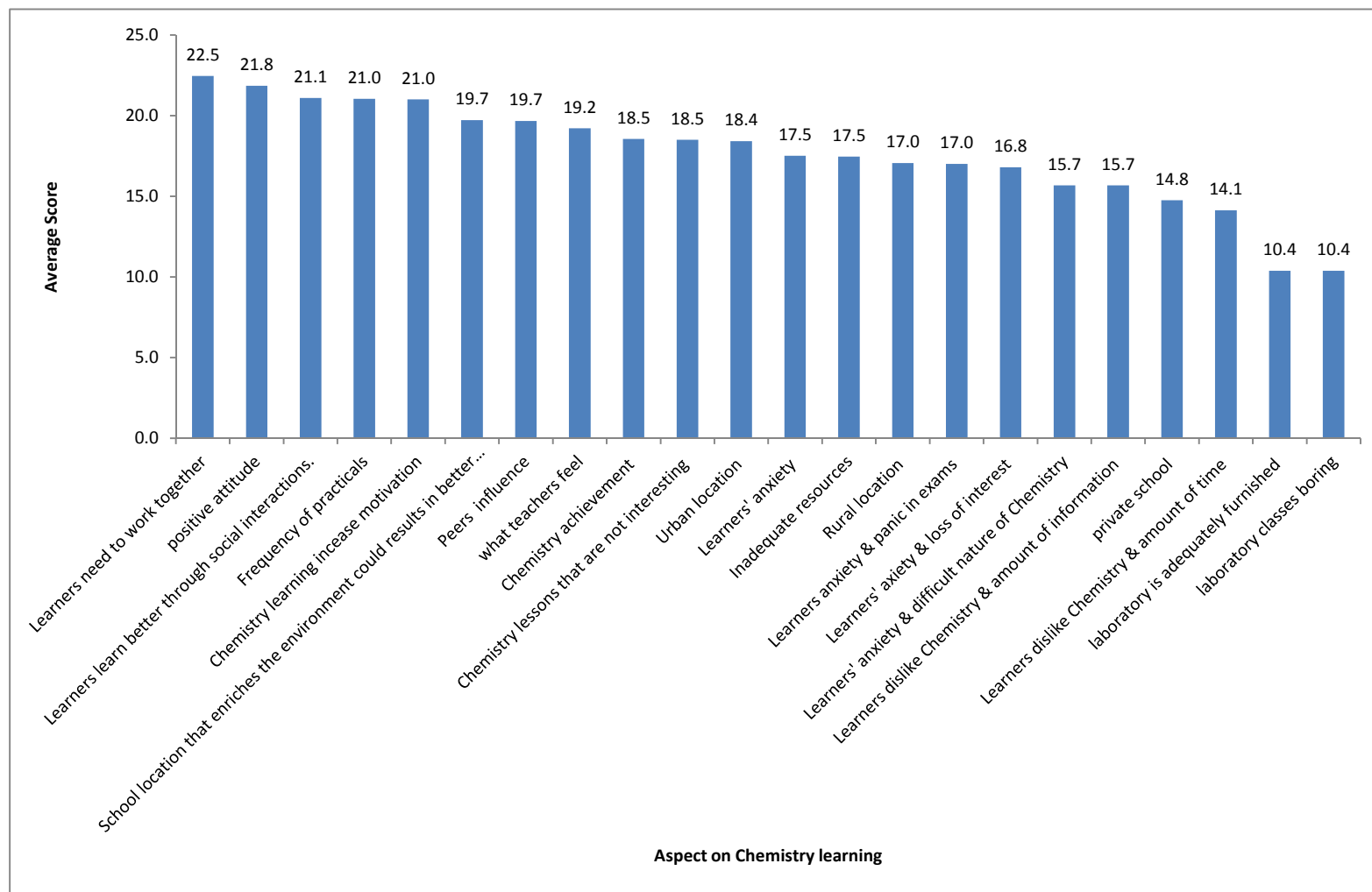
|   |     |     |     |     |     |      |
|---|-----|-----|-----|-----|-----|------|
| attitudes positively.   | 4%  | 10% | 22% | 42% | 22% | 100% |
| Learners' Chemistry learning experiences increase their motivation to learn.  | 3   | 5   | 10  | 49  | 53  | 120  |
|   | 3%  | 4%  | 8%  | 41% | 44% | 100% |
| What teachers feel about learners' learning or studies could have a significant effect on the learners.             | 7   | 10  | 15  | 51  | 37  | 120  |
|   | 6%  | 8%  | 13% | 43% | 30% | 100% |
| Learners' anxiety for Chemistry learning can also be attributed to learners' perception.                            | 4   | 17  | 36  | 41  | 22  | 120  |
|   | 4%  | 14% | 30% | 34% | 18% | 100% |
| Learners' anxiety for Chemistry learning can also be about the difficult nature of Chemistry.                       | 18  | 15  | 35  | 37  | 15  | 120  |
|   | 15% | 13% | 29% | 30% | 13% | 100% |
| Learners' anxiety for Chemistry learning leads to loss of interest in the sciences.                                 | 16  | 20  | 19  | 35  | 30  | 120  |
|   | 13% | 17% | 16% | 29% | 25% | 100% |
| Learners who have Chemistry anxiety usually panic in exams in science subjects.                                     | 22  | 11  | 18  | 35  | 34  | 120  |
|   | 19% | 9%  | 15% | 29% | 28% | 100% |
| Learners dislike Chemistry because of the amount of information they have to learn.                                 | 20  | 31  | 12  | 27  | 30  | 120  |
|   | 17% | 26% | 10% | 22% | 25% | 100% |
| Learners dislike Chemistry because of the amount of time spent on writing Chemistry in class.                       | 27  | 30  | 18  | 27  | 18  | 120  |
|   | 23% | 25% | 15% | 22% | 15% | 100% |
| Peers can also influence learners' attitude in learning Chemistry.  | 8   | 8   | 10  | 52  | 42  | 120  |
|   | 7%  | 7%  | 8%  | 43% | 35% | 100% |
| Learners need to work together, not only because of their preparation for team work in science.                     | 2   | 3   | 7   | 30  | 78  | 120  |
|   | 2%  | 3%  | 5%  | 25% | 65% | 100% |
| Learners need to work together, not only because they learn better through social interactions.                     | 3   | 7   | 10  | 41  | 59  | 120  |
|   | 3%  | 6%  | 8%  | 34% | 49% | 100% |
| Chemistry lessons that are not interesting will not inspire the learners to listen, participate and learn in class. | 10  | 15  | 15  | 41  | 39  | 120  |
|   | 8%  | 13% | 13% | 34% | 32% | 100% |

The learners were given a list of 22 statements related to the teaching and learning of Chemistry and asked to rate them on a five point Likert scale. Response categories ranged from Strongly Disagree (SD), Disagree (D), Undecided (UD), Agree (A) and Strongly Agree (SA). The response categories were given weights (scores) ranging from 5 for Strongly Disagree to 25 for strongly agree. Average scores were calculated based on the learners' responses. Based on the average scores ratings in Figure 5.5, the most agreed/strongly agreed to aspects of Chemistry teaching and learning with average scores above 20 were:

- Learners need to work together, not only because of their preparation for team work in science;
- Learners who have a more positive attitude towards Chemistry would be more successful in Chemistry;
- Learners need to work together, not only because they learn better through social interactions;
- Frequency of practical classes is an important factor since skills such as observation and prediction involves experimentation; and
- Learners' Chemistry learning experiences increase their motivation to learn.

The most strongly disagreed/disagreed to aspects of Chemistry teaching and learning with average scores of less than 15 were:

- Children who attend private school are better academic achievers than counterparts in public schools;
- Learners dislike Chemistry because of the amount of time spent on writing Chemistry in class;
- Our laboratory is adequately furnished with equipment and apparatus which are still in good conditions; and
- The laboratory classes are boring.



**Figure 5.5: Average Scores Showing Learners' Responses to 22 Statements on Chemistry Teaching and Learning**

## Section C: Information about the Chemistry Teacher

### 5.2.7.2 Influences on learners' performance in Chemistry

**Table 5.70: Learner Perceptions of Chemistry Teachers (N = 120)**

|   | SD  | D   | UD  | A   | SA  | Total |
|---|-----|-----|-----|-----|-----|-------|
| My Chemistry teacher is my personal role model.   | 15  | 15  | 19  | 27  | 44  | 120   |
|   | 13% | 13% | 16% | 22% | 36% | 100%  |
| I like my Chemistry teacher.  | 4   | 4   | 13  | 40  | 59  | 120   |
|   | 3%  | 3%  | 11% | 34% | 49% | 100%  |
| Our Chemistry teacher makes us do practical work.   | 9   | 10  | 9   | 41  | 51  | 120   |
|   | 8%  | 8%  | 8%  | 34% | 42% | 100%  |
| Our Chemistry teacher demonstrates practicals most of the time instead of allowing us to do them. | 33  | 24  | 11  | 28  | 24  | 120   |
|   | 28% | 20% | 9%  | 23% | 20% | 100%  |
| My Chemistry teacher marks our tests/exams on time.   | 4   | 7   | 6   | 26  | 77  | 120   |
|   | 3%  | 6%  | 5%  | 22% | 64% | 100%  |
| My Chemistry teacher focuses on learners who perform poorly.                                      | 16  | 20  | 26  | 26  | 32  | 120   |
|   | 13% | 17% | 22% | 22% | 26% | 100%  |
| Our Chemistry teacher is always punctual in class.  | 3   | 14  | 19  | 36  | 48  | 120   |
|   | 3%  | 11% | 16% | 30% | 40% | 100%  |
| Our Chemistry teacher answers our questions well.   | 9   | 11  | 9   | 36  | 55  | 120   |
|   | 8%  | 9%  | 8%  | 30% | 45% | 100%  |
| I would do better if I had a different Chemistry teacher.   | 47  | 23  | 15  | 10  | 25  | 120   |
|   | 39% | 19% | 13% | 8%  | 21% | 100%  |
| I find Chemistry lessons boring.  | 54  | 23  | 11  | 18  | 14  | 120   |
|   | 45% | 19% | 9%  | 15% | 12% | 100%  |
| My Chemistry teacher shares his or her knowledge and expertise with the learners.                 | 7   | 4   | 8   | 40  | 61  | 120   |
|   | 6%  | 3%  | 7%  | 33% | 51% | 100%  |
| My Chemistry teacher influenced me to choose Chemistry.   | 36  | 23  | 13  | 26  | 22  | 120   |
|   | 30% | 19% | 11% | 22% | 18% | 100%  |
| My Chemistry teacher is too lazy to look at   | 63  | 22  | 11  | 9   | 15  | 120   |

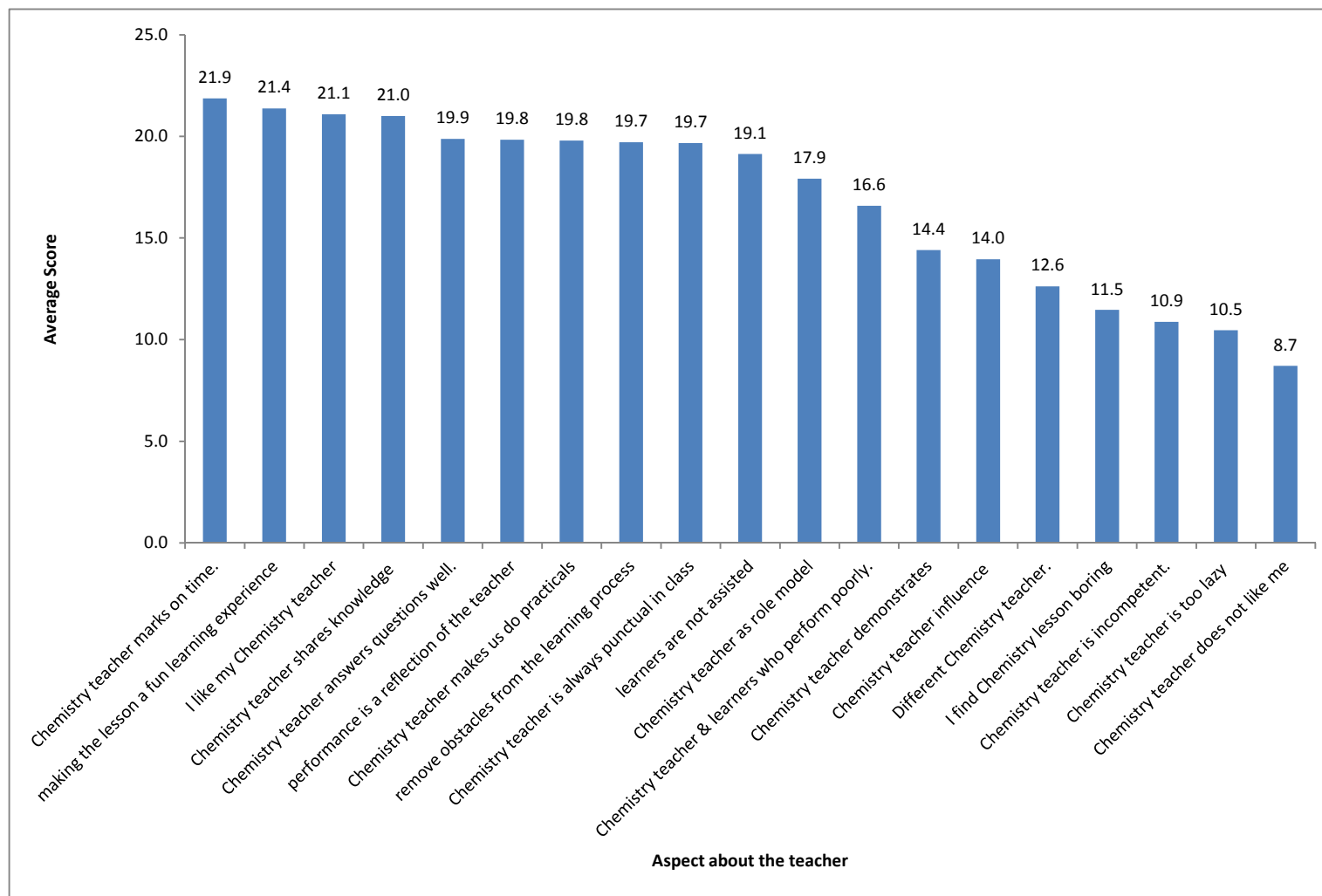
|   |     |     |     |     |     |      |
|---|-----|-----|-----|-----|-----|------|
| our notes for correction.   | 52% | 18% | 9%  | 8%  | 13% | 100% |
| My Chemistry teacher is incompetent.  | 50  | 23  | 32  | 6   | 9   | 120  |
|   | 41% | 19% | 27% | 5%  | 8%  | 100% |
| My Chemistry teacher does not like me.  | 74  | 17  | 19  | 6   | 4   | 120  |
|   | 62% | 14% | 16% | 5%  | 3%  | 100% |
| If the learners are not assisted, they may not appreciate learning of Chemistry.                        | 10  | 8   | 16  | 45  | 41  | 120  |
|   | 8%  | 7%  | 13% | 38% | 34% | 100% |
| The main duty of the teacher is to remove obstacles from the learning process.                          | 5   | 6   | 29  | 31  | 49  | 120  |
|   | 4%  | 5%  | 24% | 26% | 41% | 100% |
| It is up to the teacher to make the lesson a fun learning experience.                                   | 3   | 9   | 7   | 34  | 67  | 120  |
|   | 3%  | 8%  | 6%  | 28% | 55% | 100% |
| Learners' performance is a reflection of the teachers' effectiveness in managing classroom transaction. | 4   | 12  | 14  | 44  | 46  | 120  |
|   | 3%  | 10% | 12% | 37% | 38% | 100% |

The learners were given a list of 19 statements related to their Chemistry teachers and asked to rate them on a five point Likert scale. Response categories ranged from Strongly Disagree (SD), Disagree (D), Undecided (UD), Agree (A) and Strongly Agree (SA). The response categories were given weights (scores) ranging from 5 for Strongly Disagree to 25 for strongly agree. Average scores were calculated based on the learners' responses. Based on the average scores ratings in Figure 5.6, the most agreed/strongly agreed to aspects about Chemistry teachers with average scores above 20 were:

- My Chemistry teacher marks our tests/exams on time;
- It is up to the teacher to make the lesson a fun learning experience;
- I like my Chemistry teacher;
- My Chemistry teacher shares his or her knowledge and expertise with the learners; and
- Our Chemistry teacher answers our questions well.

The most strongly disagreed/disagreed to aspects about Chemistry teachers with average scores of less than 15 were:

- Our Chemistry teacher demonstrates practicals most of the time instead of allowing us to do them;
- My Chemistry teacher influenced me to choose Chemistry;
- I would do better if I had a different Chemistry teacher;
- I find Chemistry lesson boring;
- My Chemistry teacher is incompetent;
- My Chemistry teacher is too lazy to look at our notes for correction; and
- My Chemistry teacher does not like me.



**Figure 5.6: Average Scores Showing Learners' Responses to 19 Statements about Chemistry Teachers**

## 5.2.8 Results on the Analysis of Learners Based on Learners' Academic Performance in Chemistry which Includes Factors and Influences

**Table 5.71: Information about Chemistry Associated with Gender**

|   | Chi-square         | df* | p-value |
|---|--------------------|-----|---------|
| School location that enriches the environment could result in better performance of Chemistry.                                  | .885 <sup>a</sup>  | 2   | .642    |
| Rural location of a school can affect performance of Chemistry negatively.  | 1.432 <sup>a</sup> | 2   | .489    |
| Urban location of a school can affect performance of Chemistry positively.  | 1.609 <sup>a</sup> | 2   | .447    |
| Children who attend private school are better academic achievers than counterparts in public schools.                           | 1.142 <sup>a</sup> | 2   | .565    |
| Our laboratory is adequately furnished with equipment and apparatus which are still in good condition.                          | 1.100 <sup>a</sup> | 2   | .577    |
| Inadequate resource materials in the laboratory contribute towards poor performance in Chemistry.                               | 1.386 <sup>a</sup> | 2   | .500    |
| Frequency of practical classes is an important factor since skills such as observation and prediction involves experimentation. | .340 <sup>a</sup>  | 2   | .844    |
| The laboratory classes are boring.  | .488 <sup>a</sup>  | 2   | .784    |
| Learners who have a more positive attitude towards Chemistry would be more successful in Chemistry.                             | .733 <sup>a</sup>  | 2   | .693    |
| Learners' Chemistry achievement affects their attitudes positively.   | 6.818 <sup>a</sup> | 3   | .078    |

|   |                    |   |      |
|---|--------------------|---|------|
| Learners' Chemistry learning experiences increase their motivation to learn.                                    | 4.120 <sup>a</sup> | 2 | .127 |
| What teachers feel about learners' learning or studies could have a significant effect on the learners.         | .067 <sup>a</sup>  | 2 | .967 |
| Learners' anxiety regarding Chemistry learning can also be attributed to learners' perception.                  | .274 <sup>a</sup>  | 2 | .872 |
| Learners' anxiety regarding Chemistry learning can also be about the difficult nature of Chemistry.             | .208 <sup>a</sup>  | 2 | .901 |
| Learners' anxiety regarding Chemistry learning leads to loss of interest in the sciences.                       | .905 <sup>a</sup>  | 2 | .636 |
| Learners who have Chemistry anxiety usually panic in exams in science subjects.                                 | .185 <sup>a</sup>  | 2 | .912 |
| Learners dislike Chemistry because of the amount of information they have to learn.                             | 3.715 <sup>a</sup> | 2 | .156 |
| Learners dislike Chemistry because of the amount of time spent on writing Chemistry in class.                   | 7.301 <sup>a</sup> | 2 | .026 |
| Peers can also influence learners' attitude in learning Chemistry.  | 1.847 <sup>a</sup> | 2 | .397 |
| Learners need to work together, not only because of their preparation for team work in science.                 | .658 <sup>a</sup>  | 2 | .720 |
| Learners need to work together, not only because they learn better through social interactions.                 | .266 <sup>a</sup>  | 2 | .875 |
| Chemistry lessons that are not interesting will not inspire learners to listen, participate and learn in class. | .784 <sup>a</sup>  | 2 | .676 |

\*df=degree of freedom, †statistically significant

Chi-square ( $\chi^2$ ) test was used to associate gender with the learners' responses to statements on Chemistry as a learning area/subject. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses did not reveal any significant association of gender with learners' responses to statements on Chemistry as a subject ( $p > 0.05$ ) (Table 5.71).

**Table 5.72: Information about the Chemistry Teacher Associated with Gender**

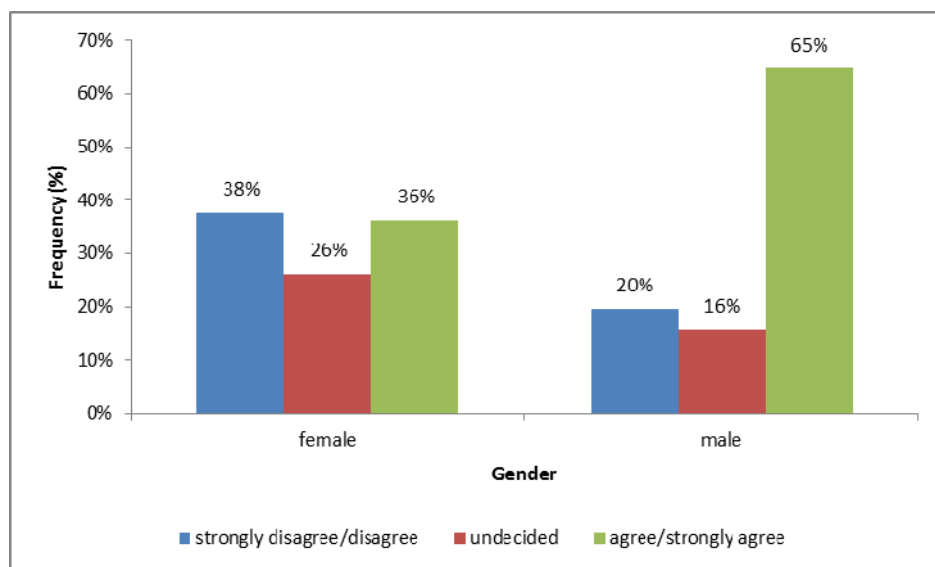
|   | Chi-square         | df* | p-value           |
|---|--------------------|-----|-------------------|
| My Chemistry teacher is my personal role model.   | 2.505 <sup>a</sup> | 2   | .286              |
| I like my Chemistry teacher.  | 2.442 <sup>a</sup> | 2   | .295              |
| Our Chemistry teacher makes us do practical work.   | .299 <sup>a</sup>  | 2   | .861              |
| Our Chemistry teacher demonstrates practicals most of the time instead of allowing us to do them. | 2.113 <sup>a</sup> | 2   | .348              |
| My Chemistry teacher marks our tests/exams on time.   | .435 <sup>a</sup>  | 2   | .804              |
| My Chemistry teacher focuses on learners who perform poorly.                                      | 9.576 <sup>a</sup> | 2   | .008 <sup>†</sup> |
| Our Chemistry teacher is always punctual in class.  | 4.351 <sup>a</sup> | 2   | .114              |
| Our Chemistry teacher answers our questions well.   | 1.013 <sup>a</sup> | 2   | .603              |
| I would do better if I had a different Chemistry teacher.   | 2.070 <sup>a</sup> | 2   | .355              |
| I find Chemistry lessons boring.  | .088 <sup>a</sup>  | 2   | .957              |
| My Chemistry teacher shares his or her knowledge and expertise with the learners.                 | .354 <sup>a</sup>  | 2   | .838              |

|   |                    |   |      |
|---|--------------------|---|------|
| My Chemistry teacher influenced me to choose Chemistry.   | 2.615 <sup>a</sup> | 2 | .271 |
| My Chemistry teacher is too lazy to look at our notes for correction.                                   | .899 <sup>a</sup>  | 2 | .638 |
| My Chemistry teacher is incompetent.  | 2.413 <sup>a</sup> | 2 | .299 |
| My Chemistry teacher does not like me.  | 1.381 <sup>a</sup> | 2 | .501 |
| If the learners are not assisted, they may not appreciate learning of Chemistry.                        | .997 <sup>a</sup>  | 2 | .607 |
| The main duty of the teacher is to remove obstacles from the learning process.                          | .236 <sup>a</sup>  | 2 | .889 |
| It is up to the teacher to make the lesson a fun learning experience.                                   | 2.603 <sup>a</sup> | 2 | .272 |
| Learners' performance is a reflection of the teachers' effectiveness in managing classroom transaction. | 1.176 <sup>a</sup> | 2 | .555 |

**\*df=degree of freedom, †statistically significant**

Chi-square ( $\chi^2$ ) test was used to associate gender with the learners' responses to statements on information on Chemistry teachers. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed a significant association of gender with the statement 'My Chemistry teacher focuses on learners who perform poorly' ( $p < 0.05$ ), while there was no association of gender ( $p > 0.05$ ) with the rest of the statements on Chemistry teachers (Table 5.72).

Figure 5.7 shows that more male learners (65%) agreed/strongly agreed to the statement "My Chemistry teacher focuses on learners who perform poorly" compared to their female counterparts (36%).



**Figure 5.7: Comparison of Response to the Statement ‘My Chemistry Teacher Focuses on Learners who Perform Poorly’ by Gender**

**Table 5.73: Information about Chemistry Associated with Learners’ Grade**

|   | Chi-square          | df* | p-value           |
|---|---------------------|-----|-------------------|
| School location that enriches the environment could results in better performance of Chemistry.         | 6.808 <sup>a</sup>  | 4   | .146              |
| Rural location of a school can affect performance of Chemistry negatively.                              | 13.287 <sup>a</sup> | 4   | .010 <sup>†</sup> |
| Urban location of a school can affect performance of Chemistry positively.                              | 8.689 <sup>a</sup>  | 4   | .069              |
| Children who attend private school are better academic achievers than counterparts in public schools.   | 5.571 <sup>a</sup>  | 4   | .234              |
| Our laboratory is adequately furnished with equipment and apparatus which are still in good conditions. | 4.426 <sup>a</sup>  | 4   | .351              |
| Inadequate resource materials in the  | 6.630 <sup>a</sup>  | 4   | .157              |

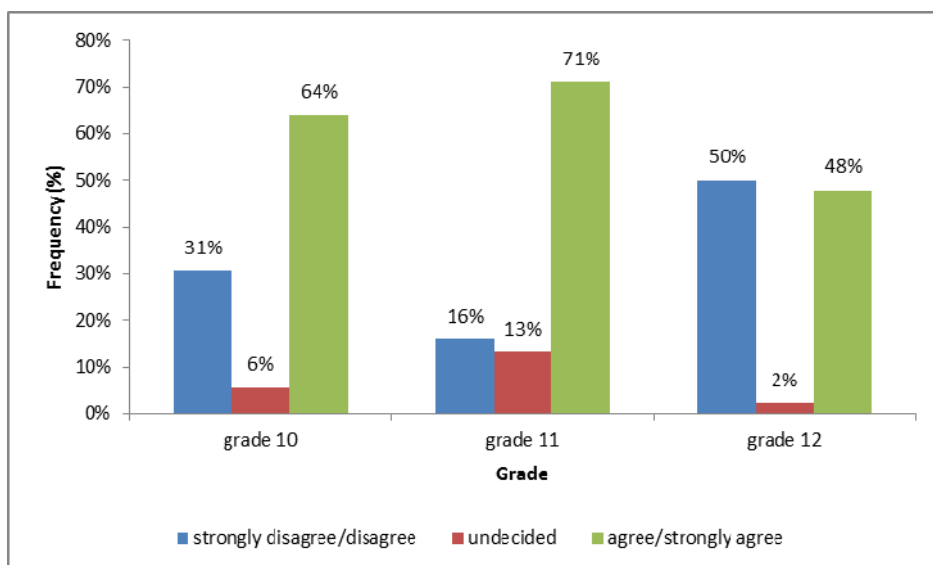
|   |                    |   |      |
|---|--------------------|---|------|
| laboratory contribute towards poor performance in Chemistry.  |                    |   |      |
| Frequency of practical classes is an important factor since skills such as observation and prediction involves experimentation. | 4.505 <sup>a</sup> | 4 | .342 |
| The laboratory classes are boring.  | 7.737 <sup>a</sup> | 4 | .102 |
| Learners who have a more positive attitude towards Chemistry would be more successful in Chemistry.                             | 1.725 <sup>a</sup> | 4 | .786 |
| Learners' Chemistry achievement affects their attitudes positively.   | 4.661 <sup>a</sup> | 6 | .588 |
| Learners' Chemistry learning experiences increase their motivation to learn.  | 1.419 <sup>a</sup> | 4 | .841 |
| What teachers feel about learners' learning or studies could have a significant effect on the learners.                         | 4.132 <sup>a</sup> | 4 | .388 |
| Learners' anxiety regarding Chemistry learning can also be attributed to learners' perception.                                  | 8.196 <sup>a</sup> | 4 | .085 |
| Learners' anxiety regarding Chemistry learning can also be about the difficult nature of Chemistry.                             | 4.951 <sup>a</sup> | 4 | .292 |
| Learners' anxiety regarding Chemistry learning leads to loss of interest in the sciences.                                       | 1.547 <sup>a</sup> | 4 | .818 |
| Learners who have Chemistry anxiety usually panic in exams in science subjects.   | 4.047 <sup>a</sup> | 4 | .400 |
| Learners dislike Chemistry because of the amount of information they have to learn.   | 5.442 <sup>a</sup> | 4 | .245 |
| Learners dislike Chemistry because of the amount of time spent on writing Chemistry in class.                                   | 3.899 <sup>a</sup> | 4 | .420 |

|   |                    |   |      |
|---|--------------------|---|------|
| Peers can also influence learners' attitude in learning Chemistry.  | 2.375 <sup>a</sup> | 4 | .667 |
| Learners need to work together, not only because of their preparation for team work in science.                 | 4.280 <sup>a</sup> | 4 | .369 |
| Learners need to work together, not only because they learn better through social interactions.                 | 7.482 <sup>a</sup> | 4 | .113 |
| Chemistry lessons that are not interesting will not inspire learners to listen, participate and learn in class. | 4.687 <sup>a</sup> | 4 | .321 |

**\*df=degree of freedom, †statistically significant**

Chi-square ( $\chi^2$ ) test was used to associate learners Grade with their responses to statements on information on Chemistry as a subject/learning area. The  $p < 0.05$  was considered significant. In these results, the Chi-square ( $\chi^2$ ) analyses revealed a significant association of learners' Grade with the statement 'Rural location of a school can affect performance of Chemistry negatively' ( $p < 0.05$ ), while there was no association of gender ( $p > 0.05$ ) with the rest of the statements on Chemistry as a learning area (Table 5.73).

Figure 5.8 shows that there are more Grade 10 learners (64%) and Grade 11 learners (71%) who agreed/strongly agreed to the statement "Rural location of a school can affect performance of Chemistry negatively" as compared to 48% of Grade 12 learners who gave the similar response to the same statement.



**Figure 5.8: Comparison of Responses to the Statement ‘Rural Location of a School can Affect Performance of Chemistry Negatively’ by Learners’ Grade**

**Table 5.74: Information related to factors on Chemistry Teacher Associated with Learners’ Grade**

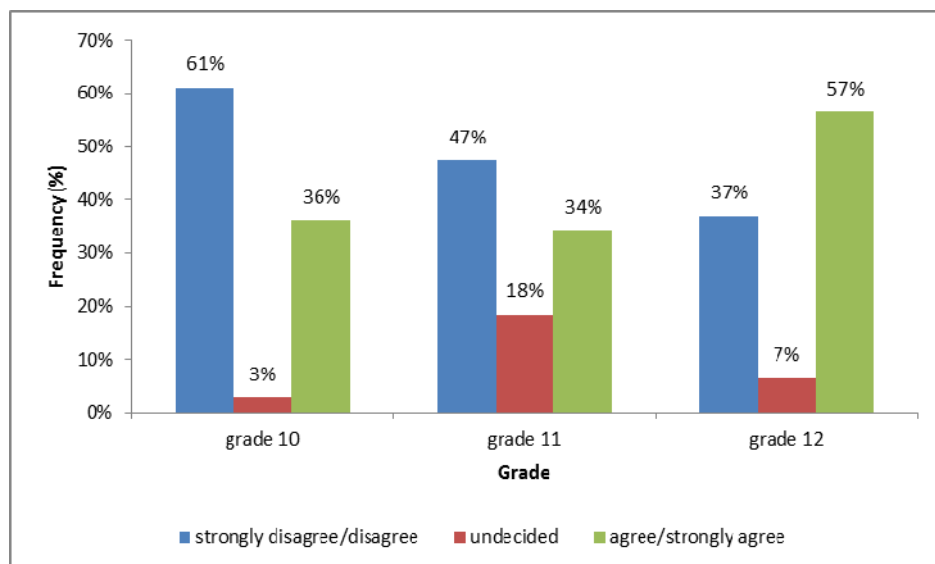
|   | Chi-square          | df* | p-value           |
|---|---------------------|-----|-------------------|
| My Chemistry teacher is my personal role model.   | 5.461 <sup>a</sup>  | 4   | .243              |
| I like my Chemistry teacher.  | 5.389 <sup>a</sup>  | 4   | .250              |
| Our Chemistry teacher makes us do practical work.   | 3.447 <sup>a</sup>  | 4   | .486              |
| Our Chemistry teacher demonstrates practicals most of the time instead of allowing us to do them. | 10.995 <sup>a</sup> | 4   | .027 <sup>†</sup> |
| My Chemistry teacher marks our tests/exams on time.   | 3.528 <sup>a</sup>  | 4   | .474              |
| My Chemistry teacher focuses on learners who perform poorly.                                      | 4.124 <sup>a</sup>  | 4   | .390              |
| Our Chemistry teacher is always   | 6.885 <sup>a</sup>  | 4   | .142              |

|   |  |                     |   |                   |
|---|--|---------------------|---|-------------------|
| punctual in class.  |  |                     |   |                   |
| Our Chemistry teacher answers our questions well.   |  | 1.393 <sup>a</sup>  | 4 | .845              |
| I would do better if I had a different Chemistry teacher.   |  | 10.512 <sup>a</sup> | 4 | .033 <sup>†</sup> |
| I find Chemistry lessons boring.  |  | 4.601 <sup>a</sup>  | 4 | .331              |
| My Chemistry teacher shares his or her knowledge and expertise with the learners.                       |  | 7.203 <sup>a</sup>  | 4 | .126              |
| My Chemistry teacher influenced me to choose Chemistry.   |  | 1.365 <sup>a</sup>  | 4 | .850              |
| My Chemistry teacher is too lazy to look at our notes for correction.                                   |  | .982 <sup>a</sup>   | 4 | .913              |
| My Chemistry teacher is incompetent.  |  | .982 <sup>a</sup>   | 4 | .913              |
| My Chemistry teacher does not like me.  |  | 7.429 <sup>a</sup>  | 4 | .115              |
| If the learners are not assisted, they may not appreciate learning of Chemistry.                        |  | 3.186 <sup>a</sup>  | 4 | .527              |
| The main duty of the teacher is to remove obstacles from the learning process.                          |  | 6.904 <sup>a</sup>  | 4 | .141              |
| It is up to the teacher to make the lesson a fun learning experience.                                   |  | 3.515 <sup>a</sup>  | 4 | .476              |
| Learners' performance is a reflection of the teachers' effectiveness in managing classroom transaction. |  | 1.016 <sup>a</sup>  | 4 | .907              |

\*df=degree of freedom, †statistically significant

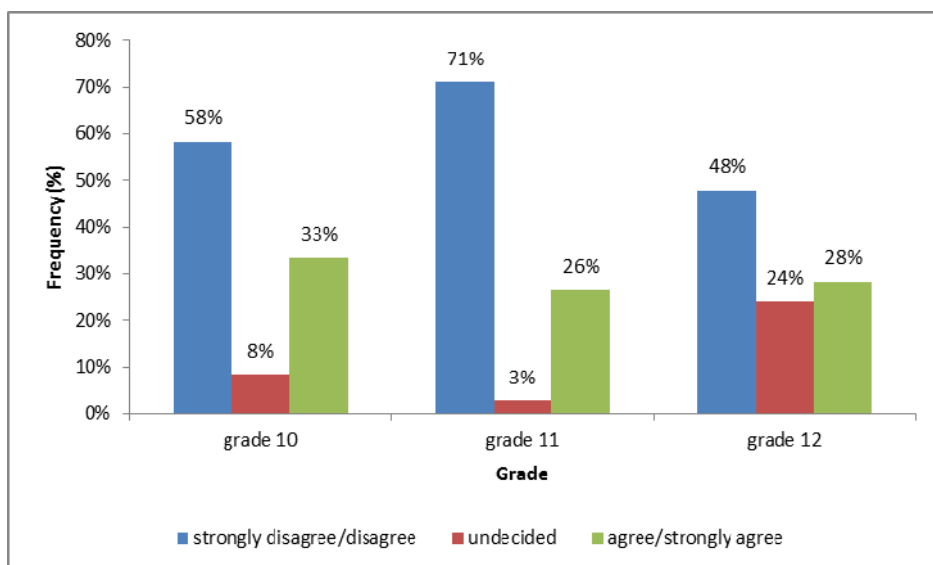
Figure 5.9 shows that there are significantly more Grade 12 learners (57%) who agreed to the statement “Our Chemistry teacher demonstrates practical most of the time

instead of allowing us to do them” compared to Grade 10 learners (36%) and Grade 11 learners (34%) who gave a similar response to the same statement.



**Figure 5.9: Comparison of Responses to the Statement ‘Our Chemistry Teacher Demonstrates Practical most of the Time Instead of Allowing us to do them’ by Learners’ Grade**

Based on the learners’ responses in Figure 5.10, there are more Grade 11 learners (71%) who strongly disagreed/disagreed to the statement “I would do better if I had a different Chemistry teacher” as compared to 58% of Grade 10 learners and 48% of Grade 12 learners who gave a similar response to the same statement.



**Figure 5.10: Comparison of Responses to the Statement ‘I would do Better if I had a Different Chemistry Teacher’ by Learners’ Grade**

### 5.3 QUALITATIVE DATA ANALYSIS

A discussion of quantitative analysis was done and now the objective is to analyze raw data and reduce it into themes and sub-themes to reflect participants’ views on the management of high school learners’ academic performance in Chemistry. The analysis revealed opinions from principals of selected schools within Vhembe District of Limpopo Province. Principals who participated in this study were attached to three Circuits, Mvudi, Sibasa and Luvuvhu. Relevant literature was used against the findings whilst incorporating the intervention of teaching and learning strategic model.

#### 5.3.1 Demography of the Participants

Data were collected from 12 (twelve) principals working within the three circuits (Mvudi, Sibasa and Luvuvhu) of Vhembe District Municipality. Each interview lasted between 45 minutes to an hour in the period of one month. The approximate total time for the interview was 720 hours. All the participants’ qualifications range from Honours to Master’s degrees. All the participants’ number of experience in teaching was above 21

years, and their ages ranged from 48yrs up to 64 yrs. The participant's gender spread was male dominant. Out of twelve principals, only one was female and the rest (eleven) of the principals were male.

### 5.3.2 The Data Coding

According to McMillan and Schumacher (1993:486), data coding is the process of dividing data into parts by a classification system. The researcher develops a classification system by using one of the three strategies mentioned below:

- “Segmenting the data into units of meaning called theme and grouping the theme into larger cluster to form sub-themes;
- Starting with predetermined sub-themes and breaking each sub-theme into smaller categories;
- Combining the strategies, using some predetermined sub-themes and adding discovered new sub-themes”.

In this research study, the researcher segmented the data into units of meaning called themes and grouping the themes into larger cluster to form sub-themes.

**Table 5.75: Illustration of the way in which Data were Coded**

| Theme  | Sub-themes  |
|--|---|
| Theme 1: Perceptions of participants regarding learner performance in physical science | 1.1 Learner interest in the subject Chemistry.<br>1.2 Poor performance in the subject Chemistry.<br>1.3 Teacher performance as motivator for learners.<br>1.4 Learner attitude towards the subject Chemistry.<br>1.5 Parental influence on the choice of subject Chemistry.<br>1.6 Acceptance of the subject Chemistry. |

|  |  |
|--|--|
| <p>Theme 2: Perception of participants regarding the influence of teaching and learning strategies employed</p>      | <p>2.1 Use of mentoring strategy/ team teaching.<br/>2.2 Use of external motivators.<br/>2.3. Building a strong foundation.<br/>2.4 Separating learners according to their performance.<br/>2.5 Increasing classroom attendance.<br/>2.6 Application of rotational teaching.<br/>2.7 Use of induction for new teachers.<br/>2.8 Use of schools of excellence during weekends.<br/>2.9 Use of experts from foreign nationals.</p> |
| <p>Theme 3: Perception of participants regarding availability of resources</p>                                       | <p>3.1 Perceptions about availability of laboratories.<br/>3.2 Insufficient space for large classes.<br/>3.3 Perceptions about the use of Vuwani Science Centre.</p>   |
| <p>Theme 4: Participants perceptions regarding management of academic activities</p>                                 | <p>4.1 Large number of learners per class/lack of individual attention.<br/>4.2 Insufficient learning materials.<br/>4.3 Poor disciplinary efforts.<br/>4.4 Insufficient in-service training for teachers.<br/>4.5 Insufficient curriculum advisor accompaniment.<br/>4.6 Progression of underperforming learners.<br/>4.7 Insufficient qualified teachers in science.<br/>4.8 Poor commitment of teachers to their work.</p>    |
| <p>Theme 5: Participants perceptions regarding relationship between classroom management and learner achievement</p> | <p>5.1 Learner attitude as enhanced by teacher management skills.<br/>5.2 Use of motivators and career guidance to channel positive attitudes of learners towards Chemistry.</p>   |

As the matrix for data coding has been presented, the researcher now focuses on the discussion of the five (5) identified themes and their variety of sub-themes. Analysis of themes and variety of sub-themes was done appropriately. Since data was presented in themes and variety of sub-themes is reflected in Table 5.75, the researcher analysed interview responses in order to elicit opinions about management of high school learners' academic performance in Chemistry so that results could be interpreted.

### **Theme 1: Perceptions of Participants about Learner Performance in Physical Science**

Principals described how learners perform in Physical Science. Different perception were revealed during the interview. The following sub-themes were identified from the theme: Learner interest in the subject; Poor performance in the subject; Teacher performance as motivator for learners; Learner attitude towards the subject; Parental influence on the choice of subject; and Acceptance of the subject.

#### **Sub-theme 1.1: Learner Interest in the Subject Chemistry**

During the interviews, different perceptions by principals were mentioned about the interest of learners in the subject Physical Science. Some participants mentioned that some learners are interested while others said they are not interested at all, especially those who always fail the subject. These made them to have different views about learners' interest in the subject.

The principal of school "A" had this to say:

*"... But we are struggling because most of the learners do not seem to have interest in the subject Physical Science". (Appendix D, Paragraph 6).*

Principal of school "B" said:

*"...I'm not satisfied with the performance of learners in Chemistry Mmmm!!!, you know I think our learners, I don't know whether is a history*

*of this learning areas, they have got xenophobia when it comes to this subject, immediately they just take it as difficult subject. Another thing, parents are influencing learners to take subjects which they were not good at from the foundation...”*

To this end, the principal of school “D” had this to say:

*“... Mmm!!!, in the lower grades they are not Mmm!!!, as better as the once for Grade 12 but in Grade 12 Mmm!!!, I’m satisfied we had good results right from the beginning of the year, but with Grade 10 is slightly different more so because they are not yet exposed. Remember they are coming from Grade 09 where they were doing Natural Science so when they start with this Physical Sciences in Grade 10, always you know if you don’t have Mmm!!!, a teacher who is very good in Grade 9, then you experience the problem that I am experiencing, but in Grade 12, I’m okay....”.*

Principal of school “F” had this to say:

*“...Well, I’m not, I will only be satisfied if all learners can pass Physical Science, then it means I’m not satisfied. The problems of the learners not to pass Mmm!!!, they are quite many, Mmm!!! some have never passed Physical Science in the EFT phase. But they managed to move from Grade 10, 11, 12 without passing the subject. So, it will be difficult for them to pass at the end of the year. I mean to pass Grade 12 Physical Science...”.*

Ogembo, Otanga and Yaki (2015:39) opined that learners’ attitude about the value of learning Chemistry may be considered as both an impact and outcome variable because their attitudes towards the subject can be related to educational achievement in ways that reinforce higher or lower performance. This means that those learners who do well in a subject generally have more positive attitudes towards that subject, and

those who have more positive attitudes towards a subject tend to perform better in the subject.

### **Sub-theme 1.2: Poor Performance in the Subject Chemistry**

During this interview, principals expressed their concern about poor performance of Chemistry which does not yield good results at their school. They individually have different views on this matter.

The principal of school “A” had this to say:

*“... Well, Mmmm!!!! Not necessarily, we have got challenges which we have experience. In fact, from grade 8 and grade 10 to grade12, our performance during the course of the year does not seem what to go beyond 70% it is a worrying factor we want to push it to between 80% and 90% and even 100% especially at the end of the year...”.*

The principal of school “D” had this to say:

*“...Normally as the principal you know I didn't take note of the difference between the two, but when I check, I just check overall results for Chemistry and Physics, but what I have seen Mmm!!!, in I think it's in Physics where they needed lot of practice but not that they are very good in Chemistry, I have checked only in Grade12...”.*

Principal of school “F” had this to say:

*“...Yaah!!! Our learners do well in the Mmm!!! Physics part, Mmm!!! But in Chemistry, Mmm!!! Most of them don't make the grade, they get good marks in Physics but when it comes to Chemistry, those who perform well in Physics, they don't match the same performance in Chemistry...”.*

The principal of school “J” said:

*“...No. The reason why I'm saying I'm not satisfied is because when we compare the current year's performance and the one of the three last*

*years, we find Mmm!!! They are not performing. With regard to what prevail in 2013, the average for Physical Science was 35,85%, followed by 2014 was 35,90%, then the last one 2015 was 27,50%, the one for this year is 27,3%. I'm force to add marks. Now you see, I'm not satisfied. I'm forced to adjust mark as prescribe by the National Department that we had supposed to adjust marks so that they can be of acceptable manner...".*

Principal of school "C" had this to say:

*"... No, I'm not that very much satisfied with the performance of learners in Physical Sciences. Mmm!!! The issue is that those learners Mmm!!!, there are not passing in good marks in Physical Sciences....".*

Principal of school "K" had this to say:

*"...I am satisfied because learners they perform well at the end of the year. Okay, they got 80% in Grade 10 and 11. In Grade 12, they got 100%. So, I'm satisfied...".*

Principal of school "L" had this to say:

*"...Yes, most of the learners they say that hey Chemistry part is too difficult but our deputy Principal who is responsible for Physical Science so he is helping our learners some of them they improve. I still remember one learner who told me that he is going to get distinction in Physical Science at the end of this academic year...".*

Tunde (2014:799) reported that the factors that negatively affect Chemistry achievement include learners' lack of interest, poor study habits and teacher-related factors, like teachers' poor preparation, inadequately qualified Chemistry teachers and application of poor teaching methods. Nbina (2012:324) adds that several factors have been advanced to affect learners' poor performance, such as the learner factor, teacher factor, societal factor, the governmental infrastructural problem, language problem,

examination body related variables, curriculum related variables, textbook related variables and home related variables.

### **Sub-theme 1.3: Teacher Performance as Motivator for Learners**

Most participants verbalized that teachers' performance related on the experience, dedication and hard work of teachers in the classroom. The participants emphasized that if teachers lack experience, do not know the subject matter and presentation of a lesson and are not hard working to go an extra mile turn, this can reduce the interest and performance of learners in Chemistry.

To this end principal of school "A" had this to say:

*"... If the teacher himself is struggling or herself struggling with content subject so it means the learners will turn to hate it and would say no! We don't understand the teacher, the teacher is like this and that. They turn to hate the subject as it is. But at this school you have those teachers that are new (the novice) and those that are seasoned educators, you find that learners would turn to like the seasoned educators more than the novice because they are struggling, they are still getting the footing and then something like that, they are not discharging as they should and the learners do not enjoy the lesson and they turn to hate so they influence this..."*

Principal of school "B" has this to say:

*"...Yes!! a teacher who is very positive and innovative definitely even the results will be brighter but the teacher who is always complaining about petty things because kids are not like manufacturing machine, you have to motivate them so that you get them into the gear, so your attitudes plays a role in the subject in which you are teaching..."*

Principal of school “D” said:

*“... Yaah!!! They do, because Mmm!!! If the teacher is Mmm!!! Somebody who is Mmm!!! Not social. Yes, Mmm!!! You find some learners saying that, No!!! We better not go for that, some learners might Mmm!!! Even change the subject, and the with me here is different because the attitudes of a Science teacher it's accommodative to the learners that's why in Grade 10 this year we have got a lot of learners who are doing Physical science...”*

Principal of school “C” had this to say:

*“...Of course, Yes!!! Teachers' attitudes have got a lot of influence there. If the educator is not so well vested with the learners, the results are always poor. So, I even know here that there is that attitudes which is affecting learners not to perform well in this Chemistry...”*

Yunus and Ali (2012:296) indicated that learners who reported positive experiences during their Chemistry class were said to be influenced by their teachers' positive attitudes toward Chemistry. It can be interpreted that when teachers are enthusiastic in teaching the Chemistry subject, the learners will also be enthusiastic towards the subject.

#### **Sub-theme 1.4: Learner Attitude Towards the Subject Chemistry**

During interviews, the participants reported that their learners' attitudes towards the subject Chemistry is not satisfactory. Some participants say their learners' attitudes are better but not quite convincing as to say their attitude is positive.

The principal of school “B” had this to say:

*“... Yes, we have identified anxiety in learners. And when it comes to learners immediately when there are things which deals with calculations, calculation. Yes, already kids have got negative attitude about it. Oh yes.*

*Then it makes them to have some xenophobia anxiety and so forth and so forth. Definitely...”.*

The principal of school “F” had this to say:

*“...Ooh yes. Yes, it does, you know if a teacher can tell learners that for example, no Chemistry is difficult is not an easy subject, well that will influence them. They will have negative attitude and they will fear Mmm!!! Chemistry...”.*

Another principal of school “G” has this to say:

*“...the attitudes of the teachers especially the teachers who are teaching Chemistry themselves, or Physics themselves, they are interested of the subjects, but Yaah!!! I don’t think they have the negative attitude. But Mmm!!! Even though that they have positive attitudes, learners still are not performing well, the teachers’ attitudes are positive but learners are always not performing well. Teachers’ attitudes are fine but learners they don’t perform according to what you expect...”.*

Principal of school “L” had this to say:

*“...teachers’ attitudes influence if the teacher has got the knowledge of that particular subject, learners get influenced even imitate to become like that Mmm!!! teacher, so, the attitude of the teacher do influence the learners to achieve. In our school, we do not have any problem of the attitudes of teachers towards learners....”.*

The principal of school “J” had this to say:

*“...The underperformance was caused by the teacher who was responsible for dealing with this Grade 11, his attitude was not good and it make learners to underperform. And the one who is currently teaching them, he is having Mmm!!! Challenges of taking them to the level in which learners will be in Grade 12. He is having problem with regard to Grade 11*

*because the teacher who was teaching them, he was not doing his full best....”.*

Yunus & Ali (2012:297) and Jegede (2007:193) indicated that the learners dislike Chemistry because of the amount of information they have to learn as well as the amount of time spent for writing in Chemistry classes, a lot of learners said that Chemistry is too broad for them to learn in a short time. Learners find it a bit difficult to learn Chemistry because of its overloaded syllabus.

### **Sub-theme 1.5: Parental Influence on the Choice of Subject Chemistry**

Analysis of data indicated that parents also influence their children on the choice of subjects. They do not check the ability of their child whether capable of doing Chemistry. They only value the career opportunity of prestigious status and ignore their children’s cognitive ability.

One principal of school “B” had this to say:

*“... Another thing, parents are influencing learners to take subjects which they were not good at from the foundation. So, I think parents must Mmm!! At least ask teachers what isn’t from Grade 09 that the child must take in Grade 10...”.*

Principal of school “J” had this to say:

*“...Another factor is lack of support from parents because the teacher will, at time organized that the learner should go to Vuwani Science lab there. The one which is under the University of Venda he can organise but you will find that very few will pay. Parents are not participating fully, and they are not supporting. Teachers are also participating I mean teacher are also giving support to science learning...”.*

Yunus and Ali (2012:297) and Berg et al., (2003:351) indicate that teachers and parents are not the only people that can influence the learners' attitude towards learning Chemistry. This is because learners are easily influenced by people of their own age. If the majority of the learners in a school have negative attitude and different opinions in Chemistry, other learners are likely to have the same reaction towards the subject. Most of the time, learners complain about the subject content.

### **Sub-theme 1.6: Acceptance of the Subject Chemistry**

Some participants indicate that an experienced and dedicated teacher makes the learners to like and accept the subject Chemistry. The positive attitude influences the learners to enjoy and like the subject, especially those learners who are good in mathematics who they tend to enjoy calculations in the Chemistry aspects which need calculations.

Principal of school "E" had this to say:

*"... Yes, usually those learners who are good in Mathematics find Physics easier, Mmm!!! But those who are weak in Mathematics, they cannot cope well with Physics. They can do well in Chemistry than in Physics. That is the difference..."*

Yunus and Ali (2012:297) indicated that learners who want to learn will have little problem grasping the concepts. However, weak learners will find Chemistry very dull and boring. In order to make learners to have more positive attitudes in learning Chemistry, people around them, especially the teachers and parents, have make time to engage with the processes and the procedures of Chemistry. Teachers and parents are very influential in the learners' development.

## **Theme 2: Perception of Participants regarding the Influence of Teaching and Learning Strategies Employed**

Participants describe the influence of teaching and learning strategies which can improve the performance of learners in Chemistry. Principals play a major role in the implementation of teaching and learning strategies. Their strategies differ as follows: Use of mentoring strategy/ team teaching; Use of external motivators; Building a strong foundation; Separating learners according to their performance; Increasing classroom attendance; Application of rotational teaching; Use of induction for new teachers; Use of schools of excellence during weekends; and Use of experts from foreign nationals.

### **Sub-theme 2.1: Use of Mentoring Strategy/ Team Teaching**

During the interview, participants described the mentoring of novice teachers done by the HOD of the subject and master teachers who have vast experience in the subject. Team teaching as a strategy is useful in a school which has unified staff members whose goals are there to be achieved.

Principal of school “A” had this to say:

*“... the academic year 2016 we even came with strategies that these learners need to be attended in the morning and afternoon so all the educators that are involved in physics from Grade 10 up to Grade 12 they must do what we call rotational teaching as a form of team teaching, some will see them this morning and the other one in the afternoon only 30 minutes just to, in fact in the afternoon we have the studies which run for one and half hours, they get 25 minutes and then go and leave the learners with some work to do, so we hope this strategy will help to improve Chemistry as one of Physical Science section...”*

Principal of school “E” had this to say:

*“...we have what we called team teaching. When we have this team teaching, we don’t pair a novice with novice, we pair a master with a novice. So, it will help with good classroom management and teaching. Sometimes the young educators will go and observe as the master teacher is teaching. That is how we help each other. Mmm!!! If you prepare well for your lessons, you deal well with some of the disciplinary problems, but if you are not well prepared, that is where you will encounter some problems...”*

According to Hudson (2013:5), an effective mentor teacher can articulate to the pre-service teacher applicable content knowledge for a lesson and where they sourced this content knowledge. Regardless of the subject area, a key aspect of mentoring is ensuring that the pre-service teacher has proficient content knowledge for teaching a lesson.

### **Sub-theme 2.2: Use of External Motivators**

During the interviews, the participants reported that the use of external motivators assists in their schools as part of strategies employed. They outsource experts from highly performing schools, University of Venda, and even subject advisors who are specialists in Chemistry to visit the schools and motivate and assist as requested. Some principals even mention outsourcing foreign national teachers from neighbouring countries who are experts in Chemistry.

Principal of school “B” had this to say:

*“... Yes as the school, we do have teaching and learning strategies because for example, we have got Mmm!!! Saturday lessons, we have got winter lessons. We also outsource so that we get better Mmm!!! Teachers, for example now we have got two teachers from Zimbabwe who every year we ask for their renewal of work permit so that they help us...”*

Principal of school “F” had this to say:

*“...Well, strategies we do have, but Mmm!!! to fulfil them, that’s difficult. Strategies we do have; like we do send Mmm!!! Our kids Mmm!!! To the university where there is equipment for doing experiment. And we also Mmm!!! Invite Mmm!!! Some curriculum advisors and some lecturers from university to come and guide teachers wherever find some difficulties in the Chemistry concept...”.*

Principal of school “D” had this to say:

*“...Like what I said earlier, we sometimes have extra lessons, and also besides sending our teacher or learners to another school which are doing better we also sometimes we have got somebody from NECT, for motivation. This is a national initiative, he comes here and teach, he is like the subject specialist. Well he comes and help by going to the class and teach himself. Yaah!!! So that’s one way that I think even if I do not have enough human resources but Mmm!!! This person comes once or twice a month. And Yaah!!! To assist, and even during school holidays. He is from National Education Collaboration Trust and our school it’s one of the school which are have been nominated to be in the NECT, we do not have to pay him...”.*

Noordin et al. (2010:130), indicated that circumstances in the environment can be arranged so a learner will be encouraged to do something that will result in his learning. The conformation of the learning environment will, in turn, motivate learners’ learning because they can easily focus on the teaching and learning process without distractions.

### **Sub-theme 2.3: Building a Strong Foundation**

Principals reported in the interview that if you build a strong foundation at lower grade, you are likely to produce learners in upper grades who are good in Chemistry. The

strong foundation is to have well experienced teachers in the lower grade, and this will have a greater impact on learners at lower grades by improving their positive attitude towards the subject Chemistry.

Principal of school “E” had this to say:

*“... We, normally, we try to teach the lower class because if you have strong foundation Mmm!!! When we have this support lessons, we concentrate on the two learning areas Physical science and Mathematics. Normally we do that on Saturdays where they would come for 1-hour Mathematics and 1-hour Physical science because if you do not have the strong foundation, when they go to senior classes they would not cope with Physical science...”.*

Nbina (2012:324) identified specific variables such as poor primary school background in science, lack of incentives for tests, lack of interest on the part of learners, learners not interested in hard work, incompetent teachers in the primary school, large classes, and fear of the subject psychologically. According to Nbina (2012:324), parents should not expect too little or too much from their children. Too much pressure can lead to failure and dislike of Chemistry. It was found that parental dominance tends to discourage the children in school learning.

#### **Sub-theme 2.4: Separating Learners According to their Performance**

During the interviews with principals, they emphasised separation of learners according to their abilities. The reason is that learners who need more attention must be placed in one class which is continuously monitored and given extra lessons and more tasks, while those who are less struggling may be allowed to continue with the syllabus and given work which is appropriate to their abilities.

Principal of school “I” had this to say:

*“... Yeah!!! The strategies that we use we normally, Mmm!!! Categorize learners according to their ability and try to isolate those learners who are doing poorly and to spend more time with them rather than Mmm!!! Mixed them together. We also have the strategy of working with learners in Saturdays but those learners who are not doing very well, we isolate them we give them test separately and we also make sure that we involve the parents and this helps to improve their performance....”.*

Tai et al. (2005:988) also affirmed that learners reporting more instances of repeating laboratory work to enhance their understanding earned higher Chemistry grades than their peers who reported few or no instances of repeating laboratory work for understanding. They emphasized that laboratory work holds greater promise in helping to prepare learners for higher level studies.

#### **Sub-theme 2.5: Increasing Classroom Attendance**

Principals described the increase of classroom attendance as a strategy to keep learners in class where teaching and learning is taking place. They said the idea is to constantly keep the learner on the spirit of learning to avoid unproductive disturbance. The principals mentioned Saturday schools, winter and vacation schools which are strictly monitored and even suggested some schools which are performing well to their learners and allow them to visit and attend classes which are led by experienced good teachers.

Principal of school “E” had this to say:

*“... And programs such as enrichment classes, we have but we are not happy if during the normal school hours, teachers do not put their 100% effort, then they become very active on Saturdays because they will get some compensation...”.*

Principal of school “C” had this to say:

*“...What I have to do is only to encourage learners to be in the class and to encourage the educators also to be there prepared. Whether they are preparing right thing or not so I’m not quite sure about that because I don’t have knowledge of this Chemistry. We do have enrichment classes during holiday vacations, sometimes in the afternoon in order to improve these results but as always the results are only little bit above average...”*

Yunus and Ali (2012:297) indicated that a lot of Chemistry teachers claimed that they have to make extra classes to cover all of the chapters in the syllabus. This issue is challenging to both learners and teachers. Yunus and Ali (2012:297) further said that teachers do not have enough time to teach and make the learners fully understand the concepts of Chemistry during the normal school time. Thus, extra time and energy have to be given to teach Chemistry to the learners. Learners who really want to learn will have little problem grasping the concepts.

### **Sub-theme 2.6: Application of Rotational Teaching**

During the interviews, some principals talked about rotational teaching, where teachers rotate to teach in the morning before the normal school program starts and after school during the afternoon studies. The idea is to assist learners as soon as possible and to finish the syllabus on time in order to have enough time for revision. Rotational teaching also gives teachers equal opportunities to teach their learners in regular times. Learners have opportunities to be closely acquainted to their teacher and reduce the barriers caused by anxiety.

Principal of school “A” had this to say:

*“... Yaah!!! In fact like all the subjects, we need strategies, the strategy here is to see that seasoned educators help the novice and then they work as a team and in fact for the academic year 2016 we even came with strategies that these learners need to be attended in the morning and*

*afternoon so all the educators that are involved in physics from Grade 10 up to Grade 12 they must do what we call rotational teaching as a form of team teaching, some will see them this morning and the other one in the afternoon only 30 minutes just to, in fact in the afternoon we have the studies which run for one and half hours, they get 25 minutes and then go and leave the learners with some work to do, so we hope this strategy will help to improve Chemistry as one of Physical Science section...”*

Van der Berg et al. (2011:4) indicated that the McKinsey and company Report on successful education systems concluded that the quality of a school system cannot exceed the quality of its teaching force. Low teacher effort is often considered as one of the most serious problems in South African schooling, perhaps even bigger than weak teacher content knowledge and pedagogical skills to successfully teach the curriculum. Although teacher time-on-task is often raised a serious concern, existing evidence regarding the impact of teaching time on learner performance is not compelling in either direction. Some studies have not found evidence that insufficient teaching time is a key factor behind under-performance (Taylor, 2011:27). On the other hand, Shepherd (2011:26) finds that extra classes offered by teachers outside the normal school day are associated with better learner results.

### **Sub-theme 2.7: Use of Induction for New Teachers**

Some participants verbalized the use of induction for new teachers. They explained lack of discipline in the classroom for the newly appointed teachers. Principals during the interviews voiced out that the new teachers who lack experienced need induction which can be done internally by the department where the novice belongs. They also view it in the manner of outsourcing experts like curriculum advisors who are always keen to help teachers as mandated by the Department of Education.

Principal of school “G” had this to say:

*“...We have the novice teachers like Mmm!!! those teachers who recently join the field. You know they just need to be Mmm!!! inducted, they need to be motivated encourage on how they must work with the learners and which good methods can they use rather than giving the learners everything...”.*

Principal of school “E” had this to say:

*“... Mmm!!! Normally, we encourage our educators to plan well for their lessons and to come together, share good practices and helping one another. Let’s say in the Physical Science department, they come together and they strategize on how to teach particular topics. When you have a master teacher, he will be assisting the novice teachers that how we are helping each other. Because you find that new teachers they have the content from the university but how to teach it is a struggle. But when you have the master teacher, they can help the new teachers to do well...”.*

Principal of school “C” had this to say:

*“...The problem and the challenge that we are faced with new educators is that it seems as if they do lack really what we said is the classroom management. But they have got knowledge of the content. The old once they can manage their classrooms but they don’t have Mmm!!! Knowledge, some of them they don’t have knowledge of the content, it seems as if they are no longer furthering studies, they are simple relaxing...”.*

Thompson, Paek, Goe and Berkeley (2005:1) indicated that induction programs for new teachers have been identified as an important way to promote the intertwined goals of teacher quality, teacher retention and learner learning. New teacher induction is providing support to beginning teachers and should increase the likelihood that they will stay in their jobs and do their jobs well. This, in turn, should lead to improved learning.

New teachers simply are not as effective as their more experienced colleagues. When teachers stay in the profession past the first few years, they solidify their teaching skills in ways that translate to better learner outcomes.

### **Sub-theme 2.8: Use of Schools of Excellence during Weekends**

During the interview, some principals mentioned the use of schools of excellence which are within the Vhembe District. Principals allow their learners to attend weekend as well as winter schools during school vacations; they value such school as excellent because of the overall performance especially in the difficult subject like Chemistry. Another principal says he personally requests permission to include his learners in their program during the weekend.

Principal of school “B” had this to say:

*“... We send them to the centers where they have good resources. We have got Tshikevha Christian Combined school, they do have good resources if we don't get teachers we ask learners to go and do extra lessons on Saturdays, weekends and the holidays' there...”.*

The principal of school “D” had this to say:

*“...Yes, we do have strategies, sometimes I do send some of my teachers to school which are doing better like Mmm!!! some years back I sent the Science teacher to a certain secondary school in our circuit which was getting good results...”.*

Principal of school “G” has this to say:

*“...We also send them out during the Science week. Mmm!!! Like going to University of Limpopo, like going anyplace where they will see science related programs. Saturday school, we encourage them, we send them to Mbilwi secondary school which produces best results, and even here at our school we always organize those extra lessons. And we also invite*

*maybe expert from other schools to come and help, especially these Science learners...”.*

Principal of school “L” had this to say:

*“...In our school we don’t have, that is why I have stated that during the school vacation, during winter we send our learners to winter school in places like Mbilwi Secondary and Thohoyandou Secondary where they have got some resources, resources here, we don’t have some resources. Resources like laboratory, we don’t have and library we don’t have. We don’t have enough teachers for science. For science we have got only two and we need more...”.*

Yunus and Ali (2012:298) and Berg et al., (2003:352) indicated that schools should at least have the basic infrastructure for teaching and learning of Chemistry which are classrooms, laboratories and libraries. Classrooms must be in good condition and comfortable for the learners to absorb knowledge because a good classroom also influences the learners’ moods. Schools should also provide enough Chemistry equipment to ensure learners can carry out many experiments with their teachers. A library can help learners find extra references for their Chemistry homework and reading. When teachers put more effort in their teaching styles as well as put into concern the learners’ needs, it can boost the learners’ attitude towards Chemistry (Yunus & Ali, 2012:298).

### **Sub-theme 2.9: Use of Expertise from foreign nationals**

During interviews, some participants reported that the use of experts from foreign nationals increase the performance of their learners in Chemistry and make learners to have positive attitude towards the subject. Another participant during the interview indicated that she assists teachers who are foreign nationals by recommending them from the Department of Home Affairs on issuing work permit.

Principal of school “I” had this to say:

*“...About human resources, we are satisfied with the teachers we have because you will remember, Mmm!!! Because of this project, Dinaledi project, there are teachers who were brought to our school from other countries. We still have those teachers even though we are now required to be with them as long as we have a vacant post that they can occupy. So, we are satisfied, but if they leave, that’s where we are going to have problem and apparently we are not sure if next year we will be having these teachers. These teachers are foreign nationals...”.*

Principal of school “J” had this to say:

*“...The other factor is that the one who is responsible for teaching Chemistry is a foreign national. He usually experiences problems because he cannot during the lesson switch and use the vernacular language usually there is problem. He uses only English as medium of instruction, it hinders learners to understand him...”.*

Heeralal (2013:204) discusses the issue of knowledge and skills particularly in Chemistry and emphasizes the fact that many South African science teachers have little content knowledge of how to teach Chemistry. The quality of a teacher is crucial in teaching and learning. School fixed effects are strong determinants of learner performance and these fixed effects are shown to be highly correlated with teacher qualifications. Teachers have powerful effects on reading and science achievement, through little of the variation in teacher quality is explained by observable characteristics such as education or experience (Maphoso & Mahlo, 2015:52).

### **Theme 3: Perception of Participants about Availability of Resources**

During the interviews, the participants reported that resources are there but, insufficient according to their perceptions. Some principals indicate that they do have laboratories where experiments can be conducted, while others do not even have a laboratory for

performing practicals. Some participants during the interviews talked about overcrowding with limited resources like laboratories and classrooms which must be conducive for Chemistry teaching and learning. Some of the principals have enough human resources while others still need more Chemistry teachers. The unavailability of resources hinders the performance of their learners according to the principals' explanation during the interviews. Participants spoke about availability of resources are as follows: Perceptions about availability of laboratories; insufficient space for large classes; Perceptions about the use of Vuwani Science Resource Centre.

### **Sub-theme 3.1: Perceptions about Availability of Laboratories**

During the interviews, some participants indicated that they do not have laboratory, other participants relate on making classroom to be converted to be laboratory, while one or two participants say they have laboratory which are in good condition to perform their experiments. Those principals of schools which do not have a laboratory end up doing experiments under the trees, and their learners are gaining nothing. Some participants talked about apparatus and equipment used in the laboratory but seldom have them, and it is difficult to improvise.

Principal of school "A" had this to say:

*"... Well, we cannot say we have got enough but we do have make shift laboratory where experiments are done there and the learners go there. Is just that we have got a very limited space for all the learners, mind you, in this school all learners are doing Physical Science and is not the part of learners, so when everybody is doing it we have got classes which have 80 learners. Classes with so many learners we cannot fit them all into a lab at once so we find that our lab need to be extended, we need space, we need equipment..."*

The principal of school “D” had this to say:

*“...No, like I have indicated earlier we don’t have laboratory but at the same time I didn’t just say well because we don’t have laboratory we don’t improvise, yes we do. Yaah!!! Textbooks we have, and besides I decided to get some DVDs and Mmm!!! A projector where at times we engage these learners with Mmm!!! You know they like to see because they just think well it’s a bioscope when while at the same time they are learning that is sometimes they want to do it on their own without the teacher and they enjoy it a lot. Yaah!!! They use projector with the DVDs...”*

Principal of school “F” had this to say:

*“...Well, resources are a problem, the resources will never be enough, but we do have the basics. We have but there are some which we have to borrow from our neighbouring schools. Mmm!!! Infrastructure well, we don’t have, we just make it here and there well, we have a laboratory which is just an existing building but with no equipment...”*

Another principal of school “G” has this to say:

*“...No, we don’t have Mmm!!! Chemistry lab, we just keep teaching everything theoretically. We also don’t have apparatus, nothing at all. If the learners have to do practical investigation, we do take them out for Mmm!!! Like Mmm!!! The Vuwani Centre. That is where they will see Science apparatus, demonstration at Vuwani Science Centre. And is controlled by the University of Venda. ...”*

Principal of school “C” had this to say:

*“... We don’t have such appropriate resources, like what I have already indicated above, normally we used to do this theoretical rather than practical, but of course we have some few things that learners are able to use when they are studying this Chemistry, but there are not enough and they are not made for their grade. We don’t have laboratory...”*

Principal of school “H” said:

*“...I don’t have enough, that’s why I even go to the University of Venda, to request some apparatus. I’m only happy because when I go there they assist me, and also university usually send a person who can come and motivate the learners and teach them. I don’t have Mmm!! Enough laboratories and classes. But I once struggled and request donation from the people, that’s why I managed to build which I take it as a temporary class of Mmm!! Lab...”*

Principal of school “K” had this to say:

*“...We don’t have appropriate resources because we don’t have library, we don’t have laboratory but we depend on textbooks and the method which are used by the teacher produce better results...”*

Ejidike and Oyelana (2015:606) indicated that the laboratory has been given a central and distinct role in science education, and science educationists have suggested that rich benefit in learning accumulates from using laboratory. The science laboratory is a setting in which learners can work supportively in small groups to investigate scientific occurrences.

### **Sub-theme 3.2: Insufficient Space for Large Classes**

Some Principals during the interviews reported that overcrowding of learners is a problem during practical sessions. Insufficient, space according to some of the participants, for large classes have a negative impact on learners’ performance in Chemistry. This is because they do not get exposed to experimentation which is an important aspect of the subject *Chemistry*.

Principal of school “A” said:

*“...we have enrolled large numbers of learners and we don’t even have enough classroom, we talk about 80 learners in classroom, and if you go*

*to grade 10 classrooms we have got 80 learners in one class and all of them are doing Science. Is overcrowding, and overcrowding as a factor will always impede learning and teaching and another thing is that you have got so many learners in that you even short of textbooks, not everyone would have textbook, they will have to share. A school with lot of learners at any given time would have experience disciplinary problems, they will be disciplinary problems, they will be truancy, dodging of classes learners sometimes will be outside, and the teachers is not there you cannot control them so this things turn to affect mostly difficult subjects because these subjects need learners to focus, need learners to be there for the subject so that they can improve, so it is little difficult when we don't have space and then we cannot fit learners to the lab and then sometimes educators told us they cannot get learners in control...".*

Principal of school "F" had this to say:

*"...The problem we do have, overcrowding because you know our lab can only accommodate about 30 but we have Chemistry class with 60 learners....".*

Principal of school "E" had this to say:

*"...Yes, we have the Physics lab and Chemistry lab, but the challenge that we have we are dealing with large numbers, to conduct individual experiment is difficult. Normally, we do demonstrations to our learners but we are fine with our two labs, the Physics lab and the Chemistry lab. The only problem is overcrowded. Yaah!!! The large enrolment, and as such in grade 10 to 12. Yaah!!! This is because the average of learners is between 65 to 70 in a class...".*

According to West and Kennedy (2014:1), overcrowding in science classrooms is the number one concern among science teachers. However, overcrowding, as well as lack of safety training of teachers, lack of appropriate classroom management, and

inadequate science equipment and facilities have all been identified as possible areas of safety concern when teaching science. West and Kennedy (2014:2) argue that increased class enrolment significantly affects the number of accidents in the secondary science classroom.

### **Sub-theme 3.3: Perceptions about the use of Vuwani Science Centre**

Principals described the importance of having Vuwani Science Centre for assisting schools which do not have laboratories for experiments and practical work related to Physical Science. It is sponsored by the University of Venda as part of community involvement for rural and regional development. Its purpose is to serve the learners in the Vhembe District Municipality as part of uplifting Science to the needy schools for better career opportunities for science and technology.

Principal of school “B” had this to say:

*“... I can't say I do have resources because for example, we don't even have the laboratory. So when we do experiment is very difficult. And taking kids to Vuwani Science Centre where the university have Mmm!!! Built the place where learners are supposed to do the experiments, is a big deal of work. Is taxing because you need transport to the place (Vuwani Science Centre). Teachers must move from here leaving other subjects moreover, the teacher is not teaching only that specific subject Chemistry but even other subjects...”.*

The principal of school “D” had this to say:

*“...Again I will say the absence of Mmm!!! you know exposure you know, we take them to Vuwani Science Centre because we don't have laboratory at our school but sometimes as you can see learners around here are in a rural area, Mmm!!! and sometimes you can say well we get a taxi or a bus to go to Vuwani Science Centre, only very few will manage to go there,*

*and the absence of our own laboratory is affecting the academic performance...”.*

Principal of school “H” said:

*“... I even take the Science learners to Vuwani Science Centre of the University of Venda. I take them there every year so that they go there the whole day will be there being taught and using apparatus of the laboratory. They always perform experiments in the very same place. That’s what I do every year...”.*

Kibirige and Hodi (2013:426) indicate that laboratory work provides learners with an opportunity to experience science by employing scientific research procedures. Thus, in order to attain meaningful learning to understand scientific theories and their application methods, learning should be done using laboratory investigations. Moreover, engaging in practical work should encourage the development of critical thinking skills and create interest in Chemistry. However, there are concerns about the effectiveness of laboratory work in aiding learners to understand various aspects of scientific investigations.

#### **Theme 4: Participants’ Perceptions of Management of Academic Activities**

Most participants revealed that management of academic activities are still a challenge in their schools. Overcrowding makes it impossible for the teacher to have individual attention as well as group attention. There are insufficient teaching and learning resources, which makes it difficult for learners and teachers to do their work completely. Principals talked about discipline in class, especially regarding a new teacher who does not know ways and means of disciplining the mischievous learners. During the interviews, the principals reported that there is insufficient in-service training of teachers for a subject like Chemistry. Some participants reported inadequate qualifications of Science teachers which also affects the performance of learners in Chemistry.

#### **Sub-theme 4.1: Large Number of Learners per Class/lack of Individual Attention**

In the interview, some participants mentioned overcrowding in the classes which affects management of classrooms by teachers to improve the performance of learners in Chemistry. Participants described lack of adequate facilities to accommodate all learners as serious such that individual attention cannot be achieved. Learners who are slow to understand some concepts always remain behind; this can only be identified after giving formal assessment. They keep on failing without the teacher ever noticing their problem areas as they class is overcrowded.

Another principal of school “B” had this to say:

*“...Overcrowding definitely has an effect especially for the teacher. Mmm!!! Yaah!!! As a class it has got negative effect because you know a teacher is very difficult to do individualization especially when you are busy teaching in a crowded classroom but when you have got a normal you can make a follow up of learners who have difficulties...”.*

West and Kennedy (2014:2) indicate that major problems with overcrowding include two issues: the teacher’s ability to supervise a large number of learners doing science activities and the amount of individual workspace per learner. Overcrowding with regards to supervision likely affects a teacher’s ability to properly manage and oversee the classroom and, therefore, may prevent adequate supervision of learners conducting science activities.

#### **Sub-theme 4.2: Insufficient Learning Materials**

Principals also indicated during the interviews that insufficient learning materials is a serious factor which affects the performance of learners in Chemistry and other content subjects. Learning materials like text books are there but do not cater for all learners. Participants said they make learners to share a textbook, which reduces the learners’ advantage to learn frequently. Some principals revealed that even the equipment and

laboratory chemicals are not available, and they sometimes improvise; this confuses the learners at later stage of their educational development.

Another principal of school “G” has this to say:

*“... And another strategy that we use, we encourage them to buy as many books as possible that are related to science. We also send them out during the Science week. Mmm!!! Like going to University of Limpopo, like going anyplace where they will see science related programs...”.*

Another Principal of school “H” said:

*“...Mmm!!! that’s the shortage of apparatus and also that we sometimes don’t receive not enough books. And what we do in order to solve that problem, I make it a point they are being photocopied. I mean to photocopy the textbooks, in order every learner must have, just a copy...”.*

Researchers like Nwosu and Bassey reported inadequate resources materials in Chemistry teaching (quoted in Oginni, Awobodu, Alaka & Saibu, 2013:1517). They further stated that where there are little resources at all, they are not usually in good condition while the few ones that are in good condition are not enough to go round those who need them. This poses a great challenge to government on the need to raise funding for schools where science subjects such as Chemistry are being offered. This is because where the materials are not available in large quantities to meet the demand, effective teaching and learning of science, especially Chemistry which is the queen of the science, becomes very difficult (Oginni et al., 2013:1517).

#### **Sub-theme 4.3: Poor Disciplinary Efforts**

The results indicated that the majority of participants experienced poor disciplinary efforts from teachers, especially the newly appointed teachers. Overcrowding of learners intimidate newly appointed teachers, and lack of discipline can escalate such that there is no control inside the classroom. The participants in the interviews

emphasize that poor management can also influence poor discipline in the classes. Master teachers and HODs assist the newly appointed teachers on how to manage their classrooms by accompanying them to class and allowing them to teach while observing, supporting and allowing smooth transition to take place.

Another principal of school “B” had this to say:

*“... Newly appointed teachers are giving us really I don’t know how maybe the strategy of training teachers must be looked into because when they come here they are like a clean slate, they’ve got completely nothing, you know to teach them right the first two three years you will be teaching the teacher how to teach the subject and what about the learners. And also managing the discipline. Is very difficult, you have to go as a manager and manage sometimes the teacher’s classroom whereas he is inside. So we find it very difficult...”*

Principal of school “K” had this to say:

*“...Discipline is good because they are not many, they are not many. We may find that in one class, they are less than 50. So it is easy to control learners but where the number is too big, is also very difficult to control them. That is why we are saying discipline is affordable in our school. We have two teachers who were employed this year, they are still new but I’m happy because those who were teaching Physical Science and Mathematics are helping them to gain experience and they are doing well...”*

Yunus and Ali (2012:297) indicate that if the majority of the learners in a school have bad attitude and opinions in Chemistry, other learners are likely to have the same reaction towards the subject. Most of the times, learners complain about the subject content. They complain that Chemistry is too difficult and takes a lot of time to study because of the weight of information the subject has. When a lot of learners complain about the same thing, other learners will have a negative attitude, which can influence

their attitude towards learning Chemistry and teachers' poor disciplinary efforts will be evident.

#### **Sub-theme 4.4: Insufficient In-service Training for Teachers**

During the interviews, the participants reported that insufficient in-service training for teachers is not done. Teachers are not developed according to the needs of the new curriculum that is, Continuous Assessment Policy Statement (CAPS). The training centres are not functional, and teachers are not trained in the sections they need to be developed due to lack of organized trainings.

Principal of school "1" had this to say:

*"... Yes, definitely because that plays a very big part. If teachers are not, Mmm!!! Trained or if they are not, they cannot manage the teaching of Chemistry, generally the performance will be very poor. So, what we normally do as part of IQMS, yes, we do classroom visit Mmm!!! We also make sure that at the departmental level, the HOD also do a slot of follow-up in terms of classroom visits..."*

Principal of school "K" had this to say:

*"...Yes, we usually encourage our teachers to go and attend workshops which deals with training of Chemistry so that when they come back they impart good knowledge to the learners. Deputy Principal or HOD for Science visit educators in their class while they are teaching. They also visit other teacher from other schools in order to see how they impart their knowledge to their learners. They always work as team and when you work with other teachers, they help you where you have challenges, especially in other aspect of Chemistry. But when you work hand in hand with other teachers, they help you as well..."*

Ejidike and Oyelana (2015:607) further suggest that teachers should be both academically and professionally trained. Higher academic qualifications and professional training improve teacher effectiveness on the job. It is important to teach and help them understand learners better than untrained teachers.

#### **Sub-theme 4.5: Insufficient Curriculum Advisor Accompaniment**

Principals said in the interviews that insufficient curriculum advisor accompaniment is a serious issue in their schools. Their visits to schools occur only when they need statistics of learner attendance or quarterly schedules to view the performance of learners in the subject they advise on. Teachers feel that they are neglected and not advised accordingly by their subject advisors who are regarded as the masters of the subject.

Another principal of school “B” had this to say:

*“...Mmm!!! the factors affecting management as such for academic performance I think the department must regularly have the workshop which are there, but they are I think personally not enough, and then secondly the curriculum advisors must always visit the school we need them they must not stay in their offices, they must be at schools 100% Yaah!!!...”*

Principal of school “E” had this to say:

*“... Subject advisor rarely do come, but they say no, you are fine, your school is one of the best in the country, rarely do they come to us to assist...”*

Principal of school “C” had this to say:

*“... Mmm!!! Curriculum advisors are there but very few indeed in our district in Vhembe and if ever we are not inviting them, they don't come for*

*advice. And normally when they do come they come for specific thing not to instil love for this subject...”.*

Another Principal of school “H” said:

*“...The curriculum advisors do visit our school but not to train just to test there and there, and to check as to whether the work is being done...”.*

Principal of school “I” had this to say:

*“...Definitely, the curriculum advisors are playing a very big part because they train these teachers, especially when giving continuous assessment task, there is a strategy that they are using where the marking is done at the common place. And they also give feedback at the end of the quarter how learners are performed and they do a lot of follow-up...”.*

Dilotothle, Smit and Vreken (2001:305) indicate that in South Africa, teachers, particularly in the Department of Education and Training (DET), criticized the subject advisory services and the appraisal system. Subject advisors in the DET had no powers but only rendered an advisory service to teachers. Despite the negative attitude portrayed towards subject advisors, the physical science teachers at North West Province felt that a solution to their teaching problems lay in the formation of study groups to share expertise and to call on subject advisors and University specialists for guidance

#### **Sub-theme 4.6: Progression of Under-performing Learners**

Some participants during the interviews, mentioned the policy on progression of under-performing learners to the next grade. Learners who are allowed to progress whether they fail more than twice in the grade end up performing poorly than other learners, especially in Chemistry. This refers to the National Department of Education Policy for progression of under-performing learners who frequently fail the grade, and the policy says they must be allowed to progress to the next grade.

Principal of school “C” had this to say:

*“... About discipline, lots of problems with a learners during Mmm!!! These days because they know that even if they may fail Mmm!!! In lower grades, there is a chance to pass by the so-called the QP Model (Progressed learners without valid pass) ...”.*

Principal of school “I” had this to say:

*“... But another challenge, the issue of learners who progress to the next grade, that is the biggest challenge because you are dealing with learners who do not have enough content knowledge of the previous grade, especially Science in Chemistry. This is because you may find that these learners who are progress perhaps maybe say those who are in Grade 12 progress from Grade 11 Mmm!!! They may have passed other subject but not Physics and Chemistry...”.*

Assessment (ANA) results Grade (1-9) to determine what learners in South Africa know and can do are not advisable (Spaull, 2015:34). The TIMSS studies showed no improvement in Grade 8 science achievement between 1995, 1999, and 2003. Subsequently, it was decided that the international Grade 8 tests were too difficult for South Africa’s Grade 8s; thus, in 2003, both Grade 8 and 9 learners wrote the Grade 8 test international (Spaull, 2015:35).

#### **Sub-theme 4.7: Insufficient Qualified Teachers in Science**

Most of the participants verbalised insufficient qualified teachers in science to be a major contributing factor on learners’ performance in Chemistry. There are many teachers who are made to teach science subjects by just looking at the years of experience as a teacher. Some, according to the principals, have done science up to Grade 12 and then requested to teach the same grade Chemistry. This is a challenge our society is facing by not having enough qualified science teachers.

Principal of school “F” had this to say:

*“...Mmm!!! Yeah!!! Number one; Mmm!!! You know Mmm!!! I believe that Chemistry when you teach Chemistry you should have a teacher who have study Chemistry at least at university level. Mmm!!! But you see some of our teachers only did Chemistry at Grade 12 level, and I do believe that it’s one of the factors...”.*

Principal of school “E” had this to say:

*“... But with the teachers the one challenge it’s Mmm!!! In this country we don’t have teachers who are qualified to teach both Physics and Chemistry Mmm!!! That is the one thing that maybe as a country we need to improve. If they can have a person majoring in Physics and Chemistry but majority of them they specialized in Physics, the others Mmm!!! But very few in Chemistry. Majority of people specialized in Physics than in Chemistry in this country not particularly in our school, in this country...”.*

Principal of school “L” had this to say:

*“...In our school, we do not have any problem of the attitudes of teachers towards learners. Not at all. From Grade 10 up to 12 we have got some shortage of teachers so, maybe if we can have more qualified teachers who specialized in Physical Science then we can achieve more...”.*

Haider and Hussain (2014:466) state that in the teaching profession, providing high-quality teachers with higher qualification is more important than anything else, and it can only be possible by providing them professional preparation and working condition.

#### **Sub-theme 4.8: Poor Commitment of Teachers to their Work**

The result revealed that participants expressed poor commitment of young and newly appointed teachers to their work. Young and newly appointed teachers can hardly go an extra mile for nothing if not promised some stipend or remuneration for the work

done. They can seldom work after hours and under severe stress and still maintain good results at the end of the academic year.

Principal of school “E” had this to say:

*“...We have majority of new teachers, but what I have realized commitment with our young educators is lacking, willingness to go extra miles is a challenge. I think we are having a nation which is becoming very lazy. They don’t want to go extra miles....”*

Van der Berg et al. (2011:2) indicate that it was found that around 11% of teaching time was lost due to teacher absenteeism, although not exceptionally poor by developing country standards. Instances of one-day leave were substantially more common on Mondays and Fridays than on other days of the week, thus indicating an abuse of the leave system to extend weekends.

## **Theme 5: Participants’ Perceptions of the Relationship between Classroom Management and Learner Achievement**

The findings of the study indicated that participants’ perceptions of relationship between classroom management and learner achievement is crucial to the performance of learners in Chemistry. Participants also emphasised good relationships and increased classroom management where learners and teacher work together as a team. Some participants said in the interviews that if learners respect one another’s views and listen to the teacher who is always positive, good relationships and learner performance can be achieved.

### **Sub-theme 5.1: Learner Attitude as Enhanced by Teacher Management Skills**

Interview statements indicated that most of the participants reported that if learners’ attitude is good, then the teachers’ management skills are also good such that discipline

in the classroom will be maintained. Participants said that a well-organized teacher with a well prepared lesson brings teaching and learning to another level.

Another principal of school “B” had this to say:

*“...Mmm!!! The relationship which is there between the teachers and classroom management, if the teacher who can manage the class well, definitely will even know how to handle their kids, how to resolve some of the problems which the learners have and how to help the children to acquire what they want which will help them in future...”.*

The principal of school “D” had this to say:

*“...Yaah!!! They do, because Mmm!!! If the teacher is Mmm!!! Somebody who is Mmm!!! Not social. Yes, Mmm!!! You find some learners saying that, No!!! We better not go for that, some learners might Mmm!!! Even change the subject, and the with me here is different because the attitudes of a Science teacher it’s accommodative to the learners that’s why in Grade 10 this year we have got a lot of learners who are doing Physical science...”.*

Principal of school “F” had this to say:

*“...Yes, you find the attitudes changes. When a teacher is well vested in the subject and he manages the classroom well, you find no disruptions and learners concentrate and ask questions, you will realize that they become much free whenever or whatever a teacher is a novice or an experienced teacher is the same...”.*

Another principal of school “G” has this to say:

*“...The good management of the teacher in the classroom will have Mmm!!! Good impact in the learning of Chemistry, because, if the class is well managed Mmm!!! It means that in that environment learners will learn easy. The attitude will also be positive. Which means that Mmm!!! If the*

*teacher himself can managed the class well, all the learners are respecting one another, attitude of learning will also be cultivated in that way. And the area, I mean the situation inside the classroom will be conducive for learning...”.*

Principal of school “C” had this to say:

*“... Yeah!!! The relationship between teachers’ classroom management and effectiveness of learners’ achievement in Chemistry is because of that Mmm!!! Like what I have already indicated, if the educator is unable to manage the classroom, it means that even the learners when he is teaching very well, the learners will not listen attentively. And as such to miss something in Chemistry, it means that the result will not be good at the end of the day...”.*

Orji (2014:12) indicated that classroom success in the form of learners’ active involvement in assigned tasks and learners learning outcomes have been shown to be greatly influenced by several factors broadly classified as context variables, input variables and classroom-processes. The teacher has been regarded as the largest single influence in the classroom transaction. Learners’ learning outcomes are a reflection of the teacher’s effectiveness in managing classroom transactions.

### **Sub-theme 5.2: Use of Motivators and Career Guidance to Channel Positive Attitude of Learners Towards Chemistry**

During interviews, principals mentioned the use of motivators and career guidance to channel positive attitudes of learners towards Chemistry. Participants explained that the University of Venda helps with career guidance by inviting all learners who are in Grade 12 for a week on career opportunities from different Institutions of Higher Learning and colleges in South Africa. Some principals talked about making use of motivators who are requested to visit school and motivating learners positively with the aim of achieving the best results in their content subject like Chemistry.

Principal of school “B” had this to say:

*“...Yes, the relationship is improving as such because normally especially when it comes to motivation, when we have people like you coming to motivate our learners and then we talk about the careers which are in lined with the Chemistry subject, we find that they are starting to dwell into the subject like for example, just now I have got Mmm!!! Five students who came to me and asked me, how can they get a bursary which deal with the subject like this one and which deals with medicine then I managed to send them to proper people to help them...”*

The principal of school “D” had this to say:

*“...Mmm!!! Yaah!!! Normally this can be because of most of the teachers are not well qualified. Yaah!!! Some of the teachers are not well prepared and so forth and so forth. That is what I’m trying to say because she is goes to class well prepared Mmmm!!! That’s a very strong bond between the learners and their teacher they don’t even want to miss a minute, immediately when they realized that well is Chemistry period or whatever in Physical Sciences, they will go there on time so that they don’t miss anything. So, you can see that a there is Mmm!!! The attitude or the relationship between the teacher and the learners is very good. It makes learners to like Chemistry...”*

Noordin et al. (2010:129) indicate that teachers do make a difference to motivate learners in learning even though teachers are not as powerful as parents because parents are the first teachers to a baby since it was born. Parents appear to be the primary influence on a learners’ motivation to learn. The formative effect of parents on the learning motivation of their children has an impact at every stage of development. This influence will last through the high school years and beyond.

## 5.4 CONCLUSION

This section of the study was devoted for both qualitative and quantitative data analysis and interpretation. The findings from the questionnaires of learners and teachers were presented and analysed using Statistical Package for Social Science (SPSS). The findings from the interviews of principals were also presented and analysed using themes and sub-themes. From the way the participants answered the questions, it became evident that the majority of participants expressed the fact that management of high school learners' academic performance in Chemistry is still not yet addressed properly secondary schools in the three circuits of Vhembe District of Limpopo Province in South Africa.

## CHAPTER 6

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 6.1 INTRODUCTION

The previous chapter dealt with the analysis and interpretation of data obtained through personal or individual interviews and questionnaires. This final chapter is devoted to the summary, conclusion and recommendations. The responses to the questions of the study focusing on “Management of high school learners’ academic performance in Chemistry” are summarized to ensure that effective recommendations would be outlined clearly.

#### 6.2 SUMMARY OF CHAPTERS

Chapter 1 outlined the problem statement that necessitated this research project. The problem question, namely the management of high school learners’ academic performance in Chemistry in Vhembe District of Limpopo Province in South Africa. This chapter also served as the orientation of the research, and outlined the aims, design and methodology, data analysis and various chapters of the thesis.

Chapter 2 dealt with literature review based on international perspective about the management of high school learners’ academic performance in Chemistry. The chapter includes: school factors; learners’ factors and attitude; teachers’ factors and attitude; influences on learners’ performance; influences on teachers’ attitude; appropriate teaching and learning strategies.

Chapter 3 dealt with literature review based on Chemistry teaching in South Africa. The Chapter includes: historical background of Science in South Africa; quality of teachers in South Africa; qualification of teachers; the impact of socio-economic factors on performance of learners; poverty, inequality and science performance; the rural context

in South African Education System; and teachers' professional development in South Africa.

Chapter 4 dealt with research design, methodology in which qualitative and quantitative method have employed, research instruments, data collection and procedure, and lastly, the data analysis.

Chapter 5 dealt with presenting and discussion of data collected from participants. Qualitative analysis and quantitative analysis were presented and analysed using the correct research procedures. Qualitative interviews in this chapter were analysed using the coding system where data is divided into parts by classification system whereas themes and sub-themes were developed. Quantitative questionnaires were analysed using both descriptive and inferential statistics by Statistical Package of Social Sciences (SPSS) program.

Chapter 6 dealt with summary, conclusion and recommendations. The responses to the question of the research study of management of high school learners' academic performance in Chemistry are clearly summarised and ensure that effective recommendation and findings according to the research question outlined clearly.

### **6.3 SUMMARY OF FINDINGS**

The purpose of this study was to investigate the management of high school learners' academic performance in Chemistry. The study uses both qualitative and quantitative research method. For quantitative, participants were 120 learners and 24 teachers from selected schools, who were stratified random sampled in twelve secondary schools. The data was analysed using descriptive statistics were frequency distributions, percentages and chi-square were used, and also to consider whether the relationship between variables were statistically significant.

### **6.3.1 Teachers' Questionnaire on Factors Affecting the Management of High School Learners' Academic Performance in Chemistry**

The findings of this study showed that 75% of the teachers were comfortable teaching some topics in Chemistry more than others. This implies that the majority of teachers only teach topics which are simple and easy to understand. The findings showed that 67% of the teachers do have full support of management and administration in teaching Chemistry. This implies that the School Management Team (SMT) gives full support to the teachers with whatever they need in connection with classroom management and administration. Other findings of this study showed that 70% of the teachers indicate that they cannot be motivated if they teach only highly ability learners. This implies that teachers are not for highly gifted learners, but everybody is welcome to his/her class no discrimination. The findings showed that 46% of teachers, which is a high percentage in this item, agreed that Chemistry should be made optional. This implies that if not optional, learners will fail and not progress to the next grade, if optional, those learners who are weak or find Chemistry difficult will chose other subject. Another finding showed that 47% of teachers disagree that the Chemistry syllabus is not too wide. This implies that Chemistry syllabus is wide, and teachers take time to finish and unable to do revision.

The findings of this study showed that 54% of the teachers agree that some learners do not have the ability to learn Chemistry. This implies that those learners are not achieving or performing well in Chemistry. The findings showed that 62% of the teachers agree that their laboratories have few Chemicals. This implies that if the laboratory does not have chemicals, experiments will not be conducted, and learners will not have the privilege of doing practical work in the laboratory. Another finding also emphasizes that 50% of the teachers agree that laboratories have few apparatuses. How can teaching and learning can take place if there are no apparatus? Learners will not perform their experiment and achieve in Chemistry if there is no apparatus in their laboratory.

### 6.3.2 Teachers' Questionnaire on Factors Influencing the academic Performance of Learners in Chemistry

The findings of this study showed that 57% of the teachers are in the teaching profession not by choice. This implies that due to lack of other career opportunities, one has to take teaching as the last option in order to have a job. Another finding also showed that 46%, which is the highest in the item, are in the teaching profession because they consider it as a waiting ground for better job. This implies that most teachers are just temporarily employed but waiting for better offers to come. The findings in this study showed that 58% of the Chemistry teachers are incompetent. This implies that Chemistry teachers are not well qualified or they do not have sufficient content knowledge of the subject, and as a result, learners will always perform poorly. The findings of this study showed that 75% of the teachers are not graduates for teaching Chemistry but circumstances allow them to teach. This implies that due to shortage of well qualified Chemistry teachers, those who have just a little knowledge of Grade 12 Physical science were requested to teach Chemistry. As long as they have done Physical science in Grade 12, they are regarded fit to be given a chance to teach Chemistry.

The findings of the study showed that 75% of the teachers agree that the emotional state of the Chemistry teacher affects his/her teaching. This implies that teachers who are emotionally unstable because of outside influences like having huge debts and even family disputes and excessive alcohol abuse can affect their teaching. The findings of the study showed that 88% of the teachers agree that a noisy environment retards learners' concentration during teaching. This implies that schools which are situated next to the industrial factories have their learners retarded by the noise, and this removes their ability to concentrate fully in class and affects their performance. The findings in this study showed that 71% of the teachers agree that Chemistry teaching environments do not properly accommodate learners during teaching. This implies that if there are no appropriate laboratories and classrooms, learners will not feel properly accommodated; therefore, teaching and learning will not be effective. The findings of

this study showed that 100% of the teacher agree that conducive learning environment promotes teaching and learning. This implies that a well-ventilated, well-furnished classroom will promote effective teaching and learning.

The findings showed that 75% of the teachers agree that due to unavailability of the equipment, practical lessons are not done. This implies that in Chemistry classes, if there is no equipment, teachers and learners will not manage to do practical work. The findings in this study showed that 96% of the teachers agree that Chemistry laboratories lacked qualified lab Technicians. This implies that schools are not having laboratory Technicians who assist teachers with regard to preparation of apparatus and chemicals and make life easier for the teachers to perform experiments without involvement with the construction of apparatus and layout demonstration. The findings revealed that 71% of the teachers agree that learners do come for assistance with Chemistry problems they encounter. This implies that when learners encounter problems, they freely go to their teachers for assistance.

The findings revealed that 70% of the teachers disagree that learners choose Chemistry because they have no alternative. This implies that learners choose and prefer to do Chemistry on their own will without any one forcing them. The findings of this study showed that 41%, which is the highest in the item, of the teachers agree that the majority of their learners spend very little time studying Chemistry. This implies that learners have little time for studying Chemistry and as a result, it affects their performance. The findings revealed that 68% of the teachers agree that most learners consider Chemistry to be a difficult subject. This implies that Chemistry is a difficult subject to learners and if not well prepared, learners tend to perform poorly in the subject. The findings also showed that 88% of teachers agree that English language competence affects learners' performance in Chemistry. This implies that English, as a medium of instruction, must be mastered by learners and they must be competent on it.

The findings in this study showed that 80% of the teachers agree that learners' mathematical competence affects their performance in Chemistry. This implies that

Chemistry needs mathematical background because some topics need calculations to solve their problems mathematically. Learners who perform poorly in mathematics may also perform poor in Chemistry. The findings showed that 83% of the teachers agree that unqualified and under-qualified teachers influence negatively the learners' performance in Chemistry. This implies that unqualified and under-qualified teachers lack pedagogical content knowledge about the subject Chemistry. This suggests that unqualified and under-qualified teachers experience problems in difficult topics. The findings revealed that 63% of the teachers disagree that female learners show more fear or anxiety towards the learning of Chemistry. This denotes that female learners are as competent as their counterpart male learners in the performance of Chemistry. The findings showed that 54% of teachers agree that learners in rural areas register more fear in learning Chemistry than their counterparts in urban areas. This implies that learners in rural areas fear doing Chemistry than learners in urban areas who tend to like and enjoy the subject.

The findings of the study showed that 92% of the teachers agree that higher academic qualifications and professional training improve teacher effectiveness on the job. This implies that teachers who are highly qualified and attend professional training and development have good subject matter and content knowledge. Another finding revealed that 96% of the teachers agree that learners who reported positive experiences during Chemistry class were said to be influenced by their teachers' positive attitude towards Chemistry. This implies that teachers' positive attitude towards the learners in Chemistry make learners interested in the subject, develop a positive attitude towards Chemistry and perform better. The findings showed that 62% of the teachers agree that they do not have enough time to teach and make the learners fully understand the concepts of Chemistry during the normal school time. This implies that teachers need extra hours to be in contact with the learners as well as enough time to do revision work in order to make sure learners do understand Chemistry concepts and their application in reality.

### **6.3.3 Teachers' Questionnaire on Management Strategies that can Improve Learners' Performance in Chemistry**

The findings in this study showed that 96% of the teachers agree that in the teaching of Chemistry, teachers are expected to have a good level of competence. This implies that teacher's knowledge and expertise are critical importance in the management of their own classroom. Teachers' competence adds value to learners' academic performance in Chemistry. Another finding revealed that 100% of the teachers agree that teachers need to develop the interest of the learners with regards to the subject through teaching methods. This implies that teachers must make use of appropriate teaching methods related to the topic they are presenting in order to develop the interest of learners in Chemistry.

The findings showed that 100% of the teachers agree that teachers need to develop the attitude of the learners with regard to the subject through teaching methods. This implies that learners' attitude towards Chemistry are encouraged by the approach of teaching methods in which teachers develop and introduce to learners. Another finding showed that 92% of the teachers agree that teachers have to be aware of current innovations in teaching so as to determine the suitable method for a particular situation. This implies that teachers must be aware of current innovations in teaching Chemistry so as to provide suitable methods which will change and improve learners' understanding of Chemistry concepts and topics in order to improve their performance.

The findings of the study showed that 96% of the teachers agree that teachers must have a command over a wide repertoire of different teaching methods. This implies that teachers must have a command of a wide range of different teaching methods. Teachers must master different teaching methods such that in any situation, they must be able to unleash them successfully. Another finding revealed that 100% of the teachers agree that teachers must have strategies for teaching. This implies that if teachers do not have strategies for teaching, learners' performance will be hindered and not improve. The findings showed that 96% of the teachers agree that teachers must

have an understanding of learning processes of learners. This implies that teachers must know during teaching presentations whether to adhere with the learning process of the learners or not. The findings showed that 96% of the teachers agree that effective teaching connotes the ability of the teachers to communicate effectively. This implies that a well-prepared lesson presentation can promote the ability of a teacher to communicate effectively during classroom teaching. The findings of this study showed that 92% of the teachers agree that effective teaching cannot be done without knowing the characteristics of a learner and his/her problems. This implies that teachers must always be watchful of the characteristics and problems of a learner.

The findings showed that 92% of the teachers agree that innovative learning strategies could be used by teachers at all levels of Chemistry education to enhance learners' motivation to learn Chemistry. This implies that teachers' learning strategies must enhance learners' motivation to learn Chemistry. Intrinsic and extrinsic motivation must be done every time during teaching and learning processes. The findings of this study showed that 96% of the teachers agree that learners generally experience improvement in learning when they are engaged in classroom activities that encourage developing their knowledge following a learning cycle. This implies that teachers encourage classroom activities for the learners to acquire knowledge, skills and experience on improvements in learning cycle. The findings showed that 100% of the teachers agree that use of a variety of teaching styles and methods can raise the learners' attention and interest in Chemistry. This implies that teachers use a variety of teaching styles and methods to increase their performance in Chemistry. The findings of this study showed that 96% of the teachers agree that teachers have to take into consideration the learners' abilities, learners' level of intelligence and the availability of resources and infrastructure. This implies that learners' abilities and levels of intelligence, together with the resources and infrastructure, make learners work hard and perform well in Chemistry.

The findings of this study showed that 96% of the teachers agree that collaborative learning is a teaching strategy involving learners' participation in small group learning

activities that promote positive interaction. This implies that teachers involved learners in collaborative learning with other peers by creating small group learning activities that will improve their learning ability and increase positive interactions. The findings of this study showed that 84% of the teachers agree that self-regulated learners are individuals who are meta-cognitively, motivational and behaviourally active are participants in their own learning process. This implies that highly-intellectual learners who are self-motivated and having good behaviour participate actively in self-regulated learning process. The findings showed that 96% of the teachers agree that effective teaching requires, among other things, basic management skills including understanding of nature of a classroom. This implies that basic management skills in classrooms promote effective teaching, which increases performance, interest and positive attitude among learners.

#### **6.3.4 Learners' Questionnaire on Factors Affecting the Management of High School Learners' Academic Performance in Chemistry**

The findings of this study showed that 77% of the learners agree that school location that enriches the environment could result in better performance in Chemistry. This implies that school location and environment of conducive teaching and learning could result in better performance of learners in Chemistry. The findings showed that 60% of the learners agree that rural location of a school can affect performance of Chemistry negatively. This implies that rural locations are most often disadvantaged by not having appropriate resources which can assist both teachers and learners to work better. The findings of this study showed that 63% of learners agree that urban location of a school can affect performance of Chemistry positively. This implies that urban location is rich in educational resources, most qualified and competent teachers and more focused learners are found to work hard and lift the standard of education in towns and cities. The findings showed that 48%, which is the highest percentage of the item on what learners chose, disagree that children who attend private school are better academic achievers than their counterparts in public schools. This implies that public school

learners perform exceedingly better in their environment as compared to private schools.

The findings of this study showed that 73% of the learners disagree that the laboratory is adequately furnished with equipment and apparatus which are still in good conditions. This implies that learners are skeptical to agree because they do not even have adequate laboratory as well as equipment. The findings showed that 62% of the learners agree that inadequate resource materials in the laboratory contribute towards poor performance in Chemistry. This implies that there are inadequate resource materials which contribute towards the poor performance of Chemistry. The findings of this study showed that 84% of the learners agree that frequency of practical classes is an important factor since skills such as observation and prediction involve experimentation.

This implies that if learners do not have frequent practical classes where demonstrations and experimentation take place, skills and prediction will not be achieved. The findings showed that 71% of the learners disagree that laboratory classes are boring. This implies that learners do not get exposed to laboratories, and since some do not even have laboratories in their schools, they cannot even comment whether classes are boring or not. The findings of this study showed that 85% of the learners agree that learners who have a more positive attitude towards Chemistry would be more successful in Chemistry. This implies that learners who are positive towards Chemistry perform better in the subject. The findings showed that 64% of the learners agree that learners' Chemistry achievement affect their attitudes positively. This implies that learners who achieve good results in Chemistry have positive attitudes.

The findings of this study showed that 85% of the learners agree that their Chemistry learning experiences increase their motivation to learn. This implies that learners get positive motivation by increasing the Chemistry learning experiences. The findings showed that 73% of the learners agree that what teachers feel about learners' learning or studies could have a significant effect on the learners. This implies that teachers'

feeling about learners learning or studying have significant positive effects on learners. The findings showed that 52% of the learners agree that learners' anxiety regarding Chemistry learning can also be attributed to learners' perception. This implies that learner's anxiety regarding Chemistry attributed to learners' perception that Chemistry is difficult for someone to achieve good grades in.

The findings of this study showed that 43%, which is the highest in the questionnaire item of the learners, agree that learners' anxiety regarding Chemistry learning can also be about the difficult nature of Chemistry. This implies that learners' anxiety regarding Chemistry learning can also be about the difficult nature of understanding the subject. The findings showed that 54% of the learners agree that learners' anxiety regarding Chemistry learning leads to loss of interest in the sciences. This implies that learners' anxiety increases loss of interest in the science subjects. The findings showed that 57% of learners agree that learners have Chemistry anxiety panic attacks during exams in science subject. This implies that learners' anxiety will affect their performance during the exams. The findings showed that 47%, which is the highest in the item of the questionnaire for the learners, agree that learners dislike Chemistry because of the amount of information they have to learn. This implies that learners regard Chemistry to have huge amount of information to learn as compared to other science subjects.

The findings showed that 48% of the learners disagree that learners dislike Chemistry because of the time spent in writing Chemistry in class. This implies that learners do not dislike Chemistry because of the time spent in writing Chemistry. The findings showed that 78% of learners agree that peers can also influence learners' attitude in learning Chemistry. This implies that peers play a major role in influencing others learners in learning Chemistry. The findings showed 90% of the learners agree that learners need to work together, not only because of their preparation for teamwork in science. This implies that learner can perform better if they work as a group and collaborate on the concepts of Chemistry which need more attention and greater knowledge and skills. The findings showed that 83% of the learners agree that they need to work together, not only that they learn better through social interaction. This implies that learners need to

work together, give support to each other, and promote positive attitudes towards Chemistry. The findings of this study showed that 66% of the learners agree that Chemistry lessons that are not interesting will not inspire learners to listen, participate and learn in class. This implies that if Chemistry lessons are not interesting, inspiring and make learners participate in class, teaching and learning will not be effective, and learners will not perform in Chemistry.

### **6.3.5 Learners' Questionnaire on Factors Influencing the academic Performance of Learners in Chemistry**

The findings of this study showed that 58% of the learners agree that their Chemistry teacher is their personal role model. This implies that learners regard their teachers as their role models during teaching and learning at schools. The findings showed 83% of the learners agree that they like their Chemistry teachers. This implies that if learners like their teachers, interest and attitude to Chemistry will be positive. The findings showed that 48%, which is the highest in the questionnaire item for the learners, disagree that their Chemistry teacher demonstrates practicals most of the time instead of allowing learners to do them on their own. This implies that if learners are allowed to do practicals on their own, this will affect their performance in Chemistry positively.

The findings showed that 86% of the learners agree that Chemistry teachers mark tests and exams on time. This implies that Chemistry teachers provide feedback about the tests and exams on time for the learners to view their performance. The findings showed that 48%, which is the highest in the learners' questionnaire item, agree that Chemistry teachers focus on the learners who perform poorly. This implies that teachers focus and work closely with those learners who perform poorly in order for them to improve their performance.

The findings of this study showed that 70% of the learners agree that Chemistry teachers are always punctual in class. This implies that most teachers have enough time for teaching and learning. The findings showed that 75% of the learners agree that

Chemistry teachers answer their questions well. This implies that teachers interact positively with learners in class by giving them positive feedback. The findings showed that 58% of the learners disagree that they would do better if they had a different Chemistry teacher. This implies that learners' performance will not change whether they had a different teacher or not. The findings showed that 64% of the learners disagree that Chemistry lessons are boring. This implies that learners have an interest in Chemistry lessons. The findings of this study showed that 84% of the learners agree that Chemistry teachers share their knowledge and expertise with the learners. This implies that learners who lack commitment will not perform better in Chemistry.

The findings of this study showed that 49% of learners disagree that Chemistry teachers influenced them to choose Chemistry as a subject. This implies that those learners chose the subject on their own will. The findings of this study showed that 70% of learners disagree that Chemistry teachers are too lazy to look at their notes for correction. This implies that teachers do view the notes after each presentation. The findings of this study showed that 60% of learners disagree that Chemistry teachers are incompetent. This implies that teachers are competent in the subject. The findings of this study showed that 76% of learners disagree that Chemistry dislike some learners. This implies that there is good interaction between teachers and learners during the lesson presentation.

The findings of this study showed that 72% of learners agree that if they are not assisted, they may show less interest in learning Chemistry. This implies that if learners are assisted, the outcome will be appreciating learning Chemistry and improved performance. The findings of this study showed 67% of learners agree that the main duty of the teacher is to remove obstacles from the learning process. This implies that as teachers, mentors and coaches must always remove any obstacles which may affect the learning process to take place. The findings of this study showed that 83% of the learners agree that it is up to the teacher to make the lesson a fun learning experience. This implies that teachers must be well prepared for their lesson in order to make it fun and exciting in the classroom. The findings of this study showed 75% of the learners

agree that learners' performance is a reflection of the teachers' effectiveness in managing classroom transaction. This implies that for the learners to perform better, it is through teachers' reflection of his or her effectiveness in managing their classroom teaching and learning process.

## **6.4 FINDINGS UNDER QUALITATIVE DATA ANALYSIS**

### **6.4.1 Major Findings from Research Question 1: Factors Affecting the Management of High School Learners' Academic Performance in Chemistry**

The findings from participants showed that learners do not seem to have interest in Chemistry; Chemistry is difficult to most learners, and learners are not passing this subject Chemistry. The findings from the principals showed that learners do better in Physics than Chemistry, but there are mixed feeling from participants that learners do better in Chemistry than Physics as long as they have good background of mathematics. The findings from principals showed that teacher performance, as motivators for learners, is another factor which affects the performance of learners in Chemistry. The findings from principals showed that if the teacher himself or herself is struggling with the pedagogical content knowledge (PCK) of the subject, this implies that teachers are not well equipped with PCK, and it also affects the learners' performance in classroom.

The findings from principals showed that learners' attitude towards the subject Chemistry is also a factor affecting the performance of learners in Chemistry. This implies that learners have negative attitude towards Chemistry, especially when teachers introduce topics related to calculations, it finds learners having no interest. The findings from principals showed that, when teachers said to learners "Chemistry is difficult if you are not serious", this statement influences learners to have negative attitudes towards Chemistry and develop fear and anxiety that make learners to perform poorly in the subject.

The findings from principals showed that parental influence on the choice of subject is another factor affecting learners' performance in Chemistry. This implies that parents influence their children to take Chemistry as a subject while learners were not good at foundation phase classes. The findings from principals showed that those learners who perform better in Chemistry also perform well in Mathematics and Physics. This implies that learners who perform well in mathematics and physics, which are factors, show better performance in Chemistry.

The findings from principals on the availability of resources are factors affecting learners' performance in Chemistry. The findings showed about lack of availability of laboratories in schools. This implies that most schools have no laboratories, and if available, it is just a makeshift where experiments are done. The findings showed that in some schools, teachers teach everything theoretically due to not having laboratories and apparatus to perform experiments. The findings from principals showed that insufficient space for large classes is a factor which affects learners' performance in Chemistry. This implies that overcrowding affects learners during teaching and learning, and teachers could not move between chairs and tables in their classrooms.

#### **6.4.2 Major Findings from Research Question 2: Factors Influencing Academic Performance of Learners in Chemistry**

The findings from principals' perception about management of academic activities showed that large numbers of learners per class influence negatively the learners' performance because it is very difficult to do individualization, especially when teaching an overcrowded classroom. The findings from principals showed that insufficient learning materials influences the performance of learners in Chemistry. Therefore, the findings indicate that shortage of text books has a severe influence due to the fact learners will not have enough reading materials to acquire information and knowledge about topics which need more attention.

The findings from principals showed that poor disciplinary efforts due to overcrowding in classrooms can also influence learners' performance in Chemistry. The findings emphasize more on the newly appointed teachers that lack disciplinary skills on learners during classroom management. The findings from principals showed that insufficient in-service training of teachers has an influence in the fact that most teachers lack pedagogical content knowledge on the subject content. The findings from principals showed that insufficient curriculum advisor service influences learners' performance in Chemistry because teachers need to be developed professionally in the subject they teach. The finding showed that subject advisors seldom visit the school, and if they visit it is usually about something else.

The findings from principals showed that learners' performance also influenced by the progression of underperforming learners to the next grade. This implies that learners are moved to the next grade without gaining enough content knowledge of the previous grade. This, according to the findings from principals, contributes to learners' poor performance in Chemistry. The findings from principals showed that inadequately qualified teachers in Physical science influence learners' performance in Chemistry.

This implies that schools have no highly qualified teachers with higher qualification in Physical Science. Most schools, according to the findings from principals, have shortage of well qualified teachers in Chemistry. The findings from principals showed that there is poor commitment of teachers to their work, and this influences learners' performance in Chemistry. Teachers, according to findings from principals, are not willing to work extra hours besides their normal teaching time e.g. during school holidays and Saturday enrichment schools. For teachers to work after hours, they need remuneration or to be given some incentives for the hours spent teaching.

### **6.4.3 Major Findings from Research Question 3: Management Strategies that can Help to Improve Learners' Performance in Chemistry**

The findings from principals showed that the use of mentoring strategies and team teaching can help to improve learners' performance in Chemistry. This implies that novice or newly appointed teachers must be mentored by the master teachers or experienced teachers in their department to make sure that they get skills and knowledge of teaching in order to produce the best results in Chemistry. The findings from principals showed that team teaching when pairing newly appointed teachers with experienced teachers is another strategy which can assist on the improvement of learners' performance in Chemistry.

The findings from principals showed that the use of external motivators can help to improve learners' performance in Chemistry. Schools, according to the findings, can outsource the best teachers who are highly qualified to teach Chemistry from neighbouring countries like Zimbabwe, Kenya and Ghana. The findings from principals showed that sending learners to the institution of higher learning like universities where experienced lecturers are there to assist for both theory and experimentation in Chemistry can be a strategy to help improve learners' performance in Chemistry. The findings from principals showed that building a strong foundation at lower classes can be a strategy to help improve learner's performance in Chemistry. This implies that learners will get better qualified, experienced teachers at their lower grade as a foundation for learning as they progress to the higher classes.

The findings from principals showed that separating learners according to their ability or performance is a strategy that can help to improve learners' performance in Chemistry. This implies that learners who need more attention must be placed in one classroom, monitored and given extra lessons and extra hours to complete their given tasks. The findings from principals showed that increasing classroom attendance is a strategy that can help to improve learners' performance in Chemistry. This implies that extra lessons in the morning and afternoon can be the solution to keep learners in class learning. The

findings from principals reported applying rotational teaching help to improve learners' performance in Chemistry. This implies that teachers rotate in teaching their learners in their grades. This suggests that learners will get equal opportunities to experience different teachers teaching them in a rotational form such as in the morning, there is another set of teachers and in the afternoon, there is another team of teachers teaching the learners the same subject but different topics.

The findings from principals showed that the use of induction for new teachers can help to improve learners' performance in Chemistry. This implies that newly appointed teachers get inducted by master teachers or Head of Department (HOD) by showing them strategies of different methods they can apply in their lesson presentation and how to apply discipline in their classrooms. The findings from principals showed that the use of schools of excellence (schools that performs excellently) is a strategy that can help to improve learners' performance in Chemistry. This implies that principals can send learners to schools which are performing very well in Physical Science. When learners are in an environment conducive for teaching and learning, their attitude and interest in the subject Chemistry will improve, especially when visiting schools of excellence during Saturday and school holidays.

The findings from principals showed that use of foreign experts (foreign nationals) from neighbouring countries can help improve learners' performance in Chemistry. This implies that teachers who are highly qualified to teach Chemistry can be recruited from neighbouring countries to come and assist with a scarce skills subject like Chemistry. From the findings, most principals recommend working with foreign nationals because of their good behaviour and being hard workers who can go the extra mile and always focusing on their work as long as they are well accepted by the school stakeholders and community. This implies that foreign national teachers will contribute positively to learners and promote positive attitudes and interest in the subject Chemistry.

The findings from principals showed that learner attitude is enhanced by teacher management skills and can be a strategy to improve learners' performance in

Chemistry. This implies that if teachers handle classroom management skills better by keeping discipline in class without any disruptions, having well prepared lessons, always interacting with learners, listening to their views and providing learners with positive feedback for every questions asked, this will uplift the morale of learners and they will perform well in Chemistry. The findings from principals showed that the use of motivators and career guidance for learners is a strategy that can help improve learners' performance in Chemistry. This implies that principals must invite motivators from different sectors such as pastors, university lecturers, politicians and also take learners to annual career exhibitions at the University campuses nationwide. These opportunities to learners will increase interest and improve their performance.

## **6.5 MODEL DEVELOPMENT AND VALIDATION**

The framework of Dickoff, James and Wiedenbach (1968:426) was modified to classify the concepts and describe them with six survey lists which formed the basis of model development.

### **6.5.1 Six Elements of the Practice Model**

The identified aspect used to survey the practical activity correspond to the following questions about the activity:

1. Context: In what context is the activity performed? The context specifies the environment within which interaction will take place. In this study, the context within which interaction will take place is the following: school and home context. At school thus where formal scientific education takes place while at home informal scientific education does exist.
2. Agent: Who or what performs the activity? The agent describes the person or persons who are involved in realizing the goal. In this study, the agent contributing to the realization of interaction are teachers. Teachers are class managers, they make sure that teaching and learning Chemistry is achieved appropriately with the purpose of transmitting knowledge and skills to learners.

3. **Patience/Recipients:** Who or what is the recipient of the activity? These are persons who receive action from the agent and in this study the recipients are learners. Learners are receiver of knowledge and skills and fulfil their obligations as learners by performing or achieving best after each lesson in Chemistry.
4. **Dynamics:** What is the energy source of the activity? In this study, the energy source are persons functioning in realization of the goal. The following are dynamics for interaction: interpersonal skills, honesty, perseverance and hope. These are energy source which motivate teachers and learners performance during teaching and learning interaction in Chemistry.
5. **Procedure:** What is the guiding procedure? In this study, the procedure specifies the steps and patterns according to which the activity is formed. The procedure for interactions initiation involves participation between learners and teachers, encourage curiosity, openness to new ideas and skepticism that characterize Chemistry teaching and learning.
6. **Terminus/Purpose:** What is the end point of the activity? The outcome of the activity will be achievement of meaningful interaction where learners and teachers engage each other in a positive communication about improving teachers' and learners' interest in Chemistry.

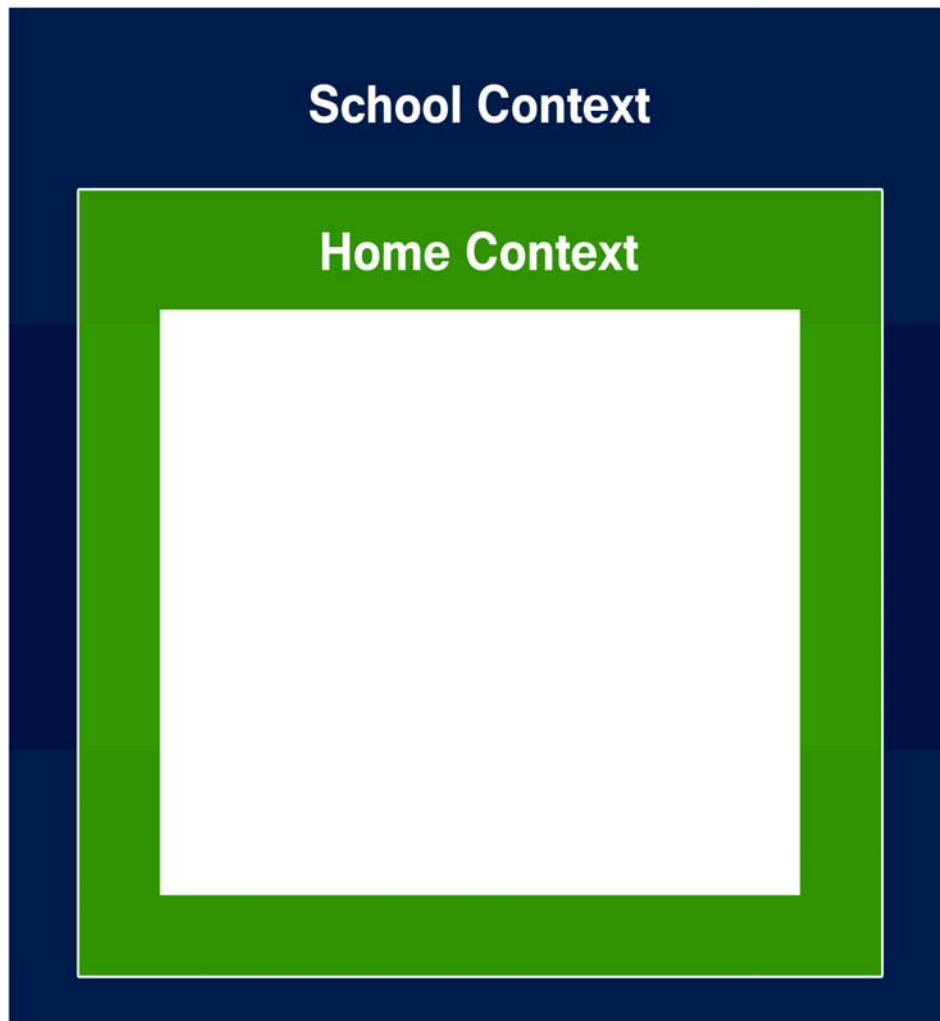
#### **6.5.1.1 Context**

The context is constituted by the school context and home context:

**School context:** This is the context where learners receive formal education. Children are at school at a specific age. They interact with each other at this level, and are taught different subjects. As they progress with education at school, they tend to choose different subjects. This is where some of them make a choice in doing social sciences or natural sciences. Those who choose natural sciences end up doing Chemistry. Chemistry is regarded as one of the most difficult subjects by teachers and students. This is where learners are exposed to laboratories which have different apparatus and chemicals. The relationship between students and teachers should be cordial, they should work together as partners. The concept of teaching or teaching methodology

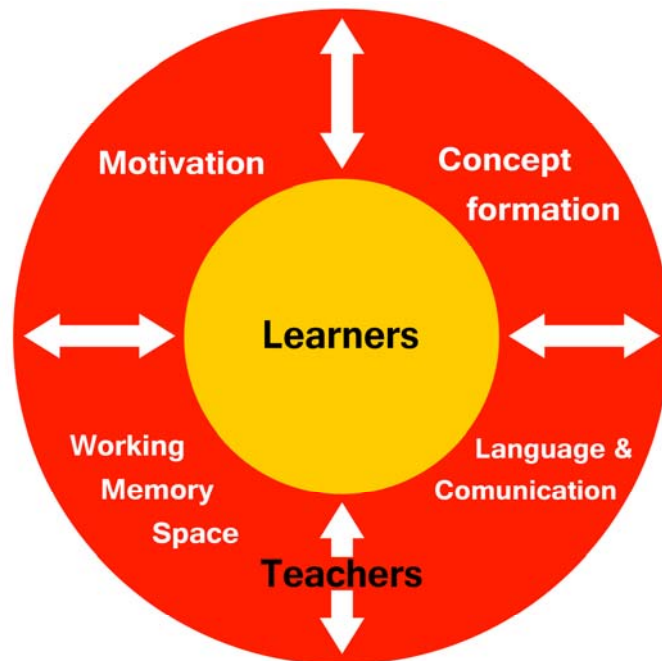
should be learner centred. This is where learners make contributions when lesson is proceeding. Though Chemistry teachers are expected to teach, they must have ability to manage their classrooms and laboratories. They must be able to demonstrate and model experiments, and emphasize the inquiry, and scrutinise information which is fundamental to the practice. In school, it is impossible to avoid school principal, while the principal manages the entire school using management tasks like planning, organizing, leading and control, principal also plays a role in curriculum delivery. That is why school context cannot isolate teaching and learning and school and classroom management.

- **Home context:** Home is the basic unit of all human beings. It is where education starts, education starts from home, though it is informal. It is emphasized that home is where learners' fundamental knowledge begins as children. It is the place where education begins by learning sounds and movements. It is the context where learners receive informal education. Parents, siblings and extended family members teach children home-based scientific experimentation, and that is where indigenous knowledge from early age occurs.



**Figure 6.1 School and home context**

### 6.5.1.2 Agents



**Figure 6.2: Teachers and Learners/students**

### 6.5.1.3 Teachers and Learners/Students

The diagram above is centred on students. Students who are at school are there to be taught by teachers through concept formation, language and communication, working memory space and motivation. Teachers function as agents of change because they have knowledge, skills and attitude. They have undergone teacher training in order for them to remain flexible. Teaching for understanding requires responsiveness to learners, so activities and strategies are continuously adapted and refined to address topics arising from learners' inquiries. Inquiry might be extended because it sparks the interest of learners. Teachers in schools are regarded as knowledge custodians. Knowledge custodians in actual fact do not need to be supervised. They are self-motivated while reflecting a sense of pride in their work. Teachers as agents of change

display exceptionally high levels of professionalism in their conduct and appearance when engaging with learners and parents in and outside the school. Students are recipients of education. In order for students to understand what is being taught (Chemistry) there should be concept formation. Concept formation leads to communication. Concept formation should be an understandable communication. Understandable communication comes through understandable language. Therefore, language is the command of communication. When students have understood what they are taught, they store what they have been taught in their memory. That is where working memory space comes into place. In order to open memory space, there should be motivation which is intrinsic in the mind of the learner. Memory space will store what it has learnt through communication. The following are brief procedures from the diagram:

- **Concept formation:** Learners must acquire intellectual thought and make judgement when learning Chemistry. Teachers must assist learners to understand key concepts but not to grasp only to establish meaningful links to bring the concept into a coherent whole. Learners must understand how meaningful learning can occur in terms of the importance of being able to link new knowledge on to the network of concepts which already exist in the learner's mind.
- **Language and communication:** The way in which language is used in Chemistry is different from the day-to-day language. Learners must be taught about the scientific language and how it is used during the communication state. There are words which are unfamiliar which change meaning when used in Chemistry, for example, the use of high-sounding language and the use of double and triple negatives. Teachers must make sure that learners differentiate the scientific language and also how to communicate it during teaching and learning of Chemistry.
- **Working memory space:** Too much Chemistry concepts can have difficulty on learners to select important and less important information. Chemistry learners need to develop skills to organize their ideas so that the working memory space must not be overloaded. Teachers must intervene and assist on the way in which

the working memory space can only absorb the relevant information of the concept needed to be mastered by learners.

- **Motivation:** Learners need motivation to learn as it is an important factor controlling the success of learning. Teachers have to be motivated to help learners' understanding of the most difficult topics. This makes learners to have the ability and willingness to learn and attend classes regularly. Learners can have both intrinsic and extrinsic motivation with the help of a teacher, for example, wanting to know for its own sake and also wanting to learn what is on an exam syllabus.

#### 6.5.1.4 Dynamics

The dynamics of this study were interpersonal skills, honesty, perseverance and hope.

- **Interpersonal skills:** Teachers, as agents, must possess the interpersonal skills which build knowledge of learners' cognitive potential, affective development and motivation while teaching and learning is in progress;
- **Honesty:** This is another dynamic that is crucial in the achievement of trust between teachers and learners. Knowing the strength and weakness of the learners, teachers examine the relationship between Chemistry content and how that content is to be taught. Chemistry teachers integrate mutual respect during teaching and learning in order to earn trust and honesty in learners;
- **Perseverance:** This dynamic is very important especially to both learners and teachers to have continued effort to teach and learn in order to achieve good results despite difficulties, obstacles or discouragement. These dynamic changes the perception of learners and teachers to work hard to achieve best results in Chemistry; and
  - **Hope:** This dynamic encourages learners to want something to happen and thinking that it could happen, a feeling that something good will be true, for the learners to improve their performance and have an interest in Chemistry.



**Figure 6.3 Dynamics of interactions**

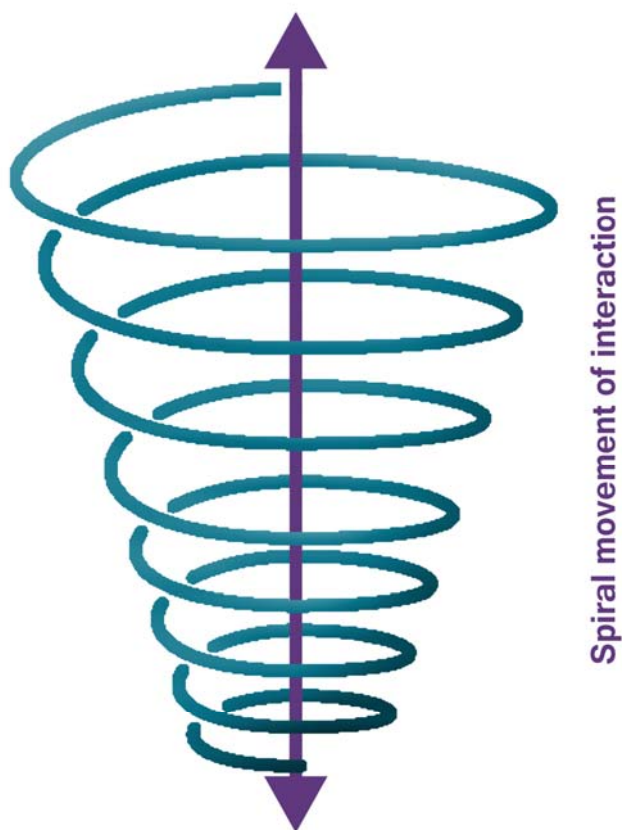
#### **6.5.1.5 Process of interactions**

The process of interaction that is regarded as important in the promotion of strategies to improve teachers' and learners' interest in Chemistry are as follows:

#### **Spiral movement of interactions**

This spiral movement resemble the interaction between agents and recipients which move in a spiral form as a results of positive achievement during teaching and learning process from simple to complex with the aim of developing positive attitude and interest in the subject Chemistry between teachers and learners. The spiral movement narrow at the bottom when recipients start their informal education at home with the involvement of parents and siblings. It gradually expands when recipients begin with formal education at school when teachers as agent start to interact with learners. During the process of teaching and learning, the spiral continues to widen when teachers

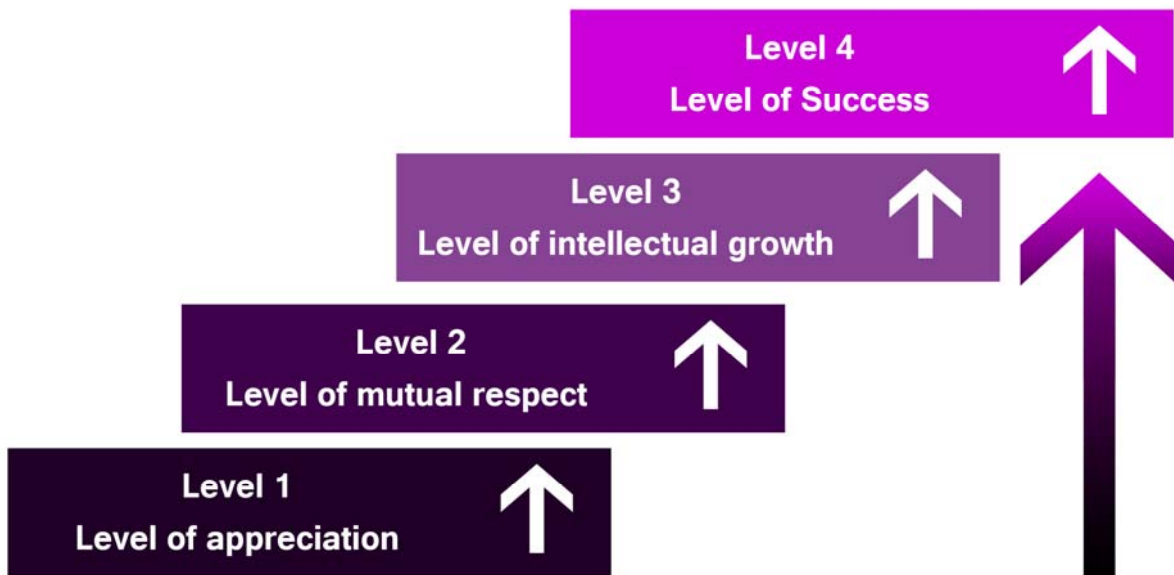
transmit knowledge and skills to learners. This interaction contributes to both teacher and learner to develop positive interest to Chemistry.



**Figure 6.4 Process of interactions**

## Levels of interaction

The process of interaction goes through a series of levels to reach the outcome which is meaningful interaction results, as reflected in figure 6.5



**Figure: 6.5 Levels of Interaction between Teachers and Learners**

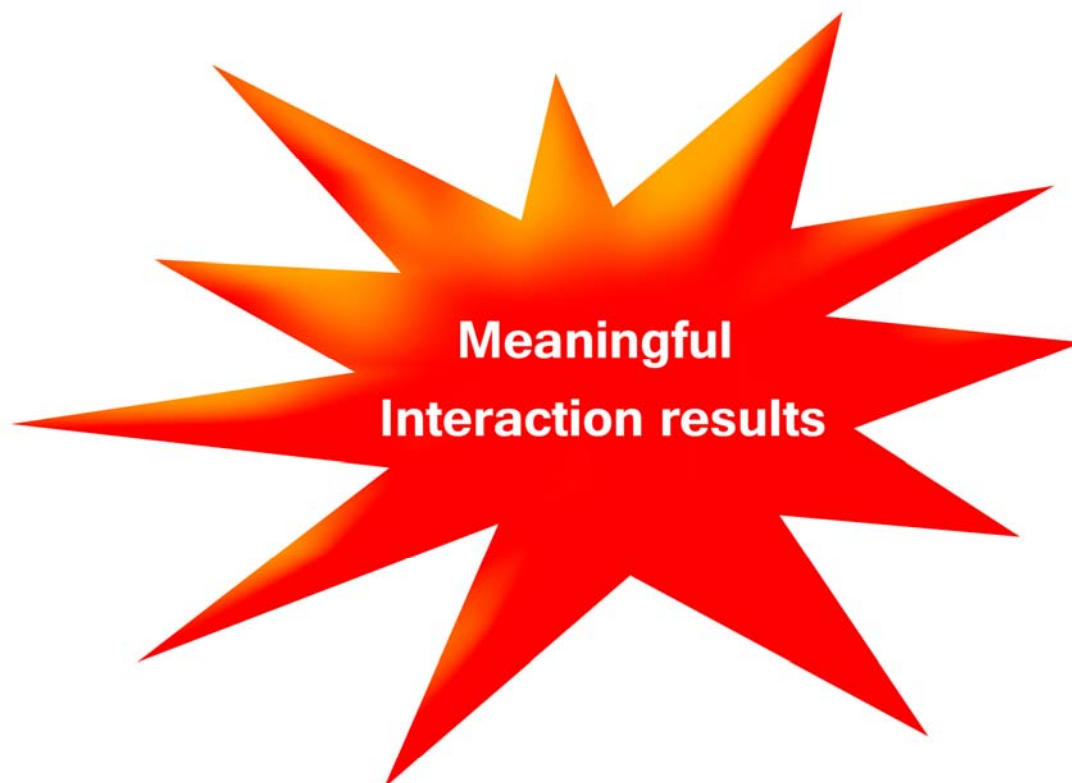
- **Level 1:** represent level of appreciation. In this level learners show positive involvement in learning and appreciate interaction of teachers in the classroom.
- **Level 2:** represent level of mutual respect. In this level, teachers show respect for learners and learning. Teachers prepare for class with materials and visuals designed with all learners in mind. Learners show respect for teachers and learning. Learners approach each class contact with enthusiasm for the learning process and academic inquiry.
- **Level 3:** represent level of intellectual growth. In this level, learners requires open-mindedness, proceeds from sense of curiosity, self-reflective and

recognising the need to examine one's own assumption. Learners often progress at different rate in the subject Chemistry, what they learn to understand in the presence of a teacher may help them better grapple with new ideas in another. Teachers during this level of interaction encourage learners' interest and their awareness of complexity by highlighting problems, issues and topics that experts wonder about.

- **Level 4:** represent level of success. In this level, learners are more likely to succeed during classroom interaction by assess their performance and frequent feedback about their performance in ways that enable everyone in Chemistry classroom. Strategy especially those that employ pedagogies of interaction to enhance learner classroom success, ultimately depend on the skills of the teacher to effectively implement them in class.

#### **6.5.1.6 Terminus/Purpose**

The accomplishment of activity in this study is to have learners and teachers to start to engage each other in a positive interaction way about the strategies to improve teachers' and learners' interest in Chemistry. The model that has been developed is going to be a guideline for teachers and learners on how they can initiate a positive interaction on improving teachers' and learners' interest in Chemistry, which will improve the performance of learners in the subject.



**Figure: 6.6 Outcome of interaction**

Positive relationship between teacher and learner during classroom interaction will provide excellent students' learning outcomes. Teacher and learner characteristics will have a meaningful loading on academic performance in Chemistry.

### **6.5.2 Model Development**

Based on the explanation given in the classification of main concepts according to Dickoff, James and Wiedenbach (1968:426), the model for the promotion of interactions

for improving teachers' and learners' interest in Chemistry and its nature of the structure can be observed in a schematic representation of the model in Figure 6.7.

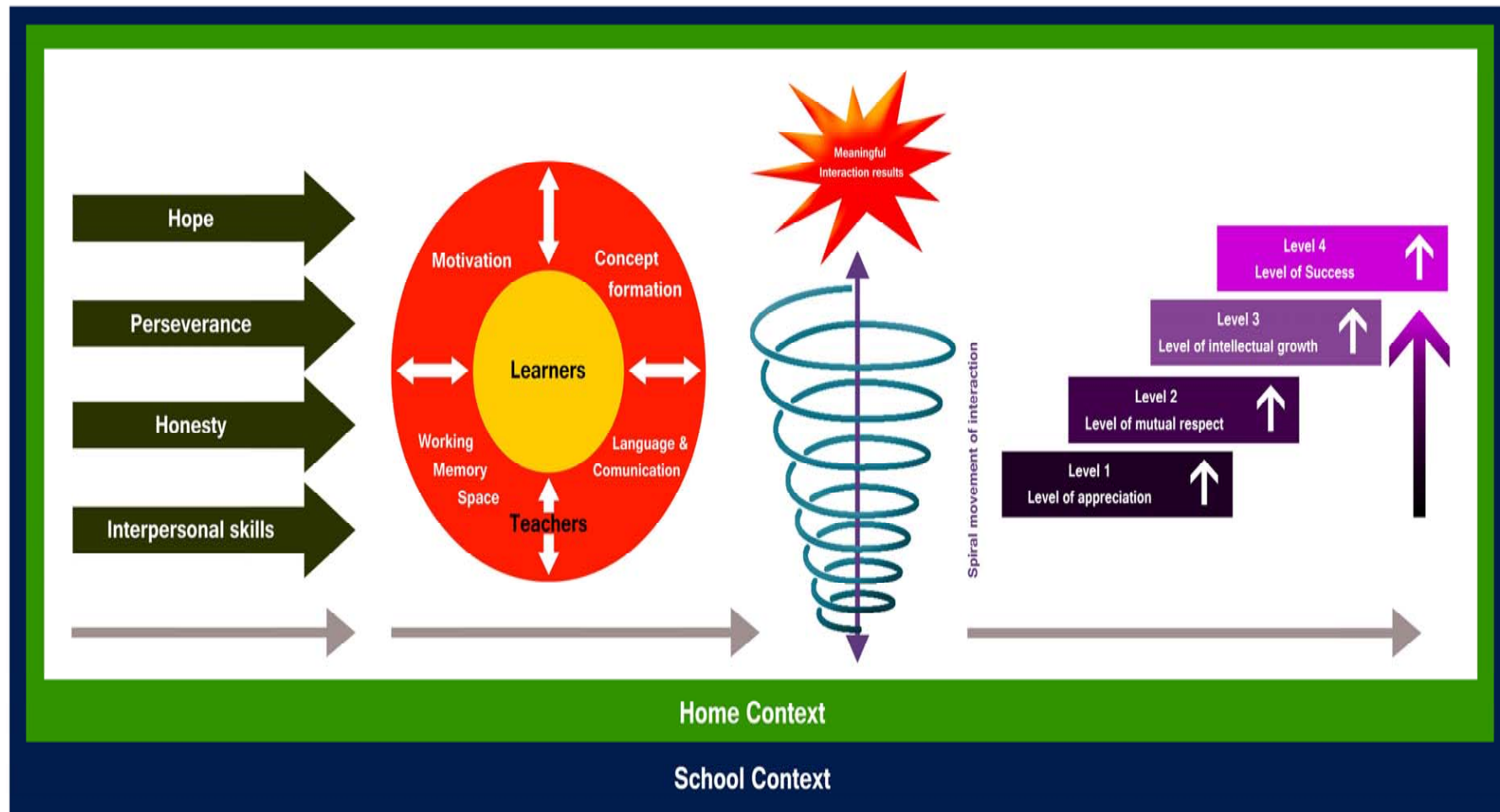


Figure : 6.7

A model to promote interaction strategies to improve teachers' and learners' interest in chemistry

## 6.6 INFORMATION ON VALIDATION

The model was validated through consultation with model experts, supervisor and colleagues to make it meaningful and applicable to the users. Comments made on the model were effected. The model will be implemented and evaluated during the post-doctoral studies.

## 6.7 CONCLUSIONS

The purpose of this study was to investigate the management of high school learners' performance in Chemistry in Vhembe District of Limpopo Province, South Africa. The picture of management of high school learners' academic performance in Chemistry was on report provided by learners, teachers and principals during teaching and learning process. The evidence gathered in this study has been used to create a picture of the actual status of Chemistry teaching and learning. The constraints that limit the quality of Chemistry teaching and learning have also been identified. Similarly, the realistic picture of Chemistry teaching and learning has been developed. Recommendations are made to bring about change in Chemistry subject to improve learners' academic performance in Vhembe District of Limpopo in South Africa so that the constraints are reduced and focus more closely to the reality of the subject.

### Research Question 1

#### **What are the factors affecting the management of high school learners' academic performance in Chemistry?**

Learners, teachers and principals in Vhembe District indicated number of factors affecting the management of high school learners' academic performance in Chemistry. The learners' factors include: school location (rural and urban); private and public schools; laboratories and inadequate equipment; inadequate physical resource like classrooms; positive attitude towards Chemistry; learners' anxiety; amount of information and time spend on Chemistry.

Chemistry teachers valued the following factors which affect management of high school learners' academic performance in Chemistry based on, school factors: teach comfortable topics, support from school management, laboratories, equipment and chemicals.

Principals valued the following factors which affect management of high school learners' academic performance in Chemistry based on the availability of resources like: laboratory, insufficient space of large classes, and learner attitude towards the subject Chemistry, parental influence on the choice of subject Chemistry.

## **Research Question 2**

### **What factors influencing the academic performance of learners in Chemistry?**

Various ways for influencing learners' academic performance in Chemistry were suggested by learners, teachers and principals. These include the following for learners: Chemistry teacher marks test/exams on time, teacher makes lesson a fun learning experience, Chemistry teacher shares his or her knowledge and expertise with learners.

Furthermore, teachers show an influence on learners' academic performance in Chemistry in various ways like: Chemistry teachers are incompetent, emotional state of Chemistry teacher affects his or her teaching, noisy environment influence learners' concentration during teaching, Chemistry laboratories having lack qualified Lab Technicians, teachers who are unqualified and under-qualified influence teaching.

Principals' perceptions of the influence of classroom management on teaching and learning which affect learners' academic performance in Chemistry include the following: insufficient learning materials, poor disciplinary effort, insufficient in-service training for teachers, insufficient qualified teachers.

### Research Question 3

#### **What are management strategies that can help to improve learners' performance in Chemistry?**

Important management strategies that can help to improve learners' performance in Chemistry were suggested by teachers and principals, and include the following for teachers: teachers are expected to have good level of competence, develop interest of learners with regards to subject through teaching methods, teacher has to be aware of current innovation in teaching to determine the most suitable method, teachers must have strategies for teaching, teachers must communicate effectively, teachers must know the characteristics of a learner and his or her problems, teachers must use variety of teaching styles and methods that can raise the learner's attention and interest in Chemistry. To add, principals must have intervention management strategies that can help to improve learners' performance in Chemistry. These include the following intervention strategies: use of mentoring strategy and team teaching, use of external motivators, increase classroom attendance, use schools of excellence during weekends, build strong foundation.

In addition to management strategies, there should be adequate funding for science to build more classrooms with enough space, more laboratories with facilities and equipment, more resources including text books and consumables such as chemicals. There should be provision for laboratory Technicians.

Finally, Chemistry teachers should be adequately supported by the School Management Team (SMT), colleagues, parents and community. Teachers should have sufficient opportunities for ongoing in-service training, and make use of curriculum advisors for assistance during workshops for subject content of difficult topics.

### **6.8 RECOMMENDATIONS**

From the research findings of this study conducted in three circuits of Vhembe District, it is evident that management of high school learners' academic

performance in Chemistry in Vhembe District of Limpopo Province is in a shocking state. The following recommendations have been made:

**Recommendation 1:** Chemistry syllabus should be structured to meet the interests of learners, attitude of learners and diminish the anxiety that can prevail.

**Action to be taken:**

- Science teaching needs to be allocated enough time for learners to have plenty of hours to participate in practicals, demonstrations and experimentation.
- Chemistry teaching and learning should be structured in a way that its content knowledge enhances learners' ability to understand its concepts.
- Ministry of Basic Education should host the National Chemistry Teaching and Learning Conference to structure and re-structure a strategic policy on developing learners and teachers' interest in the subject Chemistry.
- Ministry of Basic Education should maintain that high primary learners must be provided with an introduction to Chemistry learning in their primary science syllabus.

**Recommendation 2:** Fairness in the allocation of educational resources (physical, human, technological) for education should improve based on Chemistry teaching and learning.

**Action to be taken:**

- All institutions which offer high school science should have enough laboratories, classrooms, computer laboratories and laboratory assistants (Lab Technicians) who prepare and control practical activities as well as teach learners laboratory rules and regulations.
- All institutions which offer high school science should have adequate supplies of equipment and chemicals to be used during practical sessions in the laboratory.
- All institutions which offer high school science should be equipped with technological resources: including computers and Internet so that both

teachers and learners would be able to access information not available at their schools, storage of research activities, and administration record keeping.

- For human resources, more teachers should be hired with the consultation of the Department of Education to reduce teachers' workload and enable the teachers to increase contact hours with their learners for meaningful teacher-learner interaction.
- Regularly organise Chemistry experts to help change negative attitudes of learners towards the subject Chemistry.

**Recommendation 3:** In-service training for pedagogical content knowledge for teachers should be improved.

**Action to be taken:**

- Science teachers should be given credit points for attending workshops and conferences which can be accredited by the professional body like SACE for promotional values and upgrading of salary notch.
- Unqualified and under-qualified science teachers should be given opportunities for ongoing professional training for all categories of teachers including Science teachers.
- Chemistry teachers should adopt more practical approaches to the teaching and learning of the subject and create a caring and supportive environment where learners are assisted without being discriminated by grouping them according to their abilities.
- Professional learning workshops should be made mandatory for teachers to attend at least once a quarter in an academic year, and a certificate of attendance should be provided to encourage them to attend.
- The novices or newly appointed science teachers should undergo induction which would assist them in classroom management, including class discipline during conducive teaching and learning.

**Recommendation 4:** School Management Team, colleagues, parents and the community should positively motivate the science teachers every time.

### **Action to be taken:**

- Parents should be active stakeholders of schools in the provisioning and upgrading of their children's education by regular monitoring their children's performance, ensure that their children have adequate science reading materials.
- Principals of schools together with the School Management Team, should provide appropriate intervention management strategies that should determine the effect of teaching learners learning skills on their performance in Chemistry.
- Colleagues, parents and the community should help the learners to develop a positive attitude towards Chemistry as it is an important area that cuts across all Science related careers.

### **6.9 RECOMMENDATION FOR FURTHER RESEARCH**

Although this study has achieved its aim and objective of investigating the management of high school learners' academic performance in Chemistry; the factors affecting management of learners' performance; the influences which contribute to the performance of learners in Chemistry; and the intervention management strategies that can help to improve learners' performance in Chemistry, there is room for further research studies. Further research in the following areas will be encouraged:

- Further research should be conducted to find out if the influence on in-service training workshop has an impact on the pedagogical content knowledge in Chemistry teaching.
- An investigation should be conducted on learners' perceptions on learning of Chemistry.
- Further research should be conducted to investigate the relationship between attitude, interest and performance in Science.
- Research projects should determine the relationship between teachers' attitude and learners' academic achievement in Chemistry.

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## APPENDICES

### APPENDIX A: DATA COLLECTION INSTRUMENT – QUESTIONNAIRE FOR LEARNERS

|   |
|---|
| <b>MANAGEMENT HIGH SCHOOL LEARNERS' ACADEMIC PERFORMANCE IN<br/>CHEMISTRY QUESTIONNAIRE</b> |
|---|

This questionnaire has been created to collect information on what you think about Chemistry and your Chemistry teacher. The information you will provide by responding to the items below will be used in making suggestions on how students may be helped in the teaching and learning of the Chemistry subject. It is, therefore, meant for learners' academic welfare. There are neither right nor wrong answers, so you are invited to indicate your choice according to what you think.

**Tick or put X where appropriate**

#### General information

#### SECTION A: BIOGRAPHICAL INFORMATION

1. Gender

|        |   |
|--------|---|
| Male   | 1 |
| Female | 2 |

2. Grade

|          |   |
|----------|---|
| Grade 10 | 1 |
| Grade 11 | 2 |
| Grade 12 | 3 |

### 3. Age

15-16 [] 17-18 [] 19 – 20 [] 20+ []

## SECTION B

### Information about Chemistry as a subject

In this section, you are to choose appropriately whether you put a cross or tick:

**Strongly Agree (SA); Agree (A); Undecided (U); Disagree (D); Strongly Disagree (SD).**

|    |  | Strongly<br>Disagree | Disagree | Undecided | Agree | Strongly<br>Agree |
|----|--|----------------------|----------|-----------|-------|-------------------|
| 1. | School location that enriches the environment could result in better performance of chemistry.               | 1                    | 2        | 3         | 4     | 5                 |
| 2. | Rural location can affect performance of Chemistry negatively.   | 1                    | 2        | 3         | 4     | 5                 |
| 3. | Urban location can affect performance of Chemistry positively.   | 1                    | 2        | 3         | 4     | 5                 |
| 4. | Children who attend private schools are better academic achievers than their counterparts in public schools. | 1                    | 2        | 3         | 4     | 5                 |
| 5. | Our laboratory is adequately furnished with equipment and apparatus which are still in good condition.       | 1                    | 2        | 3         | 4     | 5                 |
| 6. | Inadequate resource materials in laboratories contribute towards poor performance in Chemistry.              | 1                    | 2        | 3         | 4     | 5                 |
| 7. | Frequency of practical classes is an important factor since skills such as observation and                   | 1                    | 2        | 3         | 4     | 5                 |

|     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
|     | prediction are involved.   |   |   |   |   |   |
| 8.  | The laboratory classes are boring.   | 1 | 2 | 3 | 4 | 5 |
| 9.  | Learners who have more positive attitudes towards Chemistry would be more successful in Chemistry.     | 1 | 2 | 3 | 4 | 5 |
| 10. | Learners' Chemistry achievement affects their attitudes positively.                                    | 1 | 2 | 3 | 4 | 5 |
| 11. | Learners' Chemistry learning experiences increase their motivation to learn.                           | 1 | 2 | 3 | 4 | 5 |
| 12. | What teachers feel about learners' learning or studies could have a significant effect on the learner. | 1 | 2 | 3 | 4 | 5 |
| 13. | Learners' anxiety for Chemistry learning can also be attributed to learners' perception.               | 1 | 2 | 3 | 4 | 5 |
| 14. | Learners' anxiety for Chemistry learning can also be about the difficult nature of Chemistry.          | 1 | 2 | 3 | 4 | 5 |
| 15. | Learners' anxiety for Chemistry learning leads to loss of interest in the sciences.                    | 1 | 2 | 3 | 4 | 5 |
| 16. | Learners who have Chemistry anxiety usually panic in exams in science subjects.                        | 1 | 2 | 3 | 4 | 5 |
| 17. | The learners dislike Chemistry because of the amount of information they have to learn.                | 1 | 2 | 3 | 4 | 5 |
| 18. | The learners dislike Chemistry because of the amount of time spent on writing Chemistry in class.      | 1 | 2 | 3 | 4 | 5 |
| 19. | Peers can also influence the learners' attitudes in learning Chemistry.                                | 1 | 2 | 3 | 4 | 5 |
| 20. | Learners need to work together, not only because of their preparation for team work in science.        | 1 | 2 | 3 | 4 | 5 |
| 21. | Learners need to work together, not only because they learn better through social interactions.        | 1 | 2 | 3 | 4 | 5 |

|     |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|
| 22. | Chemistry lessons that are not interesting will not inspire the learners to listen, participate and learn in class. | 1 | 2 | 3 | 4 | 5 |
|-----|---|---|---|---|---|---|

### Information about the Chemistry teacher

In this section, you are to choose appropriately whether you put a cross or tick on: **Strongly Agree (SA); Agree (A); Undecided (U); Disagree (D); Strongly Disagree (SD).**

|    |   | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|----|---|-------------------|----------|-----------|-------|----------------|
| 1. | My Chemistry teacher is my personal role model.   | 1                 | 2        | 3         | 4     | 5              |
| 2. | I like my Chemistry teacher.  | 1                 | 2        | 3         | 4     | 5              |
| 3. | Our Chemistry teacher makes us do practical work.   | 1                 | 2        | 3         | 4     | 5              |
| 4. | Our Chemistry teacher demonstrates practicals most of the time instead of allowing us to do them. | 1                 | 2        | 3         | 4     | 5              |
| 5. | My Chemistry teacher marks our tests/exams on time  | 1                 | 2        | 3         | 4     | 5              |
| 6. | My Chemistry teacher focuses on learners who perform poorly.                                      | 1                 | 2        | 3         | 4     | 5              |
| 7. | Our Chemistry teacher is always punctual in class.  | 1                 | 2        | 3         | 4     | 5              |
| 8. | Our Chemistry teacher answers our questions well.   | 1                 | 2        | 3         | 4     | 5              |
| 9. | I would do better if I had a different Chemistry teacher.   | 1                 | 2        | 3         | 4     | 5              |

|     |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|
| 10. | I find Chemistry lessons boring.  | 1 | 2 | 3 | 4 | 5 |
| 11. | My Chemistry teacher shares his or her knowledge and expertise with the learners.                       | 1 | 2 | 3 | 4 | 5 |
| 12. | My chemistry teacher influenced me to choose Chemistry.   | 1 | 2 | 3 | 4 | 5 |
| 13. | My Chemistry teacher is too lazy to look at our notes for correction.                                   | 1 | 2 | 3 | 4 | 5 |
| 14. | My Chemistry teacher is harsh.  | 1 | 2 | 3 | 4 | 5 |
| 15. | My Chemistry teacher is incompetent.  | 1 | 2 | 3 | 4 | 5 |
| 16. | My Chemistry teacher does not like me.  | 1 | 2 | 3 | 4 | 5 |
| 17. | If the learners are not assisted, they may not appreciate learning of Chemistry.                        | 1 | 2 | 3 | 4 | 5 |
| 18. | The main duty of the teacher is to remove obstacles from the learning process.                          | 1 | 2 | 3 | 4 | 5 |
| 19. | It is up to the teacher to make the lesson a fun learning experience.                                   | 1 | 2 | 3 | 4 | 5 |
| 20. | Learners' performance is a reflection of the teachers' effectiveness in managing classroom transaction. | 1 | 2 | 3 | 4 | 5 |

## APPENDIX B: DATA COLLECTION INSTRUMENT – QUESTIONNAIRE FOR TEACHERS

|  |
|--|
| <b>MANAGEMENT OF HIGH SCHOOL LEARNERS' ACADEMIC PERFORMANCE IN<br/>CHEMISTRY QUESTIONNAIRE</b> |
|--|

You are required to fill in this questionnaire to collect information regarding teacher characteristics and learners' achievement in Chemistry. The information gathered from this questionnaire will relate directly to you and your school and what you feel about your school. Your answers will not be shared with anyone and will be kept anonymous. DO NOT indicate your name or number anywhere. There is no correct or incorrect answer. Thank you for your contribution.

Tick or put an X where appropriate.

### SECTION A: BIOGRAPHICAL INFORMATION

1. Age

20-30 [ ]

31-40 [ ]

41-50 [ ]

50 Years and above [ ]

2. Qualifications

Diploma [ ]

Bachelor's Degree [ ]

Honours degree [ ]

Masters [ ]

Other (Specify) [ ]

### 3. Gender

|        |   |
|--------|---|
| Male   | 1 |
| Female | 2 |

### 4. Teaching Experience

1-5 [ ]

6-10 [ ]

11-15 [ ]

16-20 [ ]

21 and above [ ]

### 5. How many years have you taught in this school?

1-5 [ ]

6-10 [ ]

11-15 [ ]

16-20 [ ]

21 and above [ ]

### 6. Who is your employer?

School Governing Body [ ]

Department of Basic Education [ ]

### 7. How far do you stay from school?

In the school premises [ ]

Within a walking distance [ ]

Between 10-20km away [ ]

More than 20km away [ ]

8. How has your teaching career been as a Chemistry teacher?

Bad [ ]

Fair [ ]

Good [ ]

Excellent [ ]

## SCHOOL INFORMATION

9. Please indicate your school average mean mark in Grade 10, 11 and 12 in Chemistry as per recent results.

Grade 10

0-20% [ ] 21-40% [ ] 41-60% [ ] 61-80% [ ] 80% and above [ ]

Grade 11

0-20% [ ] 21-40% [ ] 41-60% [ ] 61-80% [ ] 80% and above [ ]

Grade 12

0-20% [ ] 21-40% [ ] 41-60% [ ] 61-80% [ ] 80% and above [ ]

10. How has the trend in the performance of Chemistry in your school been in the last three years?

2013: 0-20% [ ] 21-40% [ ] 41-60% [ ] 61-80% [ ] 80% and above [ ]

2014: 0-20% [ ] 21-40% [ ] 41-60% [ ] 61-80% [ ] 80% and above [ ]

2015: 0-20% [ ] 21-40% [ ] 41-60% [ ] 61-80% [ ] 80% and above [ ]

11. How many laboratories does your school have?

None [ ] One [ ] Two [ ] Three [ ] Above three [ ]

## SECTION B

In this section, you are to choose appropriately whether you tick or cross on: **Strongly Agree (SA); Agree (A); Undecided (U); Disagree (D); Strongly Disagree (SD).**

|     |   | Strongly Disagree | Disagree | Undecided | Agree | Strongly Agree |
|-----|---|-------------------|----------|-----------|-------|----------------|
| 1.  | I am comfortable teaching some topics in Chemistry more than others.  | 1                 | 2        | 3         | 4     | 5              |
| 2.  | I prefer to teach Chemistry most than teaching other subjects.  | 1                 | 2        | 3         | 4     | 5              |
| 3.  | I have full support of management and administration in teaching Chemistry.   | 1                 | 2        | 3         | 4     | 5              |
| 4.  | I would be more motivated if I teach high ability learners.   | 1                 | 2        | 3         | 4     | 5              |
| 5.  | Chemistry should be made optional.  | 1                 | 2        | 3         | 4     | 5              |
| 6.  | Chemistry syllabus is not too wide.   | 1                 | 2        | 3         | 4     | 5              |
| 7.  | Some learners do not have the ability to learn Chemistry.   | 1                 | 2        | 3         | 4     | 5              |
| 8.  | The laboratory has few chemicals.   | 1                 | 2        | 3         | 4     | 5              |
| 9.  | The laboratory has few apparatus.   | 1                 | 2        | 3         | 4     | 5              |
| 10. | Most Chemistry teachers are in the teaching profession not by choice.   | 1                 | 2        | 3         | 4     | 5              |
| 11. | Most Chemistry teachers are in the teaching profession because they also consider it as an awaiting ground for better jobs. | 1                 | 2        | 3         | 4     | 5              |
| 12. | Some Chemistry teachers are incompetent.  | 1                 | 2        | 3         | 4     | 5              |
| 13. | Some teachers are not graduates of  | 1                 | 2        | 3         | 4     | 5              |

|     |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|
|     | Chemistry, but circumstances allow them to teach it.  |   |   |   |   |   |
| 14. | The emotional state of the Chemistry teacher affects his teaching.  | 1 | 2 | 3 | 4 | 5 |
| 15. | A noisy environment retards learners' concentration while teaching.   | 1 | 2 | 3 | 4 | 5 |
| 16. | Chemistry teaching environments do not properly accommodate learners during teaching.   | 1 | 2 | 3 | 4 | 5 |
| 17. | Conducive learning environments promote teaching.   | 1 | 2 | 3 | 4 | 5 |
| 18. | Sometimes practicals are not done for learners due to unavailability of the equipment needed in the school.                   | 1 | 2 | 3 | 4 | 5 |
| 19. | The Chemistry laboratories lack qualified lab. Technicians.   | 1 | 2 | 3 | 4 | 5 |
| 20. | My learners like coming to me with Chemistry problems for assistance.   | 1 | 2 | 3 | 4 | 5 |
| 21. | Most learners choose Chemistry in my school because they have no alternative.   | 1 | 2 | 3 | 4 | 5 |
| 22. | The majority of my learners spend very little time studying Chemistry.  | 1 | 2 | 3 | 4 | 5 |
| 23. | Most of my learners consider Chemistry to be a difficult subject.   | 1 | 2 | 3 | 4 | 5 |
| 24. | The learners' English language competence affects their performance in Chemistry negatively.                                  | 1 | 2 | 3 | 4 | 5 |
| 25. | Learners' mathematical competence affects their performance in Chemistry negatively.  | 1 | 2 | 3 | 4 | 5 |
| 26. | The use of unqualified and under-qualified teachers has the tendency to influence teaching negatively with its implication on | 1 | 2 | 3 | 4 | 5 |

|    |   |   |   |   |   |   |
|----|---|---|---|---|---|---|
|    | performance.  |   |   |   |   |   |
| 27 | Female learners show more fear or anxiety towards the learning of Chemistry than their male counterparts.   | 1 | 2 | 3 | 4 | 5 |
| 28 | Learners in rural areas registered more fear in learning Chemistry than their counterparts in urban areas.  | 1 | 2 | 3 | 4 | 5 |
| 29 | Higher academic qualifications and professional training improve teacher effectiveness on the job.  | 1 | 2 | 3 | 4 | 5 |
| 30 | Learners who reported to have positive experiences during their Chemistry class were said to be influenced by their teachers' positive attitudes towards Chemistry. | 1 | 2 | 3 | 4 | 5 |
| 31 | Teachers said that they do not have enough time to teach and make the learners fully understand the concept of Chemistry during the normal school time.             | 1 | 2 | 3 | 4 | 5 |
| 32 | In the teaching of Chemistry, teachers are expected to have a good level of competence.   | 1 | 2 | 3 | 4 | 5 |
| 33 | Teachers need to develop the interest of the learners with regard to the subject through their methods of teaching.   | 1 | 2 | 3 | 4 | 5 |
| 34 | Teachers need to develop the attitude of the learners with regard to the subject through their methods of teaching.   | 1 | 2 | 3 | 4 | 5 |
| 35 | The teacher has to be aware of current innovations in teaching so as to determine the most suitable method for a particular situation.                              | 1 | 2 | 3 | 4 | 5 |
| 36 | The teacher must have command over a  | 1 | 2 | 3 | 4 | 5 |

|     |   |   |   |   |   |   |
|-----|---|---|---|---|---|---|
|     | wide repertoire of different teaching methods.  |   |   |   |   |   |
| 37. | The teacher must have strategies of teaching  | 1 | 2 | 3 | 4 | 5 |
| 38. | The teacher must have an understanding of learning processes of learners.   | 1 | 2 | 3 | 4 | 5 |
| 39. | Effective teaching connotes the ability of the teachers to communicate effectively.   | 1 | 2 | 3 | 4 | 5 |
| 40. | Effective teaching cannot be done without knowing the characteristics of a learner and his problem.   | 1 | 2 | 3 | 4 | 5 |
| 41. | Innovative learning strategies could be used by teachers at all levels of Chemistry education to enhance learners' motivation to learn Chemistry.                         | 1 | 2 | 3 | 4 | 5 |
| 42. | Learners generally experience improvement in learning when they are engaged in classroom activities that encourage developing their knowledge following a learning cycle. | 1 | 2 | 3 | 4 | 5 |
| 43. | The use of a variety of teaching styles and methods can raise the learners' attention and interest in Chemistry.  | 1 | 2 | 3 | 4 | 5 |
| 44. | Teachers have to take into consideration the learners' abilities, levels of intelligence and the availability of resources and infrastructure.                            | 1 | 2 | 3 | 4 | 5 |
| 45. | Collaborative learning is a teaching strategy involving learners' participation in small group learning activities that promote positive interaction.                     | 1 | 2 | 3 | 4 | 5 |
| 46. | Self-regulated learners are individuals who are meta-cognitively, motivationally, and   | 1 | 2 | 3 | 4 | 5 |

|     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
|     | behaviourally active participants in their own learning process.   |   |   |   |   |   |
| 47. | Effective teaching requires, among other things, basic management skills, including an understanding of the nature of the classroom. | 1 | 2 | 3 | 4 | 5 |

## APPENDIX C: DATA COLLECTION INSTRUMENT – INTERVIEW FOR PRINCIPALS

### MANAGEMENT OF HIGH SCHOOL LEARNERS' ACADEMIC PERFORMANCE IN CHEMISTRY

You are required to engage in an interview session to collect information regarding dynamic factors responsible for teacher characteristics and learners' achievement in Chemistry. The information gathered from this interview will relate directly to you and your school and what you feel about your school. Your response will not be shared with anyone and will be kept anonymous. DO NOT mention your name or number anywhere. There is no correct or wrong answer. Thank you for your contribution.

1. Are you satisfied with the performance of your learners in Physical science?
2. Have you noticed any difference in Chemistry results compared to the physics part?
3. Do you think teachers' attitudes influence learners' academic achievement?
4. Have you, as the principal of the school, identified learners' anxiety towards the learning of Chemistry?
5. Do you, as the principal of the school, have appropriate teaching and learning strategies for improving teachers' and learners' interest in Chemistry?
6. Do you have appropriate resources for effective teaching and learning of Chemistry in your school?
7. What are the factors affecting the management of academic performance in your school which have a negative effect on learners in Chemistry?
8. As a school manager, which strategies do you employ to make teaching and learning of Chemistry achieve your goals?
9. Do you encourage training of Chemistry teachers in the management of Chemistry classroom sessions to improve on their classroom practices?
10. What relationship is there between the teacher's classroom management effectiveness and learner's achievements in Chemistry?
11. What relationship is there between the teacher's classroom management effectiveness and learner's attitudes to Chemistry?

## APPENDIX D: VERBATIM INFORMATION - INTERVIEW FOR PRINCIPALS

|                   |  |   |
|-------------------|--|---|
| <b>Researcher</b> | Thank you, good morning Principals of School   | 1 |
| Principals        | Morning.   | 2 |
| <b>Researcher</b> | <b>I am going to interview you on the management of high school learners' academic performance in Chemistry. Please feel free to answer the questions.</b>   | 3 |
| Principals        | You're welcome.  | 4 |
| <b>Researcher</b> | <b>Are you satisfied with the performance of your learners in</b>  | 5 |
| <b>Question 1</b> | <b>Physical science?</b>   |   |
| Principal A       | Well, Mmmm!!! Not necessarily, we have got challenges which we have experience. In fact from grade 8 and grade 10 to grade12, our performance during the course of the year does not seem what to go beyond 70% it is a worrying factor we want to push it to between 80% and 90% and even 100% especially at the end of the year. But we are struggling because most of the learners do not seem to have interest in the subject Physical Science. I really don't want to talk about Maths, but Physical Science is one of the most difficult subject for the learners in this school. Because most of the learners come here in this school for technical subject they don't even think that there will be Maths or Physical Science. So they struggle that is why we are struggling beyond 70%, and I'm not satisfied at all. | 6 |
| Principal B       | Completely not, I'm not satisfied with the performance of learners in Chemistry Mmmm!!!, you know I think our learners, I don't know whether is a history of this learning areas, they have got xenophobia when it comes to this subject, immediately they just take it as difficult subject. Another thing, parents are influencing learners to take subjects which they were not good at from the foundation. So, I think parents must Mmm!!! at least ask teachers what isn't from Grade 09 that the child must take  | 7 |

- in Grade 10.
- Principal C No, I'm not that very much satisfied with the performance of learners in Physical Sciences. Mmm!!!, The issue is that those learners Mmm!!!, there are not passing in good marks in Physical Sciences. 8
- Principal D Yes, this year I'm satisfied with the performance of learners who are doing Physical Science. Mmm!!!, in the lower Grades 10 and 11 they are not Mmm!!!, as better as the once for Grade 12 but in Grade 12 Mmm!!!, I'm satisfied we had good results right from the beginning of the year, but with Grade 10 is slightly different more so because they are not yet exposed. Remember they are coming from Grade 09 where they were doing Natural Science so when they start with this Physical Sciences in Grade 10, always you know if you don't have Mmm!!!, teacher who is very good in Grade 09 then you experience the problem that I am experiencing, but in Grade 12 I'm okay. 9
- Principal E Mmm!!!, Yes Mmm!!! As a school we are satisfied because of as for this year we were comparing the average of 2012, 2013 and 2014 and we find that in Physical Science the average is above the average of the three years 2012, 2013 and 2014. But as always there is always a room for improvement. 10
- Principal F Well, I'm not, I will only be satisfied if all learners can pass Physical Science, then it means I'm not satisfied. The problems of the learners not to pass Mmm!!!, They are quite many, Mmm!!! Some have never pass Physical Science in the EFT phase. But they managed to move from Grade 10, 11, 12 without passing the subject. So, it will be difficult for them to pass at the end of the year. I mean to pass Grade 12 Physical Science. 11
- Principal G Mmm!!!, I wouldn't say that I'm satisfied because Mmm!!!, it performed lower than all other subjects. It means you are not satisfied at all? We are not satisfied. 12

- Principal H Yaah!!! I am satisfied but not that much. The reason is Mmm!!!, because of some of the shortages of what should be used. I'm bit happy. But not satisfied yet about the results. I'm satisfied when I know the plans and the situation is not having enough Mmm!!!, things to be used. 13
- Principal I Yes, I am satisfied, particularly in Grade 12, the performance has been very good in the past 3 to 4 years. In Grade 10 and 11 that's where we have challenges, particularly Grade 10 but we have ways of trying to make sure that those learners perform. 14
- Principal J No. The reason why I'm saying I'm not satisfied is because when we compare the current year's performance and the one of the three last years, we find Mmm!!! They are not performing. With regard to what prevail in 2013, the average for Physical Science was 35,85%, followed by 2014 – 35,90%, then the last one 2015 was 27,50%, the one for this year is 27,30%. I'm force to add marks. Now you see, I'm not satisfied. I'm forced to adjust mark as prescribe by the National Department that we had supposed to adjust marks so that they can be of acceptable manner. 15
- Principal K I am satisfied because learners they perform well at the end of the year. Okay, they got 80% in Grade 10 and 11. In Grade 12, they got 100%. So, I'm satisfied. 16
- Principal L No, I'm not satisfied. We have got a qualified teacher but the performance of the learners are not so satisfactory Mmm!!! 2014 we achieved, but 2015 not achieved in Physical Science more especially on the Chemistry side, so, learners do not performed well from Grade 08, 09 and Grade 10, 11. But better in Grade 12. 17
- Researcher Question 2** **Have you noticed any difference in Chemistry results compared to the Physics part?** 18
- Principal A Yaah!!!, Infact Yaah!!!, Mmm!!!, learners tend to like Chemistry more than Physics. we detect this after they have written those 19

- papers, when they have written Chemistry, well you ask them how you wrote the paper, they will say it was much better, much...much... better than we expected. They have written Physics and then you ask them, they say hey!!! The paper was difficult, so you can see that Chemistry seem to be easier than Physics so there is different, Yes!!!
- Principal B Yes. A teacher who is very positive and innovative definitely even the results will be brighter but the teacher who is always complaining about petty things because kids are not like manufacturing machine, you have to motivate them so that you get them into the gear, so your attitudes plays a role in the subject in which you are teaching. 20
- Principal C Yes, Mmm!!! The difference is that in the past of learners used to pass this Chemistry for much better than Physics. Now it seems as if Mmm!!!, I don't know whether is the issue of educators now, learners are performing very well in Physics than in Chemistry. 21
- Principal D Normally as the principal you know I didn't take note of the difference between the two, but when I check, I just check overall results for Chemistry and Physics, but what I have seen Mmm!!!, in I think it's in Physics where they needed lot of practice but not that they are very good in Chemistry, I have checked only in Grade12. 22
- Principal E Yes, usually those learners who are good in Mathematics they find Physics easier to them, Mmm!!! But those who are weak in Mathematics, they cannot cope well with Physics. They can do well in Chemistry than in Physics. That is the difference. 23
- Principal F Yaah!!!, our learners do well in the Mmm!!! Physics part, Mmm!!! But in Chemistry, Mmm!!! Most of them don't make the grade, they get good marks in Physics but when it comes to Chemistry, those who perform well in Physics, they don't match the same performance in Chemistry. 24
- Principal G Yes, it seems as if Chemistry is popular than Physics. Physics 25

- is little bit difficult to the learners.
- Principal H Yaah!!! Not that much, but the same learners are performing 26  
equally in both. Yaah!!! The way I see it's just about equal  
Mmm!!! Not above average.
- Principal I Yes, definitely learners turned to be doing very well in 27  
Chemistry. Yaah!!! Instead of paper one Physics. The  
problem, is because of the teaching. But I'm sure is because of  
the teaching strategies employ by the teachers and the  
influence that teachers have to these learners.
- Principal J Yaah!!! My problem lies here. I don't know whether Chemistry 28  
is the one which demand more practicals. The one which is  
Mmm!!! Yaah!!! With regard to the one which demand more  
practicals, learners are well interested in that, and the educator  
Mmm!!! The one we are having now, he encourages them to  
conduct some experiments. Which means that sometimes you  
can see the difference.
- Principal K Yes, learners perform well in Physical part and bad, for 29  
example in Chemistry but teachers are trying to motivate them  
all the time.
- Principal L Yes, most of the learners they say that hey Chemistry part is 30  
too difficult but our deputy Principal who is responsible for  
Physical Science so he is helping our learners some of them  
they improve. I still remember one learner who told me that he  
is going to get distinction in Physical Science at the end of this  
academic year.
- Researcher Do you think teachers' attitudes influence learners' 31**  
**Question 3 academic achievement?**
- Principal A Yes, seriously so, in fact if the teacher knows the subject it 32  
stands the better chance to convince learners to understand  
and to like the subject. If the teacher himself is struggling or  
herself struggling with content subject so it means the learners  
will turn to hate it and would say no! We don't understand the  
teacher, the teacher is like this and that. They turn to hate the

- subject as it is. But at this school you have those teachers that are new (the novice) and those that are seasoned educators, you find that learners would turn to like the seasoned educators more than the novice because they are struggling, they are still getting the footing and then something like that, they are not discharging as they should and the learners do not enjoy the lesson and they turn to hate so they influence this.
- Principal B Yes!! a teacher who is very positive and innovative definitely even the results will be brighter but the teacher who is always complaining about petty things because kids are not like manufacturing machine, you have to motivate them so that you get them into the gear, so your attitudes plays a role in the subject in which you are teaching. 33
- Principal C Of course, Yes!!!, Teachers' attitudes have got a lot of influence there. If the educator is not so well vested with the learners, the results are always poor. So, I even know here that there is that attitudes which is affecting learners not to perform well in this Chemistry, thank you. 34
- Principal D Yaah!!! They do, because Mmm!!! If the teacher is Mmm!!! Somebody who is Mmm!!! Not social. Yes, Mmm!!! You find some learners saying that, No!!! We better not go for that, some learners might Mmm!!! Even change the subject, and the with me here is different because the attitudes of a Science teacher it's accommodative to the learners that's why in Grade 10 this year we have got a lot of learners who are doing Physical science. 35
- Principal E Exactly, exactly, if you display that you don't like the subject, it will affect the learners in a negative way. Your enthusiasm and your attitudes will force learners to appreciate the subject you are teaching. The attitudes of the teacher is very.... very important. 36
- Principal F Ooh yes. Yes, it does, you know if a teacher can tell learners that for example, no Chemistry is difficult is not an easy subject, 37

- well that will influence them. They will have negative attitude and they will fear Mmm!!! Chemistry.
- Principal G Mmm!!! The attitudes of the teachers especially the teachers who are teaching Chemistry themselves, or Physics themselves, they are interested of the subjects, but Yaah!!! I don't think they have the negative attitude. But Mmm!!! Even though that they have positive attitudes, learners still are not performing well, the teachers' attitudes is positive but learners are always not performing well. Teachers' attitudes are fine but learners they don't perform according to what you expect. 38
- Principal H Yes, that's how I see it. When I visit the educator in class while he/she is busy teaching I can see the relationship is positive. Okay, it means teachers attitudes if is positive, learners attitude also becomes positive. 39
- Principal I Definitely because if the teacher is not positive about the learners, the performance will generally not improve, but we have seen that, Mmm!!! With teachers that we have, we have learners who are to come to Grade 12 performing very poorly in Chemistry but because of the attitudes of the teachers and the encouragement that the teachers give the learners, at the end of the year these learners turn to be doing very well in Chemistry. 40
- Principal J Yes, they contribute a lot Mmm!!! Underperformance in the past that was in the year 2013 where grade 11 learners got 27,50% pass rate in Science. The underperformance was caused by the teacher who was responsible for dealing with this Grade 11, his attitude was not good and it make learners to underperform. And the one who is currently teaching them, he is having Mmm!!! Challenges of taking them to the level in which learners will be in grade 12. He is having problem with regard to Grade 11 because the teacher who was teaching them, he was not doing his full best. 41
- Principal K I'm one of the best principal who is fortunate, because I got a 42

- teacher who is offering Physical Science Grade 12, who shows passion of that subject and he influence learners to do well.
- Principal L Yes, teachers' attitudes influence if the teacher have got the knowledge of that particular subject, learners get influenced even imitate to become like that Mmm!!! Teacher, so, the attitude of the teacher do influence the learners to achieve. In our school, we do not have any problem of the attitudes of teachers towards learners. Not at all. From Grade 10 up to 12 we have got some shortage of teachers so, maybe if we can have more qualified teachers who specialized in Physical Science then we can achieve more. 43
- Researcher Question 4** **Have you, as the principal of the school, identified learners' anxiety towards the learning of Chemistry?** 44
- Principal A Well, anxiety is there but is not limited to Chemistry, to all the subject there is anxiety but I do find that learners get stressed more when they learn Physical Science and Chemistry is part of the subject and then in fact it make the anxious, they turn and get discourage especially when the teacher is not well vested with the subject they turn to dodge this lesson and something like that, they don't seem most of them especially those have come for drawing and other things, they want to be out of the class cause they don't understand. 45
- Principal B Yes, we have identified anxiety in learners. And when it comes to learners immediately when there is things which deals with calculations, calculation. Yes, already kids have got negative attitude about it. Then it makes them to have some xenophobia anxiety and so forth and so forth. Definitely. 46
- Principal C Yes, what I have discovered here is that maybe it is because of the reason that they are doing it theoretical, but what I have discovered is that during Mmm!!! Chemistry period learners used to run away from the class. Like as if they are going to toilet and they will never come back before the lesson ends, 47

- thank you.
- Principal D Yes, like I have said I haven't check a lot for the different 48  
between the two but it looks like Mmm!!! In Chemistry also  
they need a lot of Mmm!!! Experiments but the problem is, we  
don't have some other things that are needed. Ooh, yes like  
the laboratory.
- Principal E Yes, Mmm!!! Unlike in the past in this school we used to select 49  
learners with the potential to do Mathematics and Physical  
science but as in the new era or in the new dispensation, we  
are admitting everybody and you find that some they find  
Science difficult. I think at one point there was a sense that we  
should include Mmm!!! Commercial subject but we said no, we  
can't do that, indeed some learners they fail to cope with  
Physical Science and also in a particular Chemistry, I  
remember one incident where a Grade 12 learner was asked  
what is the symbol for silver? And the learner say S, you can  
see that indeed there is a challenge.
- Principal F Yes, I can say yes Yaah!! To some, some have that anxiety, 50  
and they want to know more but there are others who  
seemingly don't care Mmm!!! Those who have given up  
Mmm!!! They are just doing Chemistry because, they choose to  
do Chemistry. But others do have that anxiety. Yaah!!! Like  
they were many kinds of anxiety to can find that learners they  
say Science is very difficult. Yaah!!! We do experience  
something like this in our institution. Anxiety, yes, of course. Oh  
yes, they do.
- Principal G Mmm!!! the anxiety of those who are not performing well, I think 51  
those who are not performing well, what I could say is that they  
don't have interest on the subject themselves it's like Mmm!!!,  
when they get in the class Mmm!!! They never had any choice  
of choosing any other subject. They all just feel like they are  
going to the Science stream which is difficult.
- Principal H Yes, I have seen this anxiety on learners, Yes, they are those 52

- really got that interest in Chemistry. Mmm!!! They are Okay, and some learners are not interested in Chemistry. They need just push-up or somebody to push them up. They will keep on saying Science is very difficult like what other young learners or some other learners saying for Science.
- Principal I Yaah!!!, I will not say so because they seem to be doing well in Chemistry but with Physics Mmm!!! That's where perhaps some of them do have challenges, but not in Chemistry. 53
- Principal J Yaah!!!, there are some of the learners who are not interested in Chemistry experiments. Every year we usually buy the Science kits to make sure learners will develop interest. And the teacher who is responsible for Chemistry usually have problem, says there are others who say I don't like smell of the chemicals there. Mmm!!! It seems it was affecting them. It demoralised them, and it makes them have anxiety. They hate wearing those white coats used in the laboratory. 54
- Principal K I cannot denied the fact that there are learners with anxiety because some are learning in a slow pace like tortoise and others are doing well. So, anxiety is happening but the teacher who is offering that subject is trying by all means to encourage them, motivate them and need assistance by outsourcing other teachers to help the kids. 55
- Principal L Yes, more especially Mmm!!! Most of the learners they think Physical science and Mathematics are difficult subjects. But some of them due to the influence of our deputy principal who is responsible for Mathematics and Physical science so, that anxiety goes down bit by bit. 56
- Researcher Question 5 Do you, as the principal of the school, have appropriate teaching and learning strategies for improving teachers' and learners' interest in Chemistry?** 57
- Principal A Yaah!!!, in fact like all the subjects, we need strategies, the 58

strategy here is to see that seasoned educators help the novice and then they work as a team and in fact for the academic year 2016 we even came with strategies that these learners need to be attended in the morning and afternoon so all the educators that are involved in physics from grade 10 up to grade 12 they must do what we call rotational teaching as a form of team teaching, some will see them this morning and the other one in the afternoon only 30 minutes just to, in fact in the afternoon we have the studies which run for one and half hours, they get 25 minutes and then go and leave the learners with some work to do, so we hope this strategy will help to improve Chemistry as one of Physical Science section.

- Principal B Yes, as the school, we do have teaching and learning strategies because for example, we have got Mmm!!! Saturday lessons, we have got winter lessons. We also outsource so that we get better Mmm!!! Teachers, for example now we have got two teachers from Zimbabwe who every year we ask for their renewal of work permit so that they help us. 59
- Principal C Unfortunately, myself as the principal... I don't have that strategy. What I have to do is only to encourage learners to be in the class and to encourage the educators also to be there prepared. Whether they are preparing right thing or not so I'm not quite sure about that because I don't have knowledge of this Chemistry. We do have enrichment classes during holiday vacations, sometimes in the afternoon in order to improve these results but as always the results are only little bit above average. 60
- Principal D Yes, we do have strategies, sometimes I do send some of my teachers to school which are doing better like Mmm!!! Some years back I sent the Science teacher to a certain secondary school in our circuit which was getting good results. 61
- Principal E Yes, Mmm!!! We have strategies that we are employing. We, normally, we try to teach the lower class because if you have 62

strong foundation Mmm!!! When we have this support lessons, we concentrate on the two learning areas Physical science and Mathematics. Normally we do that on Saturdays where they would come for 1 hour Mathematics and 1 hour Physical science because if you do not have the strong foundation, when they go to senior classes they would not cope with Physical science.

Principal F Well, strategies we do have, but Mmm!!! To fulfil them, that's difficult. Strategies we do have, like we do send Mmm!!! Our kids Mmm!!! To the university where there are equipments for doing experiment. And we also Mmm!!! Invite Mmm!!! Some curriculum advisors and some lecturers from university to come and guide teachers wherever find some difficulties in the Chemistry concept.

We used to have the strategy for working on Saturdays during the first part of the academic year, we had such but Mmm!!! During the second half of this year, Mmm!!! Well things did not go well, we cancelled all afternoon studies, all weekend studies because of something which did not go well here at school. The planning was there but the parents did not support us Mmm!!! But we hope next year everything will be back again.

Principal G Yes, we have the strategies, Mmm!!! The strategy for teaching and learning Chemistry, I think we are trying to, you know, to let the teacher improvise. For example, we would like to take the learners to Mmm!!! Where they could go and do the experiment in Science. Maybe this strategy will encourage the learners to have interest in Chemistry. Learners will see relationship between the theory they have done in class and practical part. I just think that could be another strategy of improving their performance. And another strategy that we use, we encourage them to buy as many books as possible that are related to science. We also send them out during the Science week. Mmm!!! Like going to University of Limpopo, like going

anyplace where they will see science related programs. Saturday school, we encourage them, we send them to Mbilwi secondary school which produces best results, and even here at our school we always organize those extra lessons. And we also invite maybe expert from other schools to come and help, especially these Science learners.

- Principal H Yes, I have strategies, the reason I can tell you is that I even go to the University of Venda to request apparatus which the Chemistry teacher can use. The university always helped me with science related matters. During the holiday, we have got enrichment programmes we use to make sure learners are kept busy. I motivate teachers to teach the learners and even on Saturdays. 65
- Principal I Yaah!!! The strategies that we use we normally, Mmm!!! categorise learners according to their ability and try to isolate those learners who are doing poorly and to spend more time with them rather than Mmm!!! Mixed them together. We also have the strategy of working with learners in Saturdays but those learners who are not doing very well, we isolate them we give them test separately and we also make sure that we involve the parents and this helps to improve their performance. 66
- Principal J Yaah!!!, as the principal I realised the value of Physical Science and Mathematics, despite the fact that I'm responsible for teaching History. I try to develop the interest towards Mathematics and Physical science. I encourage them by showing them that there is good future if one can master Science especially these Physics and Chemistry. Usually we call our former students, who are now studying at tertiary institutions like university of Cape Town, Wits, who are following engineering and science related career. They do come and assist our learners in Chemistry during the course of the holidays. We are having extra classes starting from the beginning of the year and to end of the year. We have extra 67

- classes and also during the vacation.
- Principal K No, we don't have appropriate teaching and learning strategies for improving teachers and learners' interest in Chemistry but we are trying to get the way and means of assisting the learners. We only depend on textbooks. We also outsource best teachers from other schools, and sometimes we collaborate with our neighbouring school, These secondary and we meet openly in order to assist one another. We have Saturday classes and winter vacation classes and they are helping us because at the end of the year we achieve best results. 68
- Principal L I cannot say we have enough strategies, because we are lacking facilities even if you check around here in our school, we have got shortage of classroom Mmm!!! Science equipment, we don't have but we are trying our level best to send some our learners maybe to Vuwani Science Centre where they can make experiments. We do have Saturday and winter schools and most of our learners we influence and encourage them to go to Mbilwi secondary where they have some apparatus. 69
- Researcher Question 6 Do you have appropriate resources for effective teaching and learning of Chemistry in your school?** 70
- Principal A Well, we cannot say we have got enough but we do have make shift laboratory where experiments are done there and the learners go there. Is just that we have got a very limited space for all the learners, mind you, in this school all learners are doing Physical Science and is not the part of learners, so when everybody is doing it we have got classes which have 80 learners. Classes with so many learners we cannot fit them all into a lab at once so we find that our lab need to be extended, we need space, we need equipment. 71
- Principal B I can't say I do have resources because for example, we don't even have the laboratory. So when we do experiment is very 72

difficult. And taking kids to Vuwani Science Centre where the university have Mmm!!! Built the place where learners are supposed to do the experiments, is a big deal of work. Is taxing because you need transport to the place (Vuwani Science Centre). Teachers must move from here leaving other subjects moreover, the teacher is not teaching only that specific subject Chemistry but even other subjects.

- Principal C We don't have such appropriate resources, like what I have already indicated above, normally we used to do this theoretical rather than practical, but of course we have some few things that learners are able to use when they are studying this Chemistry, but there are not enough and they are not made for their grade. We don't have laboratory. 73
- Principal D No, like I have indicated earlier we don't have laboratory but at the same time I didn't just say well because we don't have laboratory we don't improvise, yes we do. Yaah!!! Textbooks we have, and besides I decided to get some DVDs and Mmm!!! A projector where at times we engage these learners with Mmm!!! You know they like to see because they just think well it's a bioscope when while at the same time they are learning that is sometimes they want to do it on their own without the teacher and they enjoy it a lot. Yaah!!! They use projector with the DVDs. 74
- Principal E Yes, we have the Physics lab and Chemistry lab, but the challenge that we have we are dealing with large numbers, to conduct individual experiment is difficult. Normally, we do demonstrations to our learners but we are fine with our two labs, the Physics lab and the Chemistry lab. The only problem is overcrowded. Yaah!!! Tthe large enrolment, and as such in Grade 10 to 12. Yaah!!! This is because the average of learners is between 65 to 70 in a class. 75
- Principal F Well, resources is a problem, the resources will never be enough, but we do have the basics. We have but there are 76

- some which we have to borrow from our neighbouring schools. Mmm!!! Infrastructure well, we don't have, we just make it here and there well, we have a laboratory which is just an existing building but with no equipments.
- Principal G No, we don't have Mmm!!! Chemistry lab, we just keep teaching everything theoretically. We also don't have apparatus, nothing at all. If the learners have to do practical investigation we do take them out for Mmm!!! Like Mmm!!! The Vuwani Centre. That is where they will see Science apparatus, demonstration at Vuwani Science Centre. And is controlled by the University of Venda. 77
- Principal H I don't have enough, that's why I even go to the University of Venda, to request some apparatus. I'm only happy because when I go there they assist me, and also university usually send a person who can come and motivate the learners and teach them. I don't have Mmm!!! Enough laboratories and classes. But I once struggled and request donation from the people, that's why I managed to build which I take it as a temporary class of Mmm!!! Lab. 78
- Principal I Yaah!!! We do have resources because we were part of the Dinaledi project and the department in the past has been providing us with the, Mmm!!! Kits that we use in the lab so we do have resources. They may not be adequate but at least we do have. Well we do have laboratory but not well equipped at least the resource is there. About human resources, we are satisfied with the teachers we have because you will remember, Mmm!!! Because of this project, Dinaledi project, there are teachers who were brought to our school from other countries. We still have those teachers even though we are now required to be with them as long as we have a vacant post that they can occupy. So, we are satisfied, but if they leave, that's where we are going to have problem and apparently we are not sure if next year we will be having these teachers. These teachers are 79

- foreign nationals.
- Principal J Yes sir, year after year we buy these Science kits which contain apparatus and chemicals. We usually buy these for learners and teachers. We keep our Science Kits Mmm!!! Equipment in the storeroom. We don't have laboratory usually our experiment are conducted under that tree. Now about human resource, I don't have enough teachers who are teaching Science. I'm having only two. Foreigner who is responsible for Grade 10 and 12 and one local. We are running short of human resources. 80
- Principal K We don't have appropriate resources because we don't have library, we don't have laboratory but we depend on textbooks and the method which are used by the teacher produce better results. 81
- Principal L In our school we don't have, that is why I have stated that during the school vacation, during winter we send our learners to winter school in places like Mbilwi secondary and Thohoyandou secondary where they have got some resources, resources here, we don't have some resources. Resources like laboratory, we don't have and library we don't have. We don't have enough teachers for Science. For science we have got only two and we need more. 82
- Researcher Question 7 What are the factors affecting the management of academic performance in your school which have a negative effect on learners in Chemistry?** 83
- Principal A The first one I have already say is space. Everyone seem want to come to this school, we have enroll large numbers of learners and we don't even have enough classroom, we talk about 80 learners in classroom, and if you go to grade 10 classroom we have got 80 learners in one class and all of them are doing Science. Is overcrowding, and overcrowding as a factor will always impede learning and teaching and another thing is that you have got so many learners in that you even short of textbooks, not everyone would have textbook, they will 84

have to share. A school with lot of learners at any given time would have experience disciplinary problems, they will be disciplinary problems, they will be truancy, dodging of classes learners sometimes will be outside, and the teachers is not there you cannot control them so this things turn to affect mostly difficult subjects because these subjects need learners to focus, need learners to be there for the subject so that they can improve, so it is little difficult when we don't have space and then we cannot fit learners to the lab and then sometimes educators told us they cannot get learners in control.

Principal B Mmm!!! the factors affecting management as such for academic performance I think the department must regularly have the workshop which are there, but they are I think personally not enough, and then secondly the curriculum advisors must always visit the school we need them they must not stay in their offices, they must be at schools 100% Yaa!!! 85

Principal C Mmm!!! Learners themselves it seems if they are not so very much encouraged. Moreover such factors Mmm!!! They are also of great influence to learners, so as they don't have Mmm!!! or nobody is there to instil their love for Chemistry and Physical science as a whole. 86

Principal D Again I will say the absence of Mmm!!! You know exposure you know, we take them to Vuwani Science Centre because we don't have laboratory at our school but sometimes as you can see learners around here are in a rural area, Mmm!!! And sometimes you can say well we get a taxi or a bus to go to Vuwani Science Centre, only very few will manage to go there, and the absence of our own laboratory is affecting the academic performance. Another factor is that teachers Mmm!!! Are not enough, we are making use of one teacher she is teaching Physical Science from Grade 10 up to Grade 12, she is the HOD. She is overloaded because she does not have an assistance on teaching. And Yaah!!! She is the HOD as well as 87

- the teacher herself.
- Principal E As I have already alluded in the previous question, that there as 88  
large enrolment of learners. Individual attention in Maths and  
Science were normally not possible especially when we  
conduct practicals is difficult. For human resource, we have  
more than we need. We have enough teachers in our  
institution. But with the teachers the one challenge it's Mmm!!!  
In this country we don't have teachers who are qualified to  
teach both Physics and Chemistry Mmm!!! That is the one  
thing that maybe as a country we need to improve. If they can  
have a person majoring in Physics and Chemistry but majority  
of them they specialized in Physics, the others Mmm!!! But very  
few in Chemistry. Majority of people specialized in Physics than  
in Chemistry in this country not particularly in our school, in this  
country.
- Principal F Mmm!!!, Yaah!!!, number one; Mmm!!! You know Mmm!!! I 89  
believe that Chemistry when you teach Chemistry you should  
have a teacher who have study Chemistry at least at university  
level. Mmm!!! But you see some of our teachers only did  
Chemistry at Grade 12 level, and I do believe that it's one of the  
factors. The problem we do have, overcrowding because you  
know our lab can only accommodate about 30 but we have  
Chemistry class with 60 learners.
- Principal G Mmm!!! Previously the principal who was working here was not 90  
a Science orientated. So you know even the idea of buying  
some of the basic equipments he would say that you know  
Science will take all the resources, all the funds will be directed  
to Science. As we know the Science equipments are  
expensive, so, those principals were reluctant to buy the  
equipments these are some of the factors. I just think maybe  
the attitude of the principal himself and the attitude of other  
teachers were sour, for example, like if you want to teach  
learners in the afternoon, they would say, well it's like learners

are doing Science only, other subjects are not considered, that's the problem with teachers, that's the attitudes of the teachers and even the principal. This are some of the factors which do affect performance of learners.

- Principal H Mmm!!! That's the shortage of apparatus and also that we sometimes don't receive not enough books. And what we do in order to solve that problem, I make it a point they are being photocopied. I mean to photocopy the textbooks, in order every learner must have, just a copy. 91
- Principal I Mmm!!! Yaah!!! I would say the textbook issues perhaps be the biggest factors because we do not have enough of these due to overcrowding of learners. Another challenge because we do have learners especially in Grade 12 class which are more than 60 in class. But another challenge, the issue of learners who progress to the next grade, that is the biggest challenge because you are dealing with learners who do not have enough content knowledge of the previous grade, especially Science in Chemistry. This is because you may find that these learners who are progress perhaps maybe say those who are in Grade 12 progress from Grade 11 Mmm!!! They may have passed other subject but not Physics and Chemistry. 92
- Principal J The other factor is that the one who is responsible for teaching Chemistry is a foreign national. He usually experience problems because he cannot during the lesson switch and use the vernacular language usually there is problem. He use only English as medium of instruction, it hinders learners to understand him. Another factor is lack of support from parents because the teacher will, at time organised that the learner should go to Vuwani Science lab there. The one which is under the University of Venda he can organise but you will find that very few will pay. Parents are not participating fully, and they are not supporting. Teachers are also participating I mean teacher are also giving support to science learning. They are 93

- giving support to only two educators. We don't have head of department who is responsible for Maths and Science.
- Principal K We have so many affecting factors in our school because some of the learners they learn by seeing. To learn by seeing is better than learning something while you are not seeing. We don't have apparatus which can be found in the laboratory, so it gives us a negative effect in the side of our learners. No apparatus, no chemicals, we also need a mobile laboratory if we can get it somewhere but the department is not providing mobile laboratory. We need Library and also laboratory, we need both but we don't have one. 94
- Principal L You know most of the learners they influence one another that hey, Chemistry is a difficult subject, but I have identified this year in Grade 12 we have got three to four learners who stated that come January 2017, we are going to get distinction in Chemistry. So, we are breaking that barrier of fearless and bit by bit they started to have interest in Chemistry. 95
- Researcher Question 8 As a school manager, which strategies do you employ to make teaching and learning of Chemistry achieve your goals?** 96
- Principal A Yaah!!!, Team teaching is one of them, because we want to go beyond 80% so when we want to go beyond 80% we even outsource. We have got Saturday school lesson that ran from January to November, so this bringing in or roping in teachers from other school to come and assist seem to be working for us. Training these learners as early as when they are in Grade 8 and in Grade 8 and Grade 9 we get good teachers for them. Then you build a good foundation. 97
- Principal B Aaah!!! As the manager of the school, normally what I do, for example we do some motivation, we take people like yourself who is specialising in this subject. Mmm!!! To come and motivate learners so that they see or if they take this learning area what isn't which can help them in future. What are they 98

going to benefit, this is what we do. And for example, like what I said sometimes we send them to the centres where they have good resources. We have got Tshikevha Christian Combine school, they do have good resources if we don't get teachers we ask learners to go and do extra lessons on Saturdays, weekends and the holidays' there.

Principal C Mmm!!! Like what I have already indicated although myself I 99

don't have knowledge, I know that this subject is very much important to our life but myself I don't have such knowledge. But what I had to do it only to encourage learners to have books to encourage educators to be fully prepared, and that after learners have already written there must be a remedial work. Maybe by that I think are strategies to make teaching and learning work properly. Mmm!!! Curriculum advisors are there but very few indeed in our district in Vhembe and if ever we are not inviting them, they don't come for advice. And normally when they do come they come for specific thing not to instil love for this subject.

Principal D Like what I said earlier, we sometimes have extra lessons, and 100

also besides sending our teacher or learners to another school which are doing better we also sometimes we have got somebody from NECT, for motivation. This is a national initiative, he comes here and teach, he is like the subject specialist. Well he comes and help by going to the class and teach himself. Yaah!!! So that's one way that I think even if I do not have enough human resources but Mmm!!! This person comes once or twice a month. And Yaah!!! To assist, and even during school holidays. He is from National Education Collaboration Trust and our school it's one of the school which are have been nominated to be in the NECT, we do not have to pay him.

Principal E Mmm!!! Normally, we encourage our educators to plan well for 101

their lessons and to come together, share good practices and

helping one another. Let's say in the Physical Science department, they come together and they strategise on how to teach particular topics. When you have a master teacher, he will be assisting the novice teachers that how we are helping each other. Because you find that new teachers they have the content from the university but how to teach it is a struggle. But when you have the master teacher, they can help the new teachers to do well. We have majority of new teachers, but what I have realised commitment with our young educators is lacking, willingness to go extra miles is a challenge. I think we are having a nation which is becoming very lazy. They don't want to go extra miles. And programs such as enrichment classes, we have but we are not happy if during the normal school hours, teachers do not put their 100% effort, then they become very active on Saturdays because they will get some compensation.

- Principal F Yaah!!! Mmm!!! Well this is quite difficult one. You know we had to to limit Mmm!!! Periods of subjects which learner do have, like Tshivenda, like Life Orientation and First additional languages we gave them fewer periods. You concentrate on the weaker learners, and gave them more periods. This another way of trying to make sure everything went well according to your strategies. 102
- Principal G So, what we are doing now is that we outsource. We invite Mmm!!! Teachers who are performing well at their schools, like we have got Mbilwi secondary, they always have good results, we will invite those teachers to just come and assist the learners that are here. And another thing that we are doing as I have said previously, we would like to take the learners to the place of work where Science is applied. To show them that after learning Science you can follow this streams, career exhibition. 103
- Principal H What I do it's, Mmm!!! I invite the people that I know are experts 104

in the subject. I even take the Science learners to Vuwani Science Centre of the University of Venda. I take them there every year. So that they go there the whole day will be there being taught and using apparatus of the laboratory. They always perform experiments in the very same place. That's what I do every year.

Principal I Mmm!!! We do outsource but towards the end of each quarter and obviously towards the end of the year. But because we are satisfied with the teachers that we have, we only do that when we do revision, but the strategy that is effective Mmm!!! Is to use the teachers to do extra lessons. Extra lesson particularly focusing on those learners who are not doing well. Definitely, the curriculum advisors are playing a very big part because they train these teachers, especially when giving continuous assessment task, there is a strategy that they are using where the marking is done at the common place. And they also give feedback at the end of the quarter how learners are performed and they do a lot of follow-up. 105

Principal J We outsource. We usually encourage them to learn through seeing demonstrations and experiments then we organizing these trips to the place where they have laboratories. At times we take learners to Azwifarwi secondary school. We are partnered with Azwifarwi secondary school for exchange program. We exchange teachers and sometimes we call examiners to come to the centre that we always use which is Azwifarwi secondary school and take our kids there. We have morning studies to encourage learners to study before the classes resumes. I'm responsible for controlling morning and afternoon studies and we are also having this Saturday studies, where Sciences teachers play major part for assisting. We have only one teacher who assist because the other one according to his church, he is not allowed to teach on Saturday. We motivate teachers and sometimes get teachers from other 106

- schools to come and help.
- Principal K First of all, the teacher who is offering Physical Science shows passion all the time. So, he encourages learners to do best and we also try as management of school to employ different strategy, for example, we take our learners to Vuwani Science Centre to learn some of the things there. And there is another area where we can get some of the resources which can help us but it is very difficult to travel from area to another. Sometimes we take our learners to the University of Venda where they can learn some of the things in the laboratory. 107
- Principal L Because we are lacking some facilities but Mmm!!! We send our learners even our deputy principal who is responsible for this subject, he goes to the neighbouring school to ask for apparatus, sometimes he takes some initiatives like previously, learners used to go to Ramano Mbulaheni where are there, but Mmm!!! We are trying our outmost best. Unfortunately we don't have some apparatus or instruments, but bit by bit we I can see that the graph of Chemistry in our school I going up steadily, not faster. 108
- Researcher Question 9 Do you encourage training of Chemistry teachers in the management of Chemistry classroom sessions to improve on their classroom practice?** 109
- Principal A Yaah!!!, in fact training start as soon as we get new teachers into the school, induction begins. The HOD must accompany the novice to the class every day that is where they will discuss, they will agree on the method, how to manage this big classes and then he will maybe or she will teach the first few days, first few hours or just few minutes and the novice will get on board bit by bit until have confidence. 110
- Principal B Definitely, if I had money as the manager, I was going even to send them myself so that they get vast knowledge of the subject because it need a person who is completely well equipped and who is engaging himself or herself 100%. 111

- Principal C Yes, as always not only in the Chemistry, I encourage that the educators should manage their classroom well because if that is not properly managed, noisy classroom cannot produce good results. About discipline, great lot of problems with learners during Mmm!!! These days because they know that even if they may fail Mmm!!! In lower grades, there is a chance to pass by the so-called the QP Model (Progressed learners without valid pass). 112
- Principal D Yaah!!! I encourage training, we besides training, by calling perhaps some other people who, like the subject advisors, we also encourage our teachers or our HOD, to improve, and she is a learning, she is also doing something on Physical Science and Chemistry. She is furthering her studies on this particular subject. Yaah!!! It's improving the results anyway. Discipline is okay I don't have a problem because learners are not that many. 113
- Principal E Yes, is very important. I think this one will link to what I have said already that Mmm!!! We have what we called team teaching. When we have this team teaching, we don't pair a novice with novice, we pair a master with a novice. So, it will help with good classroom management and teaching. Sometimes the young educators will go and observe as the master teacher is teaching. That is how we help each other. Mmm!!! if you prepare well for your lessons, you deal well with some of the disciplinary problems, but if you are not well prepared, that is where you will encounter some problems. Subject advisor rarely do come, but they say no, you are fine, your school is one of the best in the country, rarely do they come to us to assist. 114
- Principal F Training well I don't do it myself but my deputy principal who is well vested in the Chemistry field, he does that. He does that together with the HOD. Deputy principal and HOD do visit classrooms to observe whether if things are done accordingly. 115

And do they give them some training on how to manage classroom. They do but it is very difficult because some resist because you know our unions Mmm!!! Don't encourage these visits but you know some teachers even ask the HOD or the deputy principal to come and visit their classes.

- Principal G Yes, we encourage the educators to do the advance courses in a Chemistry. Mmm!!! Or like Science as a whole we have got other universities where you can do the advance, we encourage them. Also the HOD will sit down with all the teachers, especially these new once that are just joining the field and just to motivate them. Just to show them how they can perform well in Chemistry and then we also encourage them to attend the workshops, like there are workshops that are conducted here in our circuit. And it's like Mmm!!! Besides the curriculum advisors, there are other people who are organised in the circuit like Mmm!!! Expert from other universities. Like we have this year, during the Science week, there were other guys from Pretoria, I think they were from the University of Pretoria. And they also gather the learners, while teachers are gathered differently so that they can just treat the most unpopular topics to the teachers. They get motivate by the training. 116
- Principal H Yes, I do this by inviting say other people who are expert to come and assist the teacher. For internal training Mmm!!! I don't have senior teacher, HOD, and deputy principal to train teachers on science related content like that, but what I do is to invite the guest speakers specialising in Science. The curriculum advisors do visit our school but not to train just to test there and there, and to check as to whether the work is being done. 117
- Principal I Yes, definitely because that plays a very big part. If teachers are not, Mmm!!! Trained or if they are not, they cannot manage the teaching of Chemistry, generally the performance will be very poor. So, what we normally do as part of IQMS, yes, we do 118

classroom visit Mmm!!! We also make sure that at the departmental level, the HOD also do a slot of follow-up in terms of classroom visits.

- Principal J Yes, we have also encouraged the teacher who is a foreigner to further his studies through UNISA. He attends classes there, the reason why we encourage him is that we want him to improve so that our kids could benefit from him. At the time we request curriculum advisor, that's why Mr Phalanndwa a subject advisor support us. He supports us, calls meetings, organise school meetings, he is really doing best. If I'm not there, my deputy principal does also support the training of teachers and visit them in their class while teachers are teaching. She supports and give direction to teachers. 119
- Principal K Yes, we usually encourage our teachers to go and attend workshops which deals with training of Chemistry so that when they come back they impart good knowledge to the learners. Deputy principal or HOD for Science visit educators in their class while they are teaching. They also visit other teacher from other schools in order to see how they impart their knowledge to their learners. They always work as team and when you work with other teachers, they help you where you have challenges, especially in other aspect of Chemistry. But when you work hand in hand with other teachers, they help you as well. 120
- Principal L We do, Mmm!!! Call some subject advisors to come and assist or train our Science teachers. We outsource some excellent teacher too come to our school, and sometimes during study time in the afternoon, and they visit our particular class, teach our learners and even on Saturdays they come and teach our learners. Teachers do go to attend workshops for their enrichment. We are fortunate that one of our teacher here who is teaching Grade 10 and Grade 11 is attending the courses of mathematics and Physical science in the Mastech college in Pietersburg. 121

**Researcher Question10** **What relationship is there between the teacher's classroom management effectiveness and learner's achievements in Chemistry?** 122

Principal A Hmm!!! Yaah!!!, the relationship is that when a new educator comes we are not talking about seasoned educators, if seasoned educator is not delivering you can find that learners don't perform but these learners or these educators who are coming as new educators especially these that are from University from Funza Lushaka educators the seems struggle with discipline. The learners do as they like sometimes they go out of class without ask permission and they do not write their task, so it is very-very difficult for them especially in their first year, but we assist them, we also go into their classroom as they are teaching and that is where you can find that there is order and put out strategies for punishment if it can happen again. We are trying to help but they struggle relation is that they won't produce desired results if the state of affairs remains like that if they don't gather their act together and discipline these learners and show them that they are the teachers. You find out that they might not achieve anything. 123

Principal B Yes, the relationship is improving as such because normally especially when it comes to motivation, when we have people like you coming to motivate our learners and then we talk about the careers which are in lined with the Chemistry subject, we find that they are starting to dwell into the subject like for example, just now I have got Mmm!!! Five students who came to me and asked me, how can they get a bursary which deal with the subject like this one and which deals with medicine then I managed to send them to proper people to help them. Overcrowding definitely has an effect especially for the teacher. Mmm!!! Yaah!!! As a class, it has got negative effect because you know a teacher is very difficult to do individualisation especially when you are busy teaching in a crowded classroom 124

but when you have got a normal you can make a follow up of learners who have difficulties.

Newly appointed teachers are giving us really I don't know how maybe the strategy of training teachers must be looked into because when they come here they are like a clean slate, they've got completely nothing, you know to teach them right the first two three years you will be teaching the teacher how to teach the subject and what about the learners. And also managing the discipline. Is very difficult, you have to go as a manager and manage sometimes the teacher's classroom whereas he is inside. So we find it very difficult.

Principal C Yaah!!! The relationship between teachers' classroom management and effectiveness of learners' achievement in Chemistry is because of that Mmm!!! Like what I have already indicated, if the educator is unable to manage the classroom, it means that even the learners when he is teaching very well, the learners will not listen attentively. And as such to miss something in Chemistry, it means that the result will not be good at the end of the day. The problem and the challenge that we are faced with new educators is that it seems as if they do lack really what we said is the classroom management. But they have got knowledge of the content. The old once they can manage their classrooms but they don't have Mmm!!! Knowledge, some of them they don't have knowledge of the content, it seems as if they are no longer furthering studies, they are simple relaxing. 125

Principal D Mmm!!! The relationship is good and not that bad because I sometimes go and do class visit. And what I have seen you know you might enjoy sometimes you'll feel as if Mmm!!! Instead of coming to assist you just listen to what they are doing and you can learn instead of assisting you will be learning as well. The interaction between teacher and learners is very good. 126

- Principal E The relationship between teachers' classroom management effectiveness and learners achievement they go together because you can't have Mmm!!! Good teaching in a chaotic situation, so discipline first and the rest will follow. Whatever you are giving to the learners. Mmm!!!, if they are not listening, they would not get anything from that in class, so discipline first the rest will follow. Yaah!!! They regard discipline to be cultivated if you are teaching very well and they see that this person knows what he is teaching about. In the classroom, there is no complain about ill-discipline of learners where some experienced Science teachers is busy teaching. We especially with the new educators, experience some problems with the big boys. So, time and again the HODs will be intervening to assist. Yaah, relations its fine, Mmm!!! But like any other place where you have people, Mmm!!! You need to deal with disciplinary problems. 127
- Principal F Yes, Mmm!!! Those teachers who allow assistance. Either from HODs or from other senior teachers Mmm!!! Well the results are wonderful. Yaah!!! The results are good. They make learners to know the best way of achieving in Chemistry. 128
- Principal G Mmm!!! well, effectiveness management of the class will also lead to the positive results of the learners, because if the teacher is able to control the classwork or the written work of the learners, it means that learners will also feel that well, we need to do well in our subject or we need to work well, we need to improve ourselves in the class. So, it means that the effective management of the teacher will also lead to the positive results. If the learners are just noisy in the class, well Science will not be taught well and also for the group discussion. If the teacher cannot manage and control working of the group learners working together, it means that learners will not benefit because Science need discussion, it need you know helping one another. We have the novice teachers like 129

Mmm!!! Those teachers who recently join the field. You know they just need to be Mmm!!! Inducted, they need to be motivated encourage on how they must work with the learners and which good methods can they use rather than giving the learners everything.

Principal H As far as I say, the relationship is good. There is a good relationship because you will find learners time and again going to their teacher asking questions. Wherever they have problems they do ask. And the teachers are willing to assist them. About manpower, no human resource like teachers for Science subject. They are not enough as far as I know here I have got one teacher for FET. Mmm!!! For senior phase I only have one educator and is not enough from Grade 10 to 12, for both Physics and Chemistry. And for GET I have got also one they assist each other, it means I need a lot of Science teachers to assist us. The HOD for Science is the one who is the educator for Science in FET. 130

Principal I Mmm!!! Yaah!!! The relationship is positive. I seen that because Grade 11 and Grade 12 were made sure that paper one is taught by different teacher and paper two is taught by different teacher normally you will find that learners react differently to these teachers depending on who is teaching these papers. With some educators, learners respond very positively, I would say is because the relationship between the teacher and the learners is positive. I have heard in one of the class Grade 11 I remember they were learners who were really complaining about this teacher who they were saying they could not understand how she was teaching. And the teacher's attitude as well was not very helpful, but after we have discussed with the learners Mmm!!! Things normalised. So, I would say that the positive relationship that teachers have with the learners does have an impact. 131

Principal J Mmm!!! One can say the two Science teachers that we are 132

having here, they are good in managing classrooms. The relationship between them and the learners is very good. Therefore, it makes the learners to succeed or to achieve. And even those who are performing badly they are being given support. They are struggling but we find that the teacher doesn't ignored them, they consider them to be part of the class. There is no disturbance, no chaos. I based that in the experience of the two teachers, they are highly experienced.

- Principal K It is 100%. The relationship is good because learners perform well in the classroom and teachers does not complain about learners in the classroom. Which means the cooperation between teacher, and learners is good. Discipline is good because they are not many, they are not many. We may find that in one class, they are less than 50. So it is easy to control learners but where the number is too big, is also very difficult to control them. That is why we are saying discipline is affordable in our school. We have two teachers who were employed this year, they are still new but I'm happy because those who were teaching Physical Science and Mathematics are helping them to gain experience and they are doing well. 133
- Principal L Mmm!!! The relationship between teacher and classroom management is good but not 100%. I mean is fair these days if you check the attitude of the learners, the behaviour of the learners, but all in all some of them, learners show interest in Chemistry, that is why I have got two learners who told me that they are going to study in University of Cape Town (UCT) to do BSC in Chemical Engineering. Discipline in class not 100%. 134
- Researcher Question11 What relationship is there between the teacher's classroom management effectiveness and learner's attitudes to Chemistry?** 135
- Principal A Hmm!!! Yaah!!!, the relationship is that when a new educator comes we are not talking about seasoned educators, if seasoned educator is not delivering you can find that learners 136

don't perform but these learners or these educators who are coming as new educators especially these that are from University from Funza Lushaka educators they seem struggle with discipline. The learners do as they like sometimes they go out of class without ask permission and they do not write their task, so it is very-very difficult for them especially in their first year, but we assist them, we also go into their classroom as they are teaching and that is where you can find that there is order and put out strategies for punishment if it can happen again. We are trying to help but they struggle relation is that they won't produce desired results if the state of affairs remains like that if they don't gather their act together and discipline these learners and show them that they are the teachers. You find out that they might not achieve anything.

Principal B Mmm!!! The relationship which is there between the teachers and classroom management, if the teacher who can manage the class well, definitely will even know how to handle their kids, how to resolve some of the problems which the learners have and how to help the children to acquire what they want which will help them in future. Teachers who are less competent, what normally we do, like what I'm saying unfortunately the school don't have the power to mandate on the workshop of teachers but we sometimes talk to for example, the circuit manager, Mmm!!! If possible, they must give us more workshops. 137

Principal C Then if ever we have got Mmm!!! In our case although learners are struggling, the relationship is good because some of the learners really they have got Mmm!!! Passion for studying this subject, Chemistry. And to those who are in need of studying Chemistry, they are doing very well and there is really a great gap between those who want to do Chemistry and those who seems as if they are forced to do Chemistry. But on in all the relationship can be regarded as average at our school with learners' attitudes towards this Chemistry. 138

- Principal D Mmm!!! Yaah!!! Normally this can be because of most of the teachers are not well qualified. Yaah!!! Some of the teachers are not well prepared and so forth and so forth. That is what I'm trying to say because she is goes to class well prepared Mmmm!!! that's a very strong bond between the learners and their teacher they don't even want to miss a minute, immediately when they realised that well is Chemistry period or whatever in Physical Sciences, they will go there on time so that they don't miss anything. So, you can see that a there is Mmm!!! The attitude or the relationship between the teacher and the learners is very good. It makes learners to like Chemistry. 139
- Principal E Mmm!!! those teachers who teach very well they are appreciated, but those who are not doing their work well, they would experience problems and the children will ridicule them, but those who are teaching well they would be appreciated and you find time and again the learners would come to the teachers say thank you, when we have awards, they also say thank you when they receive certificates of performance from teachers. It means they have teachers who are good and learners appreciate and also show positive attitudes. Mmm!!! Once they love the teacher, they would love also the subject and they do pass because our school is for Mathematics and Physical Science, it started from the beginning for that particular reason. 140
- Principal F Yes, you find the attitudes changes. When a teacher is well vested in the subject and he manages the classroom well, you find no disruptions and learners concentrate and ask questions, you will realize that they become much free whenever or whatever a teacher is a novice or an experienced teacher is the same. Yaah!!! With novice sometimes is still difficult but getting there since they assisted by most experienced senior teachers. 141
- Principal G The good management of the teacher in the classroom will 142

have Mmm!!! Good impact in the learning of Chemistry, because, if the class is well managed Mmm!!! It means that in that environment learners will learn easy. The attitude will also be positive. Which means that Mmm!!! If the teacher himself can managed the class well, all the learners are respecting one another, attitude of learning will also be cultivated in that way. And the area, I mean the situation inside the classroom will be conducive for learning.

Principal H As far as I say, the relationship is nice Mmmm!!! Because what I see is when they are saying few apparatus that we have, you find the learners practicing showing that they have got really anxiety and ask their educators meanwhile their educator will also come to me and say how can we get this apparatus it means the attitude is positive, is positive because of the relationship between them and the educator. 143

Principal I Yaah!!! I would say so as I have indicated at the beginning, learners were doing well in Chemistry. And it is because of these positive attitudes of teachers towards classroom management that makes it possible for learners to perform otherwise, we would not be doing well in Chemistry, in fact the reason why we are doing well in Physical Science is because learners are doing well in Chemistry. We concentrate a lot on Chemistry than Physics well incidental so because it is the teacher himself who does that he initiates some of this program on his own without us forcing him to do so. So because of this positive relationship that we see from the teacher that's why the achievement is fine. And also the learners' attitudes is also positive. 144

Principal J Yaah!!! The attitude changes the reason why we are having learners in these other universities, so, starting from the University of Venda, Wits, Pretoria and Cape Town, following this Science. It shows that what they are doing is stimulating their attitudes, they are letting learners to follow Chemistry or to 145

follow Science. The relationship is very good. Mmmm!!! Is much better than before unlike those starting from the year 2013, you can find that is much better. Things are changing.

Principal K Yaah!!! We can say the attitudes nowadays is good because they like to do Physical Science and they do well in Chemistry because they are motivated and they are also encouraged and when they pass in Grade 11 obvious in Grade 12 they started to love the subject because they do well. It means the attitudes is positive. And is positive because the teachers are also positive towards them and encourage, and their relationship is well. The relationship is well and the discipline wise is well and they also copy from other teachers who were doing it and we have old learners who were attending in our school and they are doing well in the universities. So, they use them as role models. About learners who complain it happens some years back but nowadays, I never had that challenge because the teacher who is offering it, he shows interest, he knows what to do and he encourage learners to do well. The attitude is good towards the subject. 146

Principal L As I have indicated above, some learners have got the negative impact in Chemistry. They say that hey!! Chemistry like Mathematics is very difficult. I still remember I have attended Mmm!!! Workshop where one of the Department of Education official said that as time goes on, Chemistry is going to be studied as subject, you see like in Economics, so, we have got paper one and paper two. So, they said that hey it seems as if then Chemistry it will split. It must be split into paper one and paper two, then I think if they do that then learners will be getting more time. To love that particular, because now they are not really have positive attitudes towards Chemistry. They say after Matric if they go to university they can specialise in Physics, specialise in Chemistry. Mmm!!! So, learners start to know the subject matter better, so if they started to practice at 147

FET at Grade 10, Grade 11, Grade 12. Chemistry as a subject.  
Mmm!!! Maybe they have got paper one, paper two, then I  
think we can improve.

**Researcher Thank you, this is the end of our interview.**

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## APPENDIX E: REQUEST LETTERS FOR PERMISSION TO CONDUCT RESEARCH

ENQUIRIES: A T NESENGANI  
TEL: 015 962 9101/ 082 683 1305

P.O. BOX 529  
SIBASA  
0970  
12 AUGUST 2016

The District Director  
ATTENTION: Dr NG Rambiyana  
Vhembe District  
P/Bag x2250  
SIBASA  
0970

Dear Sir

### REQUEST FOR PERMISSION TO CONDUCT RESEARCH

I am registered with the University of Venda in the school of Education. My promoter is Prof TS Mashau while the co-promoters are Prof AP Kutame and Dr SJM Kaheru.

The title of my thesis is "Management of High School learners' academic performance in Chemistry".

My proposal fieldwork plan is as follows:

1. A questionnaire survey will be conducted with a sample of secondary school learners and teachers who are doing and teaching Physical Science in the FET level.
2. A sample of secondary school principals will be interviewed.

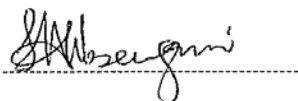
I hereby request permission to conduct research in the following circuits in the Vhembe District: Sibasa, Mvudi and Luvuvhu.

The research will be conducted after the lessons so as not to disturb them.

I hope my request will be taken into consideration.

Yours faithfully

ALIDZULWI THOMAS NESENGANI



ENQUIRIES: A T NESENGANI  
TEL: 015 962 9101/ 082 683 1305

P.O.BOX 529  
SIBASA  
0970  
31 OCTOBER 2016

The Circuit Manager  
Sibasa Circuit

Dear Sir

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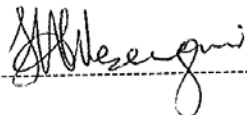
**I hereby attach the approval from the District Director for your consideration.**

The research will be conducted after the lessons so as not to disturb them. The followings schools will be involved in my study: Mbilwi Sec School; Mphaphuli Sec School; Ralson Tshinane Sec School; and Dengenya Sec School.

Thanking you in advanced.

Yours faithfully

ALIDZULWI THOMAS NESENGANI



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ENQUIRIES: A T NESENGANI  
TEL: 015 962 9101/ 082 683 1305

P.O.BOX 529  
SIBASA  
0970  
31 OCTOBER 2016

The Circuit Manager  
Mvudi Circuit

Dear Madam

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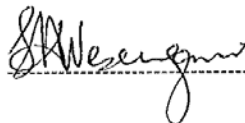
**I hereby attach the approval from the District Director for your consideration.**

The research will be conducted after the lessons so as not to disturb them. The followings schools will be involved in my study: Thohoyandou Technical High School; Liivha Combine School; Thohoyandou Sec School; and Mpariseni Sec School.

Thanking you in advanced.

Yours faithfully

ALIDZULWI THOMAS NESENGANI



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ENQUIRIES: A T NESENGANI

TEL: 015 962 9101/ 082 683 1305

P.O.BOX 529

SIBASA

0970

31 OCTOBER 2016

The Circuit Manager

Luvuvhu Circuit

Dear Sir

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH**

I am registered with the University of Venda in the school of Education. My promoter is Prof TS Mashau while the co-promoters are Prof AP Kutame and Dr SJM Kaheru.

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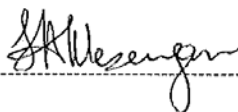
**I hereby attach the approval from the District Director for your consideration.**

The research will be conducted after the lessons so as not to disturb them. The followings schools will be involved in my study: Azwifarwi Sec School; Thivhilaeli Sec School; Gole Sec School; and Muvhavha Sec School.

Thanking you in advanced.

Yours faithfully

ALIDZULWI THOMAS NESENGANI



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## APPENDIX F: CONSENT FORM

### CONSENT FORM

ENQ: AT NESENGANI

Tel: 015 962 9101

School of Education

University of Venda

P/Bag x5050

THOHOYANDOU

0950

12 August 2016

Dear Principal,

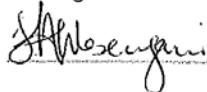
I am currently conducting research into Management of high school learners' academic performance in Chemistry 2013-2017, and I have been granted permission by the **Limpopo Education Department** to conduct research in the school in which you are currently managing as it has been selected to take part in this research.

1. An interview will be conducted and it will take approximately 30 minutes.
2. The questionnaire will be completed and it will take 2 weeks
3. There is no known risk involved in the research.
4. There are no costs involved.

You are assured that your identity and responses to this interview will be regarded as **extremely confidential at all times and that they will not be made available to any unauthorized user.**

Should you have any queries or comments, you are welcome to contact me.

Nesengani A T



## CONSENT

In terms of the ethical requirements of the University of Venda, you are now requested to complete the following section:

\_\_\_\_\_

have read this letter and understand the terms involved.

On condition that the information provided by me is treated as confidential at all times, I hereby (MARK the appropriate section)

give consent

do NOT give consent that the results may be used for research purposes.

Signature: \_\_\_\_\_

Date \_\_\_\_\_

## APPENDIX G: APPROVAL LETTER FROM THE DEPARTMENT OF EDUCATION



# LIMPOPO

PROVINCIAL GOVERNMENT  
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF  
**EDUCATION**

**VHEMBE DISTRICT**

CONFIDENTIALITY

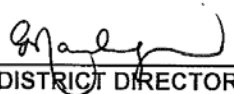
REF: 14/7/R  
ENG: MAGUGUMELA J  
TEL: 015 962 1029

ALIDZULWI THOMAS NESENGANI  
P.O.BOX 529  
SIBASA  
0970

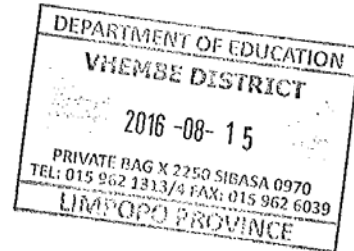
12 AUGUST 2016

**REQUEST FOR APPROVAL TO CONDUCT A RESEARCH IN THE VHEMBE DISTRICT: SIBASA, MVUDI AND LUVUVHU.**

1. The above matter refers.
2. You are hereby informed that your request for permission to conduct research titled, **"Management of high school learners; academic performance in chemistry"**
3. We appreciate your commitment to ensure confidentiality, anonymity and voluntary participation by research subjects.
4. Kindly inform Circuit Manager and Principals of selected Schools prior to commencing your data collection.
5. Ensure that your research activities do not disturb teaching and learning in the schools.
6. Wishing you the best in your study.

  
DISTRICT DIRECTOR

15/08/2016  
DATE



REQUEST FOR APPROVAL TO CONDUCT A RESEARCH IN THE VHEMBE DISTRICT: SIBASA, MVUDI AND LUVUVHU. [Type text]

Page 1

Thohoyandou Government Building, Old Parliament, Block D, Private Bag X2250, SIBASA, 0970  
Tel: (015) 962 1313 or (015) 962 1331, Fax: (015) 962 6039 or (015) 962 2288

**The heartland of southern Africa - development is about people!**

## APPENDIX H: LANGUAGE EDITOR'S CERTIFICATE

23 Elfin Glen Road, Nahoon Valley Heights, East London, 5200

Professional  
**EDITORS**  
Group

To whom it may concern:

This document certifies that the Phd thesis whose title appears below has been edited for proper English language, grammar, punctuation, spelling, and overall style by Rose Masha, a member of the Professional Editors' Group whose qualifications are listed in the footer of this certificate.

Title:

**MANAGEMENT OF HIGH SCHOOL LEARNERS' ACADEMIC  
PERFORMANCE IN CHEMISTRY**

Author:

**ALIDZULWI THOMAS NESENGANI**

Date Edited:

27 April 2017

Signed



**Dr. Rose Masha**

B. Library & Inf. Sc.; HDE; Hons. ELT; M. Phil. Hyll.; PhD Ed.